



— BUREAU OF —
RECLAMATION

Lake Powell Pipeline Project Draft Environmental Impact Statement

**Coconino and Mohave Counties, Arizona
Kane and Washington Counties, Utah**



Estimated Lead Agency Total Costs
Associated with Developing this EIS
\$1,474,000

Mission Statements

Department of the Interior

The Department of the Interior conserves and manages the Nation's natural resources and cultural heritage for the benefit and enjoyment of the American people, provides scientific and other information about natural resources and natural hazards to address societal challenges and create opportunities for the American people, and honors the Nation's trust responsibilities or special commitments to American Indians, Alaska Natives, and affiliated island communities to help them prosper.

Bureau of Indian Affairs

The Bureau of Indian Affairs' mission is to enhance the quality of life, to promote economic opportunity, and to carry out the responsibility to protect and improve the trust assets of American Indians, Indian tribes and Alaska Natives.

Bureau of Land Management

The Bureau of Land Management's mission is to sustain the health, diversity, and productivity of public lands for the use and enjoyment of present and future generations.

Bureau of Reclamation

The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

National Park Service

The National Park Service preserves unimpaired the natural and cultural resources and values of the National Park System for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

U.S. Fish and Wildlife Service

The Fish and Wildlife Service's mission is to work with others to conserve, protect and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people.

Lake Powell Pipeline Project Draft Environmental Impact Statement

**Coconino and Mohave Counties, Arizona
Kane and Washington Counties, Utah**

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Lake Powell Pipeline Project Draft Environmental Impact Statement

Dear Reader:

Enclosed is the Draft Environmental Impact Statement (DEIS) and Draft Arizona Strip Field Office Resource Management Plan Amendment (RMPA) for the Lake Powell Pipeline Project (LPP, or Proposed Project).

Lead and Cooperating Agencies. The DEIS/Draft RMPA was prepared by the Bureau of Reclamation (Reclamation) as the Lead Agency, in consultation with the following Cooperating Agencies: Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), Kaibab Band of Paiute Indians (Tribe), National Park Service (NPS), and U.S. Fish and Wildlife Service (USFWS).

Public Scoping and Comment. Reclamation has incorporated input from various government agencies and organizations into this DEIS/Draft RMPA, considering comments received during public scoping conducted by the BLM from June 22 to August 3, 2018, specifically on the RMPA sub-alternatives, and from December 6, 2019 to January 10, 2020, on the entire Proposed Project, including the sub-alternatives.

Proposed Project. This DEIS was prepared to evaluate the potential consequences of the Proposed Project on the human and natural environment as required by the National Environmental Policy Act (NEPA). Based on projected population growth in Washington County through the year 2060, water demands will exceed Virgin River Basin surface and groundwater supplies, resulting in shortages. A second, reliable water supply is needed to meet existing and future water demand. Pursuant to the Lake Powell Pipeline Development Act, the Utah Board of Water Resources (UBWR) proposes to build a water conveyance system with inline hydroelectric components spanning from Lake Powell's Glen Canyon Dam in Page, Arizona, to water storage facilities near St. George, Utah (approximately 141 miles in length).

Federal Decisions to be Made. The following table lists the decisions to be made by each cooperating agency in response to the UBWR's proposal under the different action alternatives.

Agency	Southern Alternative	Highway Alternative
BIA	No decision	Right-of-way (ROW) grant
BLM	ROW grants and RMPA	ROW grants
NPS	ROW permit	ROW permit
Reclamation	Lake Powell Pipeline Project (LPP) water exchange contract and easement	LPP water exchange contract and easement
USFWS	No decision	No decision

Structure of the DEIS. This document comprises the main body, which provides the primary presentation of the Proposed Project, the baseline conditions, and the evaluation of the proposed action alternatives on the natural and human environment. It also includes supporting appendices. Additional information has been incorporated into the DEIS by reference. The body of the DEIS is organized as follows:

- Chapter 1 addresses the purpose and need for the Proposed Project and the decisions to be made based on the UBWR proposal.
- Chapter 2 describes two action alternatives and the No Action Alternative. Other alternatives that were considered but eliminated from detailed analysis are also described in Chapter 2.
- Chapter 3 describes the affected environment and the direct and indirect effects on individual resources resulting from each alternative.

- Chapter 4 describes the irreversible and irretrievable commitment of resources of the action alternatives and No Action Alternative.
- Chapter 5 evaluates cumulative effects of the action alternatives and No Action Alternative.
- Chapter 6 lists the references used throughout the document.
- Chapter 7 lists acronyms throughout the document.
- Chapter 8 contains the list of preparers.
- Chapter 9 includes an index of key terms used in this document.

The following appendices contain supporting information:

- Appendix A details the consultation and coordination for the Proposed Project.
- Appendix B provides additional detail on the purpose and need for the Proposed Project.
- Appendix C includes the Supplemental Resource Reports for all resources.
- Appendix D presents the analysis and perspective of the tribes.
- Appendix E includes the Plan of Development for the Proposed Project.

Final EIS (FEIS). The FEIS/Proposed RMPA will be prepared following public and agency comment on the DEIS/Draft RMPA. Reclamation will file a Notice of Availability with the U.S. Environmental Protection Agency announcing availability of the FEIS for interested parties to review.

Protest. Pursuant to 43 Code of Federal Regulations (CFR) §§ 1610.4-8 and 1610.5-1(b), any person who participated in the planning process for this RMPA and has an interest that is or may be adversely affected by the RMPA decision may protest approval of the RMPA decision contained therein. The protest period only applies to the BLM RMPA decision.

Governor's Consistency Review. Pursuant to 43 CFR §§ 1610.3-2(e), prior to the approval of a proposed RMPA, the BLM State Director shall submit to the Governor of the State(s) involved, the RMPA and shall identify any known inconsistencies with State or local plans, policies or programs.

Record of Decision. As a "major infrastructure project" under Executive Order 13807, the Proposed Project is subject to the Memorandum of Understanding implementing One Federal Decision. The Secretary of the Interior will issue a Record of Decision outlining the federal agencies' decision, including the alternative selected and the environmental commitments required of the UBWR. This concludes the NEPA and planning processes.

Sincerely,

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Executive Summary

The Bureau of Reclamation (Reclamation), as lead federal agency, in coordination with the cooperating agencies, has developed this Draft Environmental Impact Statement (DEIS) and Draft Arizona Strip Field Office Resource Plan Amendment (RMPA) in accordance with the National Environmental Policy Act (NEPA - 42 United States Code §4321). The five cooperating agencies are: Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), Kaibab Band of Paiute Indians (Tribe), National Park Service (NPS), and U.S. Fish and Wildlife Service (USFWS).

Reclamation and the cooperating agencies prepared this DEIS/Draft RMPA in response to the Utah Board of Water Resources' (UBWR) proposal to construct, operate, and maintain the Lake Powell Pipeline Project (LPP, or Proposed Project). The LPP is a water delivery pipeline that would convey water from Lake Powell near Glen Canyon Dam in Page, Arizona, to Washington County, Utah. The two action alternatives in this DEIS would cross lands administered by the federal agencies. The Tribe is a cooperating agency because one alternative would cross the Kaibab Indian Reservation (KIR), lands held in trust by the United States for the benefit of the Tribe. This chapter summarizes the purpose and need for the Proposed Project, the alternatives carried forward for detailed analysis in this DEIS/Draft RMPA, and the affected environment and environmental consequences of implementing the Proposed Project.

ES-1 Project Background

The UBWR holds Water Right No. 41-3479, which allows 447,500 acre-feet of Colorado River diversions. The UBWR segregated this water right in various ways, but it retained 86,249 acre-feet as part of Water Right No. 41-3479 for the LPP. This LPP water is already allocated to Utah as part of its apportionment from the Colorado River Compact of 1922. The UBWR intends to use up to 86,249 acre-feet per year to address future water demands in southwest Utah.

The UBWR previously proposed a pipeline project with an intake at Lake Powell that included a large hydroelectric station with associated reservoirs at the Hurricane Cliffs in Utah. The Federal Energy Regulatory Commission (FERC) was the lead federal agency for that project (Project No. P-12966) because it would have required a hydroelectric license issued by FERC. In 2008, UBWR filed a Preliminary Application Document and Notice of Intent (NOI) with FERC to begin the federal licensing, permitting, and environmental compliance processes for the Proposed Project. In January 2009, FERC required the UBWR to complete 23 resource studies needed to understand the environmental and economic effects of building the LPP. The study reports were revised based on public and agency comment from 2010 to 2016 when final versions were submitted to FERC. Data within the study reports were subsequently updated in 2018 and 2019 FERC filings.

In 2019, the UBWR revised their proposal by removing the large hydropower components at the Hurricane Cliffs, eliminating the need for an individual hydropower license from FERC. UBWR withdrew its application to FERC on September 25, 2019, and FERC terminated Project No. P-12966, [effective October 10, 2019](#). Shortly after withdrawing their license application, the UBWR requested that the U.S. Department of the Interior (Interior) assume the responsibility for NEPA

compliance for the Proposed Project. On October 28, 2019, Interior delegated those responsibilities to Reclamation, as the lead federal agency for NEPA. Based on the changes to project design and the lead federal agency, Reclamation issued a new NOI on December 6, 2019, to begin a new public scoping process, separate from the previous FERC process (84 Federal Register [FR] 66929). Reclamation also reinitiated government-to-government consultation with Indian tribes under Section 106 of the National Historic Preservation Act and in accordance with Executive Order 13175.

ES-2 Scoping

Two scoping efforts were conducted to satisfy NEPA requirements for the Proposed Project as currently designed. The first was conducted by the BLM from June through August 2018 in response to the need for amending the Arizona Strip Field Office Resource Management Plan (RMP) if the Southern Alternative, then called the South Variant, were to be selected in the Record of Decision. The scoping period began on June 22, 2018, with issuance of the NOI in the FR and ended on August 3, 2018 (83 FR 29134). The BLM's final scoping report was published in December 2018 and is available on the agency's eplanning website (https://eplanning.blm.gov/epl-front-office/projects/lup/91318/165557/201946/508_Final_Scoping_Report.pdf). The BLM received 39 submissions. The following issues were raised by public commenters.

- Cultural Resources, including Tribal Cultural Property
- Southwestern Willow Flycatcher Habitat
- Riparian Areas
- Visual Quality
- Travel Management Areas
- Other Environmental Considerations
- Cumulative Effects

This scoping occurred prior to the revision of the Proposed Project design and the change in lead federal agency from FERC to Reclamation in 2019. However, the portion of the pipeline alignment for the Southern Alternative did not change when the Proposed Project design was revised. The lack of changes to that portion of the alignment meant the need to amend the RMP due to the conflicting management direction remained the same. The scoping effort to solicit public input and the three RMPA Sub-alternatives derived from the scoping process are still relevant. For these reasons, the BLM's 2018 scoping effort was incorporated into Reclamation's NEPA process.

Reclamation initiated another scoping period with the issuance of an NOI on December 6, 2019, to solicit input from the public and agencies on the revised Proposed Project. The scoping period began when the NOI was published and ended on January 10, 2020. A total of 1,125 submissions were made during that period (Table ES-2-1). Because each submission can contain multiple comments regarding different topics, submissions were segmented by topic. The total number of segments was 1,307. Reclamation's final scoping report for the 2019 to 2020 scoping effort is available on Reclamation's LPP website (<https://www.usbr.gov/uc/DocLibrary/Reports/20200200-LakePowellPipeline-PublicScopingReport-508-PAO.pdf>).

Table ES-2-1 Submissions Made during the 2019–2020 Scoping Period

Submission Type	Submission Count
Form Letter 1 - Cancel Pipeline	615
Form Letter 2 - Conserve SW UT Org Bullet List	22
Form Letter 3 - Colorado River Crisis	6
Total Form Letter Submissions	643
Non-substantive Comments	360
Substantive Comments	116
Transcripts (verbal comments collected at public scoping meetings)	6
Total Unique Submissions	482
Total Submissions	1,125

ES-3 Purpose and Need

The Utah Board of Water Resources (UBWR, also referred to herein as the “Project Proponent”) is the policy-making body of the State of Utah’s Division of Water Resources (UDWRe). It is the mission of UDWRe to plan, conserve, develop, and protect Utah’s water resources. Washington County is located in southwest Utah, bordering northwestern Arizona. The Washington County Water Conservancy District (WCWCD, also referred to herein as the “Project Participant”) is the primary water supplier for Washington County. The WCWCD supplies water wholesale to local providers and retail directly to select customers. The Virgin River Basin is the sole source for the WCWCD’s water supply, which presents challenges in providing a reliable water supply for a fast-growing population.

Under median climate change scenarios, approximately 86,000 acre-feet of water will be needed annually by 2060 to satisfy increased water demands (Appendix B, Purpose and Need Report) of a growing population in Washington County, Utah (Gardner Institute 2017). A more diverse and secure water supply is needed to mitigate vulnerabilities to unexpected demand and supply scenarios and to ensure reliable water deliveries into the future (UBWR 2019).

The WCWCD is the sole Project Participant. Kane County Water Conservancy District (KCWCD) was previously a Project Participant as recently as Reclamation’s 2019 to 2020 scoping effort. However, in evaluating the KCWCD’s supply and demand data using the Kem C. Gardner Institute’s 2017 population projections (Gardner Institute 2017), Reclamation determined that projected demand in 2060 did not outpace the KCWCD’s estimated future reliable water supply (Appendix B, Purpose and Need Report). On April 10, 2020, the KCWCD informed Reclamation it no longer wished “to be included as part of any alternative in the current NEPA process” (KCWCD 2020). The Kane County System was subsequently removed from the Proposed Project and is not included in this DEIS.

In the event that conditions related to population projections, economic expansion, tourism, climate scenarios, water supply reliability, or water quality do not continue as currently expected, the KCWCD may pursue a project at some unknown time that would deliver water from the LPP to Kane County. For this reason, a “T” or turnout in the LPP has been proposed where the Kane County System was previously proposed to diverge from the main pipeline. That project would be

subject to its own NEPA process and is not reasonably foreseeable at this time, based on Reclamation's evaluation of their supply and demand data.

ES-4 Alternatives

Two non-LPP alternatives were considered but eliminated from detailed analysis, along with seven LPP variations on the pipeline or associated facilities. These alternatives were eliminated based on the factors found in Interior's NEPA regulations at 43 Code of Federal Regulations (CFR) 46.420(b). Three alternatives were brought forward for detailed analysis: the No Action Alternative (required by NEPA), the Southern Alternative (preferred alternative), and the Highway Alternative.

ES-4.1 Comparison of the Action Alternatives

Both action alternatives begin and end in the same locations, and both would cross lands administered by Reclamation and NPS along the same alignment. This would require Reclamation to issue an easement and the NPS to issue a right-of-way (ROW) permit under either alternative. Both action alternatives would also cross land administered by the BLM in Utah and Arizona and would require multiple ROW grants.

Another similarity between the two action alternatives is the LPP water exchange contract with Reclamation. Under the exchange contract, the UBWR would forbear the diversion of a portion of the natural flows to which the UBWR is entitled and allow these flows to contribute to meeting the Endangered Species Act Upper Colorado River Recovery Implementation Program requirements in the Green River. In exchange, the UBWR would deplete an equal amount of water released from Flaming Gorge Dam throughout the year and available at Lake Powell. This exchange contract would not entitle the UBWR to call for releases from Flaming Gorge.

The main difference between the two action alternatives is that the Southern Alternative would travel south of the KIR, while the alignment for the Highway Alternative would cross lands held in trust by the United States for the benefit of the Tribe, following Arizona State Route 389. The LPP would follow Corridor 113-116, hereafter referred to as the utility corridor, for much of the alignment as it travels south of the KIR in the Southern Alternative. However, due to constraints related to terrain, one portion of the alignment deviates from the utility corridor within the Kanab Creek Area of Critical Environmental Concern (ACEC). Authorizing the LPP within the ACEC is not in conformance with the RMP when another reasonable alternative is available. An amendment to the RMP would be necessary to make the Proposed Project conform with the RMP and to address other conflicting management direction in the RMP related to the visual resources, ACEC, and the utility corridor. Three sub-alternatives to amend the RMP are evaluated in the Southern Alternative.

Under the Highway Alternative, the BIA would need to issue a ROW grant and would require a Tribal resolution. The Highway Alternative is in conformance with the BLM RMP, and no amendment to the RMP would be required in order to authorize the Highway Alternative. Therefore, the three RMPA sub-alternatives do not apply to the Highway Alternative.

ES-5 Affected Environment and Environmental Consequences

A total of 24 resources or issues were considered in this DEIS. Four of the 24 resources were eliminated from further consideration in Chapter 3 for reasons described below. However, all 24 were fully evaluated in Appendix C, Supplemental Resource Reports. Readers are encouraged to review Appendix C in conjunction with Chapter 3 of this DEIS.

The four resources that were considered but eliminated from Chapter 3 are air quality, electric and magnetic fields, general fish and wildlife, and paleontology. These resources were eliminated based on minimal effects, largely contingent on implementation of environmental protection measures (EPMs). Some resources with minimal effects were retained in Chapter 3 due to public interest or regulatory requirements. EPMs are measures or design features that the UBWR has committed to implementing as part of the Proposed Project and would avoid, minimize, or otherwise mitigate effects to resources. The UBWR's EPMs are fully outlined in the Plan of Development (Appendix E, Plan of Development).

Cumulative effects are evaluated by resource in Chapter 5 of this DEIS and in Appendix C-25, Cumulative Effects, which contains information on the methodology for evaluating cumulative effects and provides a synthesis of the cumulative effects analyses for the 24 resources.

1 Introduction

The Utah Board of Water Resources (UBWR, also referred to herein as the “Project Proponent”) is the policy-making body of the State of Utah’s Division of Water Resources (UDWRe). The mission of UDWRe is to plan, conserve, develop, and protect Utah’s water resources (UDWRe 2019, 2020). UDWRe plans to meet the future water needs in the state of Utah through a combination of multi-faceted solutions that include conservation, efficiency, optimization, agriculture conversion, and water development. Such an approach will help prepare, plan, and sustain Utah’s water future (UDWRe 2020).

As the Project Proponent and pursuant to the Lake Powell Pipeline Development Act of 2006 (Utah Code 73-28, Parts 1-5), UBWR has proposed building the Lake Powell Pipeline Project, which would deliver water from Lake Powell to Washington County in southwest Utah. The Washington County Water Conservancy District (WCWCD also referred to herein as the “Project Participant”) supplies water wholesale to local providers and retail directly to select customers in Washington County. For the Proposed Project, the UBWR would construct, own and operate the Proposed Project until title is transferred to the Project Participant. The WCWCD as the Project Participant would be responsible for repaying the cost of the construction, and bearing the cost of future operation and maintenance.

1.1 Project Background

The Upper Colorado River Basin Compact of 1948 establishes the allocations of water from the Colorado River and its tributaries for the Upper Basin states. Utah’s portion of that water allocated to the Upper Basin states is 23 percent. The Bureau of Reclamation (Reclamation) constructed Flaming Gorge Dam and Glen Canyon Dam on the Colorado River. These dams impound Flaming Gorge Reservoir and Lake Powell, respectively. Reclamation filed Water Right Number 41-2963 (A30414) to store water at Flaming Gorge with the Utah State Engineer on August 7, 1958, and received approval of the application on October 6, 1959. The storage capacities of these reservoirs are 3,788,500 acre-feet for Flaming Gorge and 27,000,000 acre-feet for Lake Powell.

On March 3, 1995, Reclamation’s Water Right Number 41-3479 (A30414d) for 447,500 acre-feet was segregated from the original Flaming Gorge Water Right 41-2963 (A30414). Then, on March 12, 1996, Reclamation assigned Water Right Number 41-3479 (A30414d) to the UBWR (“1996 Assignment”). Since the 1996 Assignment, the UBWR has segregated this water right in various ways, but it retained up to 86,249 acre-feet for the Lake Powell Pipeline Project (LPP). This LPP water is already allocated to Utah, an “Upper Basin” state, as part of its apportionment from the Colorado River Compact of 1922 and the Upper Colorado River Basin Compact of 1948. Use of Utah’s Upper Basin water retained for LPP would be put to use in the Lower Basin, although still within the boundaries of Utah. Scoping comments from some states question whether Upper Basin water can be put to use in the Lower Basin but still within the boundaries of the Upper Basin state. The Project Proponent is addressing this question with the Colorado River Basin States.

The UBWR intends to use up to 86,249 acre-feet per year to address future water demands in southwest Utah. The LPP is a water delivery pipeline that would carry water from Lake Powell in

northern Arizona, near the town of Page, west approximately 141 miles to Washington County, Utah. The pipeline alignment for UBWR's proposal travels south of the Kaibab Indian Reservation (KIR) and will be referred to throughout this document as the Southern Alternative. The Southern Alternative is the preferred alternative in this document. The alternative pipeline alignment along Arizona State Route 389 that crosses the KIR is referred to herein as the Highway Alternative. Collectively, these will be the action alternatives analyzed in this Draft Environmental Impact Statement (DEIS). The action alternatives will be compared to the No Action Alternative in Chapter 3. The Southern Alternative includes three sub-alternatives for amending the Arizona Strip Field Office Resource Management Plan (RMP).

The UBWR previously proposed a pipeline project with an intake at Lake Powell that included a large hydroelectric station with associated reservoirs at the Hurricane Cliffs in Utah. The Federal Energy Regulatory Commission (FERC) was the lead federal agency for that project (Project No. P-12966), because it would have required a hydroelectric license issued by FERC. In 2008, the UBWR filed a Preliminary Application Document and Notice of Intent (NOI) with FERC to begin the federal licensing, permitting and environmental compliance processes for the Proposed Project. In January 2009, FERC required the UBWR to complete 23 resource studies needed to understand the environmental and economic effects of building the LPP. The study reports were revised based on public and agency comment from 2010 to 2016, when final versions were submitted to FERC. Data within the study reports were subsequently updated in 2018 and 2019 FERC filings.

On June 22, 2018, the Bureau of Land Management (BLM) published an NOI in the Federal Register (FR). The NOI initiated the public scoping process and served to notify the public of the BLM's intent to incorporate the analysis for the Draft Arizona Strip Field Office Resource Plan Amendment (RMPA) into FERC's DEIS for the LPP. The BLM held two public scoping meetings, one in Fredonia, Arizona, and one in St. George, Utah. The BLM also conducted an Economic Strategies Workshop in Fredonia, Arizona. This process produced four RMPA sub-alternatives (including the No Action Alternative) to be incorporated into FERC's DEIS.

In 2019, the UBWR revised their proposal by removing the large hydropower components at Hurricane Cliffs, eliminating the need for an individual hydropower license from FERC. The UBWR withdrew its application to FERC on September 25, 2019, and FERC terminated Project No. P-12966, effective October 10, 2019

(https://elibrary.ferc.gov/idmws/file_list.asp?accession_num=20191016-3069). Shortly after withdrawing their license application, the UBWR requested that the U.S. Department of the Interior (Interior) become the new lead federal agency for National Environmental Policy Act of 1969 (NEPA; 42 United States Code [USC] §4321) compliance. On October 28, 2019, Interior designated Reclamation as the lead federal agency for the LPP NEPA process. Based on the changes to the Proposed Project design and the lead federal agency, Reclamation issued a new NOI on December 6, 2019, to begin a new public scoping process (84 FR 66929), separate from the previous FERC process. Reclamation also reinitiated government-to-government consultation with Indian tribes under Section 106 of the National Historic Preservation Act and in accordance with Executive Order (E.O.) 13175. This DEIS relies on both the BLM scoping effort in 2018 and the scoping by Reclamation in 2019 to 2020 to solicit public input and develop alternatives.

For this DEIS, the Washington County Water Conservancy District (WCWCD) is the only Project Participant in the Proposed Project. Kane County Water Conservancy District (KCWCD) was previously a Project Participant as recent as Reclamation's 2019 to 2020 scoping effort. On April 10,

2020, the KCWCD informed Reclamation it no longer wished “to be included as part of any alternative in the current NEPA process” (KCWCD 2020). The Kane County System was subsequently removed from the Proposed Project and is not included in this DEIS.

In the event that conditions related to population projections, economic expansion, tourism, climate scenarios, water supply reliability, or water quality do not continue as currently expected, the KCWCD may pursue a project that would deliver water from the LPP to Kane County. For this reason, a “T” or turnout in the LPP has been proposed where the Kane County System was previously proposed to diverge from the main pipeline. That project would be subject to its own NEPA process and is not reasonably foreseeable at this time, based on Reclamation’s evaluation of their supply and demand data (Appendix B, Purpose and Need Report).

1.2 Statement of Purpose and Need

Washington County is located in southwest Utah, bordering Arizona. The WCWCD is the primary water supplier for Washington County. The WCWCD supplies water wholesale to local providers and retail directly to select customers. The Virgin River Basin is the sole source for the WCWCD’s water supply, which presents challenges in providing a reliable water supply for a fast-growing population.

The population in Washington County is estimated to increase from about 186,600 to 468,800 by 2060 (Gardner Institute 2017). Despite the various conservation objectives listed in Chapter 5 of Appendix B, Purpose and Need Report, population growth will increase total annual water demand beyond the existing water supplies in Washington County (Appendix B, Purpose and Need Report; see Table 1.2-1, below).

Table 1.2-1 Water Supply and Demand for Washington County Water Conservancy District under Different Climate Change Scenarios, Ranging from Hotter and Drier to Warmer and Wetter

WCWCD Reliable Annual Water Supply (acre-feet) ^(a)	Climate Change Scenario ^(b)	Climate Change Type	WCWCD 2060 Demand and Reserve (acre-feet)	WCWCD 2060 Supply Deficit (acre-feet)
71,516	10th	Hotter, Drier	184,513	112,997
88,022	30th			96,492
98,727	50th	Median		85,786
112,196	70th	Warmer, Wetter		72,318
130,888	90th			53,625

Notes:

(a) Average yield with up to 10% shortage represents reliable yield for WCWCD projects.

(b) Virgin River natural streamflow scenarios provided by Reclamation demonstrate the effect of climate change to reliable annual water supply (Reclamation 2014).

Key:

WCWCD = Washington County Water Conservancy District

Relying on a single source of water increases vulnerabilities of the water supply due to unexpected demands associated with increases in population or economic expansion, natural or human-induced infrastructure disruptions, and projected climate change scenarios (Reclamation 2012; Udall and Overpeck 2017; Milly and Dunne 2020). As a water supplier, the WCWCD must plan for future water demand and supply conditions. Inadequate planning adds risk to the WCWCD as a water supplier and to its customers.

1.2.1 Need for the Project

Under median climate change scenarios, approximately 86,000 acre-feet of water will be needed annually by 2060 to satisfy increased water demands of a growing population in Washington County, Utah (Appendix B, Purpose and Need Report). A more diverse and secure water supply is needed to mitigate vulnerabilities to unexpected demand and supply scenarios and ensure reliable water deliveries into the future (UBWR 2019, Attachment C).

1.2.2 Project Proponent's Objectives

The UBWR proposes building the LPP to meet future water demands through 2060 and beyond. In addition, the LPP is intended to achieve other prudent planning objectives, consistent with the UBWR's mission (UBWR 2019, UDWR 2019), which include:

1. Diversifying the regional water supply portfolio by providing a second source of water for Washington County;
2. Providing for system reliability by developing a secure source of water;
3. Providing for system redundancy in the event of system failure due to disasters or aging infrastructure;
4. Accounting for climate change scenarios; and
5. Accounting for long-term uncertainty when considering the summed effect of the vulnerability to the water supply.

Other large water districts/suppliers in Utah that operate and maintain some of Reclamation's federal projects have similar objectives in both their day-to-day and long-term plans (e.g., Jordan Valley Water Conservancy District 2019).

1.2.3 Project Purpose

The purpose of the Proposed Project is to deliver a reliable annual yield of approximately 86,000 acre-feet of water per year from outside the Virgin River Basin into Washington County to meet projected water demands in 2060.

1.3 Agency Decisions

1.3.1 Bureau of Indian Affairs

If the Highway Alternative is selected (see Section 2.3.3, below), the Bureau of Indian Affairs (BIA) would decide whether to issue a right-of-way (ROW) under the authority of 25 USC 323 and 25 Code of Federal Regulations (CFR) Part 169. The pipeline route for the Highway Alternative would cross lands held by the United States in trust for the benefit of the Kaibab Band of Paiute Indians (Tribe) the KIR along Arizona State Route 389. The Tribe would need to consent to the ROW grant (and could impose conditions on its consent) and UBWR would be required to pay compensation to the Tribe.

If the Southern Alternative is selected, the BIA would have no decision to make because the Southern Alternative would not cross any land held by the United States in trust for an Indian Tribe or individual.

1.3.2 Bureau of Land Management

The decisions to be made by the BLM are whether to issue ROWs to the UBWR and providers of power for either proposed alternative on lands administered by the BLM under the Federal Land Policy and Management Act (FLPMA; 43 USC §1701 et seq.) and whether to amend the RMP pursuant to FLPMA and the regulations at 43 CFR §1610.

An RMPA must be considered because some portions of the Action Alternatives are not in conformance with the RMP. The RMP directs that new land use authorizations would be allowed in the Kanab Creek Area of Critical Environmental Concern (ACEC) only when no reasonable alternative exists. It also directs that designated utility corridors be used to the extent possible for ROWs. The Southern Alternative crosses the ACEC and within the ACEC deviates from the utility corridor. In addition, the RMP includes some conflicting management direction between the ACEC and utility corridor. It identifies the ACEC as an avoidance area for new land use authorizations while the utility corridor is a location where ROWs are encouraged. It also designates the ACEC as Visual Resource Management (VRM) Class II and utility corridors as VRM Class IV. The LPP may not be able to meet VRM Class II objectives. The amendment would clarify and resolve these inconsistencies. The LPP is in conformance with the other RMPs that provide management direction for the public lands crossed by the LPP.

The BLM will decide whether to approve, deny, or approve with modifications the UBWR ROW application or select another alternative. Modifications could include changing the route or location of the proposed facilities if the BLM determines such changes are in the public interest (43 CFR 2805.10(b)(1)), as well as determining terms and conditions (stipulations) deemed appropriate by the BLM to include in the ROW grants. The BLM will also decide whether to amend the RMP. An RMPA would be required to issue ROWs for portions of the Southern Alternative. The BLM may also decide to amend the RMP if the No Action, Highway Alternative or another alternative is selected.

1.3.3 Bureau of Reclamation

The decisions to be made by Reclamation are whether to: (1) enter into an LPP water exchange contract with the UBWR; and (2) issue an easement for the use of its lands for the intake and pumping plant at Lake Powell. The decisions would be the same for both action alternatives. These actions would be pursuant to the Reclamation Act of June 17, 1902 (32 Stat. 388), the acts amendatory thereof and supplementary thereto; the Colorado River Storage Project (CRSP) Act of April 11, 1956 (43 USC §620, et seq.); and the Reclamation Project Act of 1939, Section 14 (43 USC §389). The LPP water exchange contract and easement would need to comply with and further the purposes of the CRSP Act and the Reclamation Project Act.

1.3.4 National Park Service

Under both the Southern and Highway Alternatives, the National Park Service (NPS) will decide whether to issue a ROW permit for the land it administers. The NPS has federal authority to manage the land and resources within Glen Canyon National Recreation Area (GCNRA) and Pipe Spring

National Monument in accordance with the NPS Organic Act of 1916, as amended (54 USC 100101) and other laws, regulations, and NPS Management Policy, which furthers the purpose of the Organic Act and the NPS mission. While these authorities allow activities that adversely impact NPS resources, NPS Management Policies 2006, which set forth the NPS interpretation of the Organic Act, prohibit the NPS from taking any action that would result in impairment of park resources or values.

1.3.5 U.S. Fish and Wildlife Service

The U.S. Fish and Wildlife Service (USFWS) has jurisdictional authority to provide technical assistance under the provisions of the Endangered Species Act (ESA; 16 USC §1531 et seq.), as amended; Fish and Wildlife Coordination Act (16 USC §661-666c), as amended; Bald and Golden Eagle Protection Act (16 USC 668), as amended; Migratory Bird Treaty Act (16 USC 703-712), as amended; and NEPA, as amended. The action agencies are consulting with the USFWS under 7(a)(2) of ESA.

1.3.6 One Federal Decision

The agencies will make their decisions, summarized in Table 1.3-1, in a joint Record of Decision (ROD) in accordance with the Memorandum of Understanding Implementing Executive Order 13807, *Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects* (One Federal Decision).

Table 1.3-1 Agency Decision by Action Alternative

Agency	Southern Alternative	Highway Alternative
Bureau of Indian Affairs	No decision	ROW grant
Bureau of Land Management	ROW grants and RMPA	ROW grants
National Park Service	ROW permit	ROW permit
Bureau of Reclamation	LPP water exchange contract and easement	LPP water exchange contract and easement
U.S. Fish and Wildlife Service	No decision	No decision

Key:

LPP = Lake Powell Pipeline Project

ROW = right-of-way

RMPA = Arizona Strip Field Office Resource Management Plan Amendment

2 Alternatives Development and Screening

This section summarizes the alternatives development process and describes the alternatives analyzed in this DEIS.

2.1 Action Alternatives Development

2.1.1 Scoping

Reclamation initiated a scoping period with the issuance of an NOI on December 6, 2019, to solicit input from the public and agencies on the revised Proposed Project. The scoping period began when the NOI was published and ended on January 10, 2020. A total of 1,125 submissions were made during that period (Table 2.1-1). Because each submission can contain multiple comments regarding different topics, submissions were segmented by topic. The total number of segments was 1,307. Reclamation's final scoping report for the 2019 to 2020 scoping effort is available on Reclamation's LPP website (<https://www.usbr.gov/uc/DocLibrary/Reports/20200200-LakePowellPipeline-PublicScopingReport-508-PAO.pdf>).

Table 2.1-1 Submissions Made during the 2019–2020 Scoping Period

Submission Type	Submission Count
Form Letter 1 - Cancel Pipeline	615
Form Letter 2 - Conserve SW UT Org Bullet List	22
Form Letter 3 - Colorado River Crisis	6
Total Form Letter Submissions	643
Non-substantive Comments	360
Substantive Comments	116
Transcripts (verbal comments collected at public scoping meetings)	6
Total Unique Submissions	482
Total Submissions	1,125

Many commenters requested that a “conservation alternative” be considered in the DEIS, but the only alternative with specific components that could be analyzed in sufficient detail and was submitted to Reclamation during the scoping period was the Local Waters Alternative, initially developed by Western Resource Advocates in 2013. This alternative was considered but eliminated from detailed analysis in this DEIS. No other alternatives were submitted during the scoping period.

2.1.2 Criteria for Action Alternatives

To determine whether alternatives were reasonable under NEPA and should be carried forward for detailed analysis in this DEIS, each alternative was evaluated against 43 CFR 46.420(b) and was considered reasonable if it:

1. Met the need for the Proposed Project as described in Section 1.2.1, above;
2. Accomplished the purpose of the Proposed Project as described in Section 1.2.3, above; and
3. Was practical or feasible from an economical and technical standpoint.

To meet criterion 1, the alternative had to meet future water demands through 2060 with a more diverse and secure water supply, as described in the need for the Proposed Project (see Section 1.2.1, above).

To meet criterion 2, the alternative needed to accomplish the purpose of the Proposed Project (see Section 1.2.3, above). Alternatives that did not accomplish the purpose of the Proposed Project were not considered “reasonable” and thus were not carried forward.

To meet criterion 3, the alternative had to be practical or feasible from an economical and technical standpoint. If it was not, it was eliminated from further study. Economic feasibility refers to the ability to repay the cost of construction plus interest in addition to operation and maintenance charges. Technical feasibility is defined as being able to use available technologies and/or methods to successfully construct, operate, and maintain project facilities.

2.1.3 Alternatives Considered but Eliminated from Detailed Analysis

2.1.3.1 Alternatives Developed during the U.S. Federal Energy Regulatory Commission Licensing Process

Many comments were received regarding a water conservation alternative through the various public meetings and comment periods held through the NEPA and FERC application processes. Eventually, FERC requested that the UBWR provide a detailed analysis of an action alternative that eliminated the LPP and consisted of additional conservation actions, building additional water storage, and constructing advanced treatment plants. This alternative was called the No Lake Powell Water Alternative. The Local Waters Alternative, presented by Western Resource Advocates in 2013 (WRA 2013) with updates in 2018 (WRA 2018), was also brought forward through the public scoping process and is discussed in this DEIS.

No Lake Powell Water Alternative

This alternative would involve a combination of developing remaining available surface water and groundwater supplies in the Virgin River Basin, developing reverse osmosis (RO) treatment of existing low-quality water supplies, and eliminating residential outdoor culinary water use in the WCWCD service area. This alternative could provide approximately 86,000 acre-feet of water annually to the WCWCD’s service areas for municipal and industrial (M&I) use without diverting Utah’s Compact Allocation water from Lake Powell.

Under this alternative, the WCWCD and other municipal water providers would implement other future water development projects that are currently planned, develop additional water reuse/recovery programs, continue to implement new water conservation measures, and convert all agricultural water use to M&I use. Remaining planned and future water supply projects include the Ash Creek Pipeline (initial studies demonstrated up to 2,840 acre-feet per year, but more recent analyses completed independent of LPP show that it may yield only up to 1,730 acre-feet), Sand Hollow recharge/recovery (3,000 acre-feet per year), Westside groundwater wells arsenic treatment (5,000 acre-feet per year), and development/yield increase of existing groundwater wells (2,830 acre-feet per year). Along with existing supplies, these future water supplies would yield an estimated 72,842 acre-feet per year of potable water and 8,505 acre-feet per year secondary water by 2028.

Actions in addition to the currently planned WCWCD projects (see Table 2.3-1 in Section 2.3.1, below) would need to be taken to meet the water demand that the LPP is proposed to supply. Washington County residential outdoor potable water use would be permanently repurposed to indoor potable water use to help meet increasing indoor potable water demands starting approximately 2030. The WCWCD would need to develop a RO advanced water treatment facility near the Washington Fields Diversion in Washington County, Utah, to treat up to 50,000 acre-feet per year of diverted Virgin River water, which has a high total dissolved solids concentration, mixed with an additional 19,030 acre-feet per year of reuse water. The WCWCD would also develop the Warner Valley Reservoir to store the reuse water and diverted Virgin River water prior to RO treatment. A water distribution pump station and pipeline would be constructed to convey 13,249 acre-feet of potable water from Quail Creek Water Treatment Plant to the Apple Valley area of Washington County. The estimated cost of this alternative was \$3.3 billion (see LPP Final Study Report 22 – Alternatives Development [UBWR 2016a]).

This alternative would satisfy water demands for the Proposed Project (part of criterion 1, meeting the need for the Proposed Project) if the above assumptions could be met but was eliminated based on the rest of criterion 1, as well as criteria 2 and 3. It would not diversify the water supply because Washington County would not have a second secure, reliable water source outside of the Virgin River Basin, as described in the purpose and need statements and Project Proponents' objectives.

Additionally, this alternative may not be technically feasible. Repurposing outdoor potable water to indoor is not feasible because the WCWCD does not have the ability or authority to require Washington County residents to xeriscape their properties to more water efficient environments, although the WCWCD does employ landscape rebates. RO is a costly method for increasing water supply with potential adverse environmental effects related to diminished flows in the Virgin River affecting endangered fish species and also the disposal of spent brine materials.

Furthermore, it may not be feasible to acquire or convert all private agricultural water rights to M&I use. Some landowners may not be willing to sell or give away their water rights or land for development. It is not the disposition or mission of the WCWCD to develop or condemn land. Beyond the criteria mentioned above, it would likely change some of the culture and aesthetics of the area, possibly reducing the desirability of the area.

Local Waters Alternative

The main feature of the Local Waters Alternative is the emphasis on greater conservation. Future per-capita demand is modeled to decline by 1 percent per year – that is, every year per capita water use would decline by 1 percent based on each previous year's level of per capita water use, through 2060 (WRA 2013). This alternative has multiple components (WRA 2018):

1. Advanced treatment of existing water supplies (RO)
2. Water conservation
 - a. Water rates that encourage efficiency
 - b. Land use policies to substantially increase water efficiency in new construction
3. Development of local supplies
 - a. Conveying available groundwater from Kane County to Washington County by pipeline
 - b. Conversion of agricultural uses to municipal uses
4. Water data management
 - a. Universal metering of all culinary and secondary water deliveries
 - b. Improved tracking to inform water management and conservation efforts

Western Resource Advocates estimated that total costs (in 2010 dollars), without accounting for infrastructure needs (including RO), would range from \$410,300,000 to \$510,400,000 (WRA 2013). The Local Waters Alternative would require infrastructure not yet in place, such as a RO plant, additional agricultural water pump stations and distribution systems, water supply storage reservoirs, and a pipeline to Apple Valley. The Local Waters Alternative does not provide estimates for the infrastructure needed to implement the alternative and some of the updated conservation measures for the alternative (WRA 2019). Therefore, a comparison of cost estimates against the other alternatives is not possible.

This alternative was eliminated based on criteria 1, 2, and 3. This alternative would fail to fully meet the need or accomplish the purpose of the Proposed Project. However, the Local Waters Alternative could partially meet the need and achieve part of the purpose of the Proposed Project (meet future water demands in 2060) if all the supply and demand assumptions can be met. One of the assumptions of the Local Waters Alternative is that the WCWCD would have to require a higher rate of water conservation (1 percent per year for 40 years) than what is found in the Proposed Project, which is 20 percent over a 40-year period. Although the WCWCD encourages conservation through conservation rebate programs, they do not have the ability or authority to require Washington County residents to xeriscape their properties to more water efficient environments or nearly eliminate outdoor water use. This DEIS has been prepared in response to the Proposed Project and does not attempt to compel Washington County residents to modify, change, or curtail their current culture, lifestyle or social expectations.

Washington County was the first county in Utah to meet the statewide water conservation goal of reducing per capita water use 25 percent by 2025, by achieving more than 30 percent conservation before 2025 (UBWR 2019, Attachment C). The Proposed Project's goal of 240 gallons per capita per day (gpcd) by 2060 aligns with the UDWRe's water conservation goal for Washington County of 236 gpcd by 2065 (UDWRe 2019).

Conversion of agricultural water to M&I use is another component of the Local Waters Alternative and requires at least 13,700 acre-feet of conversion to meet this alternative's projected demand, which is based on the more ambitious conservation goal. Olds (2018) estimated that up to 23,000 acre-feet of water per year would be available for conversion. However, Olds (2018) also noted that this may be the upper range of possible conversions and that it could be cost prohibitive to obtain some of those water rights. The UBWR asserts that up to 10,080 acre-feet is available for conversion without pursuing "buy and dry" programs (Final Water Needs Assessment – UBWR 2016b). Furthermore, it may not be feasible to acquire or convert all private agricultural water rights to M&I use. Some landowners may not be willing to sell their water rights for land development or cease their agricultural operations. It is not the disposition or mission of the WCWCD to develop or condemn land to obtain water rights.

Under the Local Waters Alternative, projected reuse would need to increase by 16,900 acre-feet to meet this alternative's projected demand. By comparison, an increase of 7,300 acre-feet of reuse water is projected under the Proposed Project. The 16,900 acre-feet from the Local Waters Alternative would require upgrading the existing St. George City treatment plant beyond its current maximum design and/or building a new treatment facility to treat that much water, whereas the Proposed Project would only maximize the existing treatment plant to the designed capacity. Both

the Local Waters Alternative and the Proposed Project would require additional storage to accommodate the treated reuse water.

Therefore, this alternative does not fully meet the need or accomplish the purpose of the Proposed Project; instead, it would likely introduce additional risk to the WCWCD's overall water supply and only provide a single source of water rather than a more diverse and secure water supply through a second source.

2.1.3.2 Other Pipeline Alternatives to UBWR's Proposal

There are a finite number of alignments for providing a second source of water to Washington County. From a cost, engineering, and feasibility perspective, much effort has been put into assess any viable alternative. These limitations inherently limit the range of structural alternatives available. The UBWR submitted alternative alignments for the pipeline and associated features to FERC in 2015 (UBWR 2015). These alignments/alternatives are discussed below.

Lone Rock Intake Pump Station Alternatives

Four intake pump station alternatives near Lone Rock in Lake Powell were considered. These intake pump station alternatives were sited in the Utah portion of Lake Powell as part of the All Utah Alignment Alternatives. Each intake pump station alternative involved extending an intake pipeline into Lake Powell near Lone Rock, with a pump station building constructed on the shore. Pipeline alignments from each pump station site extended west-northwest to U.S. Highway 89 and then followed the highway ROW. These intake pump station alternatives were determined impracticable for several reasons. The shallow depth and fluctuating levels of Lake Powell in the Lone Rock arm would not always provide a reliable water depth and supply for pumping to meet M&I water needs. In some years, the intake pipelines for each of the Lone Rock intake pump station sites would be above the Lake Powell water surface elevation. Reclamation evaluated the Lone Rock intake pump station sites and determined they would not provide a reliable water depth to meet the M&I needs during all years. Additionally, Reclamation recommended the intake pump station be sited near Glen Canyon Dam for security reasons because it would be adjacent to their ongoing operations at the dam. Siting of the intake pump station near Lone Rock would be remote, maintaining security would be difficult, and the cost of providing electrical power would be higher than at a Glen Canyon Dam intake pump station.

All Utah Alignment Alternatives

Several alignment alternatives were considered where the pipeline and all facilities would be located within Utah. One of the All Utah Alignment Alternatives would involve an intake pump station near Lone Rock, pipeline alignment along U.S. Highway 89 to Kanab, Utah, a booster pump station (BPS) at the Cockscomb geological feature, a BPS west of Kanab, pipeline up through the mountains west of Kanab to Sand Dunes Road and southwest along Sand Dunes Road, a tunnel under the Canaan Mountain Wilderness Study Area (WSA) and Area of Critical Environmental Concern for 6 miles to east of Hildale City, a pipeline along Utah State Route 59, a pipeline across Little Creek Mountain to a peaking reservoir, and a pipeline through Gould Wash to Sand Hollow Reservoir. A second All Utah Alignment alternative would be similar except it would bypass Kanab and follow the Utah/Arizona state line west to the 6-mile-long tunnel, pipeline along Utah State Route 59, take a northern alignment across Little Creek Mountain to a peaking reservoir, and a pipeline through Gould Wash to Sand Hollow Reservoir. These All Utah Alignment Alternatives were determined impracticable because of their significantly higher construction costs, higher operating costs, hydraulic limitations, uncertainties with siting the pipeline through active faults

along and under the Canaan Mountain WSA and Area of Critical Environmental Concern, and the lack of reliability for pumping water from the Lone Rock area intake pump station.

Flat Top Alignment Alternative

The Flat Top Alignment Alternative was considered as an all Utah alternative to the pipeline parallel to U.S. Highway 89. This alternative would run west-southwest from the Lone Rock intake pump station and across U.S. Highway 89 for about 7 miles (south of the highway), then northwest and west for about 13 miles across a high plateau where it would return to the U.S. Highway 89 corridor about 1.5 miles west of the Grand Staircase – Escalante National Monument east boundary. The Flat Top Alignment Alternative was determined to be impracticable because of significantly higher construction costs, higher operating costs, and the lack of reliability for pumping water from the Lone Rock area intake pump station.

Honeymoon Trail and South Little Creek Mountain Alignment Alternative

The Honeymoon Trail and South Little Creek Mountain Alignment Alternative would start at the Lone Rock intake pump station, parallel U.S. Highway 89 to 5 miles east of Kanab, follow the Honeymoon Trail along the Utah state line and through the KIR, south around Lost Spring Mountain, north around the west side of Little Creek Mountain, and west across the Hurricane Cliffs to Sand Hollow Reservoir. This alignment alternative was determined to be impracticable because of higher construction costs and higher operating costs.

South Powerline Alignment Alternative

The South Powerline Alignment Alternative would share the same alignment as other alternative alignments traveling to the west Grand Staircase – Escalante National Monument former boundary, continue southwest through White Sage Wash, run south around the KIR, follow the Navajo-McCullough Transmission Line corridor to Clayhole Wash, and either run north along the west side of Lost Spring Mountain and Little Creek Mountain to Sand Hollow Reservoir or follow the Honeymoon Trail through the Hurricane Cliffs and run south and west of Sand Mountain to Sand Hollow Reservoir. The South Powerline Alignment Alternative was determined to be impracticable because of significantly higher construction costs and higher operational costs.

Cockscomb Tunnel Alignments

The Cockscomb Tunnel Alignments were considered as alternatives to paralleling U.S. Highway 89 through the Cockscomb geological feature. Three tunnel alignments were evaluated to convey the LPP water under pressure from the east side to the west side of the Cockscomb. Each tunnel alignment would connect with the LPP pipeline on the east side of the Cockscomb and trend northwest, with east portals in the exposed bedrock. Each of the west tunnel portals would be in the alluvium on the west side of the Cockscomb and would connect to a pipeline paralleling U.S. Highway 89. The Cockscomb Tunnel Alignments were determined to be impracticable because of the high construction cost, uncertainties with crossing the Cockscomb Fault through a tunnel, and difficulties with constructing tunnel portals in alluvium.

Hurricane Cliffs Alignments

The Hurricane Cliffs Alignments included six alternatives for conveying the LPP water through the Hurricane Cliffs and onto Sand Hollow Reservoir. These included, from north to south, the Willow Springs Alignment, the Gould Springs to Mollie's Nipple Alignment, the Gould Springs Alignment, the Gould Reservoir Alignment, the West Little Creek Alignment, and the Honeymoon Trail Alignment. The four northern-most alignments were linked to alternative alignments following Utah

State Route 59 around the north side of Little Creek Mountain or alternative alignments over the top of Little Creek Mountain. The two southern-most alignments were linked to alternative alignments following the Honeymoon Trail south of Sand Hollow Reservoir. All of these alignments through the Hurricane Cliffs were determined to be impracticable because the alignments they would connect with are impracticable for reasons including high construction cost and hydraulic limitations.

2.2 Sub-alternatives Development

2.2.1 Scoping

2.2.1.1 Bureau of Land Management 2018 Scoping

The formal public scoping process for the proposed RMPA began on June 22, 2018, with the publication of the NOI in the Federal Register (83 FR 29134). The BLM also issued a media release and sent a mail and email announcement of the scoping period to the Proposed Project mailing list. The public scoping period extended through August 3, 2018. During this time, the BLM hosted two public scoping meetings and an economic strategies workshop to provide the public with an opportunity to become involved and offer comments on the proposed RMPA. In addition to the public meetings and economic strategies workshop, an agency-specific meeting was held at the BLM's Arizona Strip District Office on July 18, 2018. The meeting included a presentation by the BLM and a discussion of the role of cooperating agencies.

The BLM received 39 comments from the public during and after the official public scoping period; a final scoping report was published in December 2018. The BLM developed draft RMPA sub-alternatives and held two meetings with cooperating agencies before producing the sub-alternatives.

Cooperating Agencies on the RMPA

State and local governments, tribes, and other federal agencies were invited to be cooperating agencies for the RMPA process. To serve as a cooperating agency, an agency or government must have either jurisdiction by law or special expertise relevant to the environmental analysis. A total of 32 agencies and tribes were invited to be cooperators; and four accepted the invitation: Washington County Commission, Kane County Commission, WCWCD, and the Tribe.

Collaboration and Consultation with Tribes on the RMPA

Tribal consultation was initiated on November 16, 2017, when the BLM made a presentation to the Kaibab Paiute Tribal Council at the Tribal Office in Pipe Spring, Arizona, informing them about the proposed RMPA. The BLM followed up with additional meetings with the Tribe, directly engaging with tribal members and tribal representatives who had concerns about the social and economic effects of the RMPA.

2.2.1.2 Reclamation 2019–2020 Scoping

In addition to the 2018 BLM scoping effort mentioned above, Reclamation accepted comments on the Proposed Project during the 2019 to 2020 scoping effort, including the RMPA sub-alternatives. A total of 14 comments were received regarding the RMPA. Several comments expressed opposition to amending the RMP at all, and several others suggested topics or resources that should be considered in the DEIS. However, none of the comments proposed different sub-alternatives

than those identified in the 2018 BLM scoping effort or in Reclamation's 2019 to 2020 scoping effort.

2.2.2 Criteria for Reasonable Arizona Strip Field Office Resource Management Plan Amendment Sub-alternatives

The 2018 NOI indicated the following preliminary planning criteria:

1. The BLM will continue to manage the ACEC in accordance with FLPMA and other applicable laws and regulations;
2. The BLM will continue to manage Utility Corridor No. 113-116 in accordance with FLPMA and other applicable laws and regulations; and
3. The amendment process will follow the FLPMA planning process.

2.2.3 Arizona Strip Field Office Resource Management Plan Amendment Sub-alternatives Considered but Eliminated from Detailed Analysis

The three sub-alternatives developed by the BLM meet the reasonable criteria above. During public comment, three other sub-alternatives were proposed:

1. Remove that portion of the utility corridor that crosses the ACEC
2. Review Section 368 utility corridor
3. Reroute the utility corridor to avoid the ACEC

These alternatives were eliminated from detailed analysis because they address changes to the utility corridor that are outside the scope of this RMPA and would not meet the purpose and need for the RMPA. Utility corridors are designated as areas where ROWs would be encouraged, but they do not preclude approval of land use authorizations outside of a utility corridor. As discussed elsewhere, the Southern Alternative is not in conformance with the RMP with regards to approving land use authorizations within the ACEC because another reasonable alternative exists. Changing or removing the utility corridor would not address this conformance issue, nor would it preclude consideration of a land use authorization in the ACEC. If the utility corridor was removed, the visual resources decisions related to the ACEC would still need to be clarified because the RMP VRM decision would still show this area as VRM Class IV. Furthermore, removing a portion of the utility corridor and leaving a gap would defeat the purpose of designating utility corridors as there would no longer be a continuous linear area to locate linear ROWs. Reviewing the Section 368 utility corridor, which presumably could include either continuing to or no longer identifying it as a Western Utility Group priority energy corridor, would not remove the corridor itself as it was previously designated as a corridor through an RMP process. It would remain as a designated corridor, including an existing major transmission line ROW. Rerouting the utility corridor to avoid the ACEC entirely would not be practical because the location through the ACEC is a pinch point, with a designated wilderness area to the south and the KIR to the north; however, one of the RMPA Sub-alternatives does propose an adjustment that would decrease the number of acres of the ACEC overlapped by the utility corridor. In addition, rerouting the corridor would not change the need for the BLM to consider the proposal to route the LPP ROW through the ACEC.

2.3 Description of Alternatives Carried Forward for Detailed Analysis

The following sections describe the alternatives carried forward: the No Action, Southern, and Highway Alternatives.

2.3.1 No Action Alternative

The No Action Alternative is required by NEPA regulations. Under NEPA, the No Action Alternative also serves as the baseline to which action alternatives are compared to determine potential effects. The No Action Alternative may differ from existing conditions if there are actions that could occur in the Project Area in the future that (1) currently do not exist and (2) do not rely on approval or implementation of the Proposed Project.

Under the No Action Alternative, the Proposed Project would not be built. The agencies would not grant (or permit) the requests for the LPP water exchange contract, an easement, or ROWs for the Proposed Project. An RMPA would not be needed. The BIA would not issue a ROW grant for crossing the KIR for the Highway Alternative. Colorado River water would not be delivered from Lake Powell to the Washington County service area. The WCWCD would continue current operations and conservation programs (WCWCD 2015). The WCWCD would also implement future planned projects (Table 2.3-1). Only one of the projects listed in Table 2.3-1, below, is currently undergoing NEPA review: the Ash Creek Pipeline and Toquer Reservoir (DOI-BLM-UT-C030-2012-0001-EA). The BLM plans to continue resource surveys in spring 2020 (<https://eplanning.blm.gov/epl-front-office/eplanning/planAndProjectSite.do?methodName=dispatchToPatternPage¤tPageId=200007247>). Because it is an independent project undergoing its own NEPA review, it does not need to be covered in this DEIS.

The other projects are not developed in sufficient detail to analyze them in the No Action Alternative. The Sand Hollow Recharge and Recovery project will be developed at some point in the Sand Hollow well field. The Westside Arsenic Treatment is related to the Navajo sandstone aquifer and is not currently planned for development. The combined Groundwater Well Development projects are named and listed, but locations and numbers of wells are not known at this time. The reuse project is a current plant that could be maximized to its 11,200 acre-feet annual design capacity. Maximizing reuse through this plant does not create additional environmental effects. Finally, agricultural conversion would occur as agricultural lands are developed. However, currently each conversion location and amount of water is unknown.

Table 2.3-1 Planned Water Supplies Independent of the Lake Powell Pipeline Project

Planned Supplies	Reliable Culinary Water Yield (acre-feet/year)	Reliable Secondary Water Yield (acre-feet/year)
Washington County Water Conservancy District		
Ash Creek Project ^(a)	2,840	0
Sand Hollow Recharge and Recovery	3,000	0
Westside (Gunlock Wells) Arsenic Treatment	5,000	0
Groundwater Well Development	2,830	0
Maximize Existing Wastewater Reuse	0	7,300
Agricultural Conversion from Development	0	10,080

Note:

(a) More recent analyses completed independent of LPP show that the Ash Creek Project yield could be less (BLM 2019).

In the absence of the LPP (i.e., under the No Action Alternative), the WCWCD would pursue other projects not listed in Table 2.3-1 that have been part of their long-term planning (WCWCD 2020). These projects may include Warner Valley Reservoir (includes RO treatment of Virgin River water), additional wastewater reuse, water rights acquisitions, stock acquisitions, and additional agricultural conversion from development.

It would be speculative to include these potential projects in this analysis because it is unknown which, if any, of these projects may be built by 2060 in the absence of the LPP. If any of these projects become foreseeable prior to completion of the LPP NEPA process, they would be addressed.

2.3.2 Southern Alternative (Preferred Alternative)

The Southern Alternative is the Preferred Alternative. It satisfies all three screening criteria because it would meet the need for and accomplish the purpose of the Proposed Project by meeting future water demands in Washington County by 2060, and it would establish a more diverse and secure water supply that would mitigate uncertainties related to relying on a single source of water. It is economically feasible based on the ability to repay the Proposed Project (see Appendix C-23, Socioeconomics). This alternative is hydraulically and geotechnically feasible. It also complies with the directives established by the Utah State Legislature as outlined in the 2006 Lake Powell Pipeline Development Act. Therefore, it was carried forward for detailed analysis.

The full description of Southern Alternative can be found in the Plan of Development (POD, see Appendix E, Plan of Development). Acreages of potentially affected federal, state and private lands are contained therein. The locations of BPSs and inline hydrostations (HSs) are disclosed as well.

Table 2.3-2 provides a summary of the proposed permanent and temporary ROW for the Southern Alternative.

Table 2.3-2 Summary of Proposed Permanent and Temporary Rights-of-Way for the Southern Alternative by Type of Facility and Land Ownership/Management

Land Ownership/Management	Permanent ROW (acres)			Short-term or Temporary Construction Easement ROW ^(a) (acres)	Total
	Pipeline ^(a)	Transmission Lines ^(a)	Pumping, Hydro, and Road Facilities ^(b)		ROW (acres)
BLM	876	533	68	649	2,127
NPS	126	55	20	79	280
Reclamation	1	8	27	0	36
State	302	375	11	186	874
Private	382	95	42	565	1,083
Total	1,687	1,067	168	1,479	4,401

Notes:

(a) Disturbed ROW would be restored.

(b) Disturbed ROW would not be restored due to permanent above ground facilities.

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = Right-of-way

The Southern Alternative is a proposed 141-mile, 69-inch-diameter water delivery pipeline that begins at Lake Powell near Glen Canyon Dam in Page, Arizona, and ends at Sand Hollow Reservoir near St. George, Utah (Figure 2.3-1). The pipeline would deliver up to 86,249 acre-feet of water from Lake Powell to Washington County in southwest Utah. The Southern Alternative would cross land owned or administered by multiple federal and state agencies and private landowners.

The primary facilities associated with the LPP include:

1. Approximately 141 miles of 69-inch-diameter buried pipeline from Lake Powell to Sand Hollow Reservoir.
2. A water intake system on the west side of Lake Powell near Glen Canyon Dam in Coconino County, Arizona.
3. Four BPSs, one regulating tank, and six inline HSs.
4. A turnout east of Johnson Canyon in Kane County, Utah, that could deliver water to the KCWCD service area at some future time.
5. A turnout west of Hildale, Utah, for future delivery of up to 13,249 acre-feet of the WCWCD's 86,249 acre-feet allocation of LPP water to Apple Valley.
6. Approximately 71 miles of power transmission line ranging from 12.47 kilovolts (kV) to 230 kV.
7. Multiple temporary and permanent access roads.
8. Multiple construction staging areas.

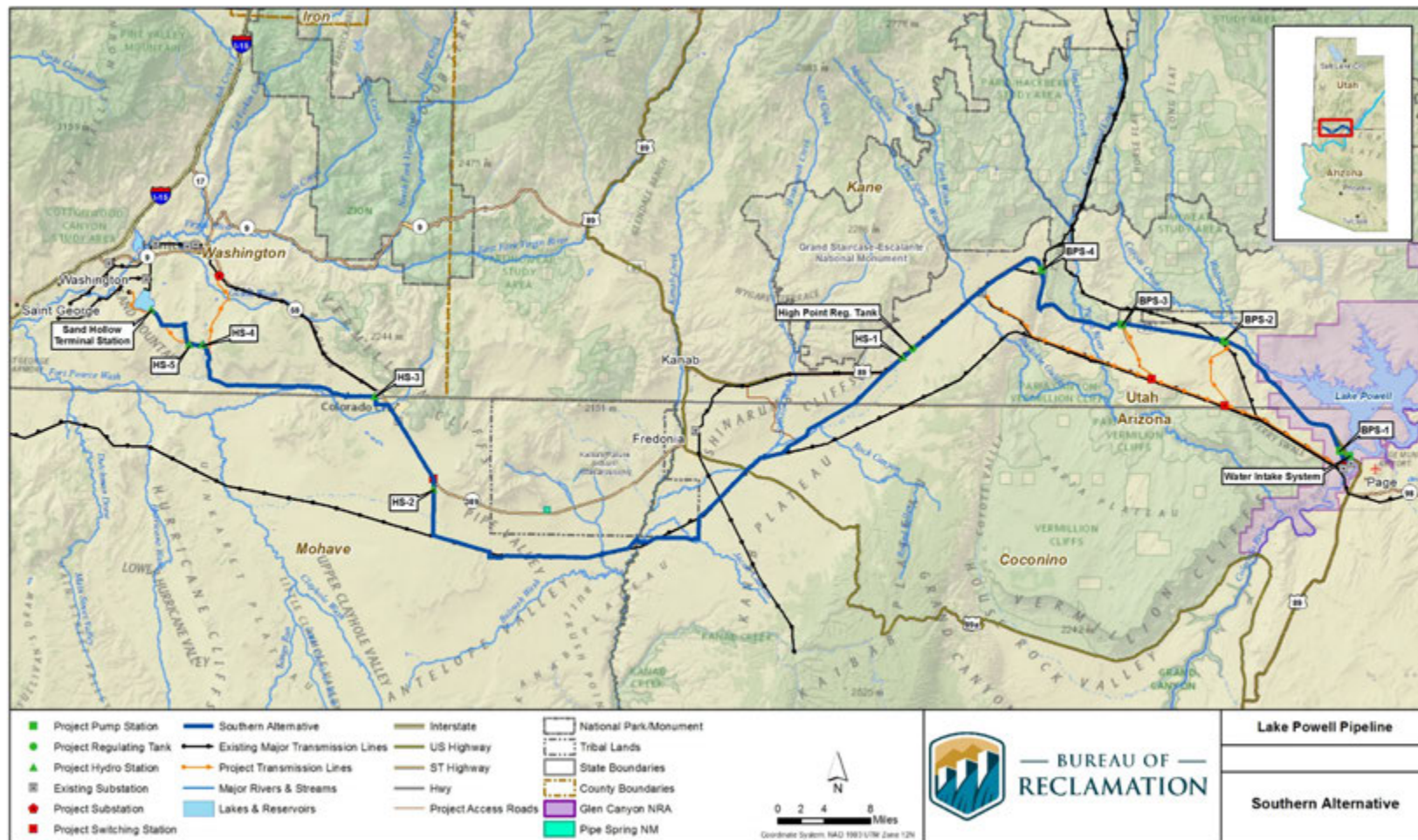


Figure 2.3-1 Southern Alternative

2.3.2.1 Pipeline

The pipeline would begin in Arizona at the discharge manifold at the water intake system and extend 51 miles through a 69-inch-diameter steel pipe to the topographic high point of the system in Utah, where the water then enters a gravity-driven pipeline. Approximately 47 miles of this pipeline segment would be within or along the U.S. Highway 89 ROW. Approximately 39 miles of this pipeline segment would be within designated utility corridors.

After the topographic high point, the pipeline would extend 90 miles through a 69-inch diameter steel pipe to Sand Hollow Reservoir in Washington County, Utah. Approximately 53 miles of this pipeline segment would be within or along an existing road or utility ROW. Approximately 22 miles of that 53 miles would be within designated utility corridors. A turnout would be installed in the segment west of Hildale, Utah, for potential future delivery of LPP water to Apple Valley, if pursued. Another turnout would be installed east of Johnson Canyon in Kane County, Utah, for potential future delivery of water to the KCWCD service area, if pursued. Building off either turnout would require additional NEPA analysis.

The pipeline would be completely buried, with air release valves, vacuum relief valves, drain valves, and isolation valves located in buried concrete vaults with locking manhole covers at the ground surface. Markers or other pipeline identifiers such as concrete monuments, fiberglass or composite marker posts, or brass caps would be installed approximately every 1,000 feet or less along the entire alignment directly over the pipeline to clearly identify the buried locations. In general, a 150-foot-wide ROW would be required for the pipeline, of which 100 feet would be a permanent ROW and 50 feet would be a short-term construction ROW.

2.3.2.2 Water Intake System

The LPP water intake system on Reclamation-managed land includes the following major components:

1. Underground features consisting of two vertical intake shafts and six horizontal intake tunnels.
2. An intake pump station consisting of six pumps and motors; four surge tanks; treatment equipment (chemical, filter screens, and/or ultraviolet) for quagga mussel management; an electrical switchyard; various electrical, mechanical, and office rooms; fencing and gates; and an access road and parking area.

2.3.2.3 Booster Pump Stations

Four BPSs would be designed and built along U.S. Highway 89 and have similar characteristics for efficient design, construction, and maintenance. BPS-1 would be located on NPS-managed land, BPS-2 would be located on state land, BPS-3 would be located on BLM-managed land, and BPS-4 would be located on private land. Each BPS would pressurize the water to convey it uphill to the next BPS. Each BPS would include a pump station building housing pumps, tanks, a treatment room, and other equipment; an electrical substation; a forebay basin; fencing and gates; and a gravel access road and parking area. Each BPS would be approximately 36 feet high above the finished ground level grade and approximately 85 feet wide, and 130 feet long. The permanent ROW for each BPS site would vary between approximately 5 and 7 acres.

2.3.2.4 High Point Regulating Tank

The High Point Regulating Tank would be located at the LPP topographic high point (5,691 feet above mean sea level along U.S. Highway 89). The regulating tank would be a buried circular concrete tank with 1.5 million gallons of total storage capacity, which would provide an estimated 15 minutes of pipeline flow to allow for the pumping system to shut down. The regulating tank would have an overflow pipe to a 1.5-million-gallon detention basin. The regulating tank site would have fencing and gates, and a graveled access road and parking area. The permanent ROW for High Point Regulating Tank site is approximately 5 acres.

2.3.2.5 Inline Hydrostations

Six inline HSs would be designed and built with similar characteristics for efficient design, construction, and maintenance. HS-1, HS-4, and HS-5 would be located on BLM-administered land. HS-2, HS-3, and the Sand Hollow terminal station (HS-6) would be located on private land. Each inline HS would include a powerhouse building housing turbines, generators, and other equipment; an electrical substation; an afterbay basin; fencing and gates; and a gravel access road and parking area. HS-1 through HS-4 powerhouses would be approximately 25 feet high above the finished ground level grade, 75 feet wide and 50 feet long. HS-5 powerhouse would be approximately 82 feet high, 55 feet wide, and 120 feet long. The afterbay basins would be approximately 75 feet wide and 180 feet long, below grade, and discharge to the next downstream pipeline segment. The permanent ROW for each HS site varies between approximately 5 and 10 acres. The inline HSs would generate no more than 40 megawatts of electricity in total, which is under the threshold for FERC's license exemption.

2.3.2.6 Transmission System

The transmission system includes the following components:

1. An upgraded 69 kV bus by the Glen Canyon substation, a new switching station, a new 1-mile 69 kV line to the water intake system, and a new 1-mile 69 kV line to BPS-1. These lines would not be co-located on existing towers or placed in existing power ROWs.
2. A new 36-mile 230 kV transmission line originating at the Glen Canyon substation to an upgraded Buckskin substation. The new 230 kV transmission line would run parallel to the existing Garkane Electric Cooperative, Inc., 138 kV transmission line.
3. Two three-ring switching stations would be installed along the new 230 kV line providing interconnection points for two new 138 kV lines needed to supply power to BPS-2 (7 miles) and BPS-3 (5.5 miles). These lines would not be co-located on existing towers or placed in existing power ROWs.
4. A new 0.4-mile 69 kV line to BPS-4 from the upgraded Paria substation.
5. A new interconnection (less than 0.1 miles) between HS-1 and an upgraded Buckskin-Johnson 138 kV (upgrade part of a separate project) line.
6. A new 1-mile 34.5 kV line between HS-2 and the existing Cane Beds-Hack Junction 34.5 kV line.
7. A new 0.6-mile-long, 12.47 kV underground line between HS-3 to the existing Twin Cities substation.
8. A new 10-mile 69 kV line from HS-4 to the interconnection with the existing Windy Ridge-Twin Cities 69 kV transmission line.
9. A new 5-mile 69 kV line from HS-5 to the switchyard at the proposed Sand Hollow terminal station (HS-6).
10. A new 3.7-mile 69 kV line from the Sand Hollow terminal station (HS-6) to a proposed Dixie Power substation west of Sand Hollow Reservoir.

2.3.2.7 Access Roads

Access roads include temporary construction access roads and permanent access roads. Some existing roads may be upgraded during construction to provide construction access by grading, culvert installation, and placement of crushed rock, gravel, or other stabilization materials.

Temporary construction access roads could be up to 30 feet wide. Temporary construction access roads include the following:

1. The existing gravel road from BPS-3 to the Glen Canyon-Buckskin 138 kV transmission line.
2. The existing gravel road from U.S. Highway 89 (near Vista Avenue) into White Sage Wash and lower Johnson Wash.
3. The existing County Road 239 from Arizona State Route 389 to the Navajo-McCullough Transmission Line corridor.
4. Other temporary construction access roads that would be built within the proposed pipeline or transmission line ROWs.

Multiple permanent ingress/egress roads off of existing roads and highways would be built for each aboveground pump station, regulation tank, and HS. Permanent access roads for operations and maintenance personnel along the pipeline would include existing public (i.e., state, county, or municipal) roads that intersect the alignment. Multiple short, two-track spurs would be needed from public roads to LPP appurtenant features like drain and valve vaults. Access controls, such as fences or gates, will be coordinated with applicable landowners and agencies during final design.

Other temporary construction roads built within the proposed ROWs would be converted to permanent two-track administrative access roads, up to 16 feet wide, in areas that lack public or existing administrative road access. These roads include the following:

1. The 34.9-mile-long road extending from where the proposed 230 kV Glen Canyon Substation to Buckskin Substation transmission line leaves NPS-managed land to the Buckskin Substation.
2. The 7.0-mile-long road between the proposed 230 kV transmission line and BPS-2.
3. The 18.1-mile-long road extending from the U.S. Highway 89 vertical curve to the K4020 road. This road would be set back from U.S. Highway 89 within the LPP ROW to accommodate future Paunsaugunt mule deer (*Odocoileus hemionus*) herd migration under-crossings.
4. The 11.3-mile-long road through White Sage Wash and Johnson Wash to the existing road along the Navajo-McCullough Transmission Line.
5. A series of segments totaling 9.5 miles of road extending from west of Hildale City through Canaan Gap to the pipeline intersection with a BLM-road southwest of Little Creek Mountain.
6. A series of segments totaling 4.5 miles of road from HS-5 along the pipeline and/or transmission line to the Sand Hollow terminal station (HS-6).

2.3.2.8 Other Ancillary Features

Communication facilities requirements would be met through use of fiber optics, radio systems, or possibly cellular communications equipment installed at pump stations, the regulating tank, and HSs. Fiber-optic cables would be installed underground within the proposed ROWs. Radio antennas, if used, would only be as high as necessary for functionality, but may be as high as 20 feet and may be mounted on top of buildings or tanks.

Multiple temporary construction staging areas would be used for equipment and materials storage, construction office trailers, water storage and transfer, fuel storage, plant storage, equipment maintenance, and temporary stockpiling. Temporary security fencing may be used to enclose staging areas during construction.

2.3.2.9 Environmental Protection Measures

Environmental protection measures (EPMs) would be used to avoid or minimize environmental effects. Disturbed lands associated with the pipeline and under transmission lines would be stabilized and restored after construction activities. Temporary construction access roads would be restored to pre-construction conditions in coordination with the land management agencies. Improvements to existing roads made for temporary construction access may be left in place in coordination with land management agencies.

Buildings, transmission lines, and other aboveground facilities would be blended into the surrounding area and hidden from view as feasible using local topography, or paint and other materials to blend with surrounding natural colors. Motion-detection security lights would be used within the fenced area. Lighting fixtures would comply with special lighting standards for protecting dark night skies. Multiple other measures would be used to protect wildlife and the public. See the Project Proponent's POD in Appendix E for a complete listing of proposed EPMs.

2.3.2.10 Construction Duration

Construction of the LPP is planned to begin after receipt of the ROW grants/permit and after final design. It is estimated that final design would take approximately two years post-ROD. Construction would begin after that and is anticipated to occur over a six-year period. Various components of the LPP may be constructed simultaneously throughout the Project Area during this period.

2.3.2.11 Operations and Maintenance

The LPP would be operated and maintained in accordance with environmental requirements of each ROW grant/permit and other federal, state, and local agency requirements (see B.2.1 through B.2.13 in Appendix B of the Project Proponent's POD, provided in Appendix E, Plan of Development). In addition to routine operation of facilities, activities would include remote and on-site monitoring of system functions, inspection of the pipelines and facilities, regular maintenance of equipment, repairs conducted as needed, and responses to emergency conditions should they occur. All operation and maintenance activities would be confined to the ROW areas. If additional ROW area is required for unforeseen circumstances, the UBWR would request it from the appropriate agencies. A routine operations and maintenance schedule would be developed for the Proposed Project during facility construction and provided to the appropriate federal, state, and local land management agencies. Facilities would periodically be visually inspected to maintain proper functioning, with emphasis on main facilities and mechanical and electrical equipment. On-site personnel and remote monitoring and control systems would track and manage facility functions. Agency staff would be notified if extraordinary maintenance or repair efforts are necessary.

2.3.2.12 Lake Powell Pipeline Water Exchange Contract

This alternative relies upon the proposed LPP water exchange contract between the UBWR and Reclamation. Under the exchange contract, the UBWR would forbear the diversion of a portion of the natural flows of the Colorado River to which the UBWR is entitled under the Upper Colorado River Basin Compact and the Colorado River Compact of 1922 and allow these flows to contribute

to meeting the ESA Upper Colorado River Recovery Implementation Program requirements in Reaches 1 and 2 of the Green River. In exchange, the UBWR would deplete an equal amount of water released from Flaming Gorge Dam throughout the year and available at Lake Powell. The exchange would assist Reclamation in meeting its ESA obligations and be in compliance with the 2006 Flaming Gorge ROD (<https://www.usbr.gov/uc/envdocs/eis/fgFEIS/index.html>). It would also provide the UBWR with a more reliable water supply for Washington County. This exchange contract would not entitle UBWR to call for releases from Flaming Gorge.

2.3.2.13 Resource Management Plan Amendment

The pipeline alignment for the Southern Alternative as currently proposed is located within the utility corridor near the southeast corner of the KIR. As the pipeline heads east to west, the utility corridor crosses a steep portion of the Kanab Creek Canyon. To avoid hanging a pipe through the utility corridor or boring under the canyon, the proposed alignment of the pipeline would deviate from the utility corridor in a wider, less steep crossing through Kanab Creek but through the ACEC. Locating the LPP in the ACEC when another reasonable alternative exists is not in conformance with the RMP. In addition, there are conflicts within the RMP between the management decisions for the ACEC and the utility corridor, including that the ACEC is an avoidance area for new land use authorizations while the utility corridor is prioritized for ROWs. There is also a lack of clarity in the VRM decisions with regards to the ACEC, where the level of change to the landscape should be low, versus the utility corridor, where major modifications are allowed.

For the Southern Alternative, one of the three following RMPA sub-alternatives for amending the RMP would be needed to make the Southern Alternative conform with the RMP and resolve conflicts between other decisions in the RMP:

1. RMPA Sub-alternative 1 (Figure 2.3-2). Amend Decision Nos. MA-LR-06 and LA-VR-01
 - a. Revise Decision No. MA-LR-06 to remove the language that limits new land use authorizations when a reasonable alternative exists but keep the requirement that new authorizations are allowed while mitigating effects on the sensitive resources for which the area was designated. This would not apply to all other Areas of Critical Environmental Concern. The revised decision would read: "*Individual land use authorizations (ROWs, permits, leases, easements) will be evaluated on a case-by-case basis in accordance with other RMP provisions and NEPA compliance. New land use authorizations will be allowed within the Kanab Creek ACEC while mitigating effects on the sensitive resources for which the area was designated. New land use authorizations within avoidance areas (i.e., all other ACECs, lands supporting listed species, NHTs [National Historic Trails], riparian areas, and areas managed to maintain wilderness characteristics) will be allowed only when no reasonable alternative exists and impacts to these sensitive resources can be mitigated. New ROWs will be routed away from high-density listed species' populations and cultural sites, and along the edges of avoidance areas. In addition, mitigation measures may include underground placement of linear ROWs along existing roads in the House Rock Valley area and special protection measures for archaeological resources (See Special Status Species and Cultural decisions).*"
 - b. Revise Decision No. LA-VR-01 to clarify that where a designated utility corridor overlaps an area of critical environmental concern, the overlap area would be VRM Class IV.
2. RMPA Sub-alternative 2 (Figure 2.3-3). Amend the size of the ACEC
 - a. Reduce the ACEC area by 905 acres to remove any overlap between the utility corridor and the ACEC. In addition, exclude areas of the ACEC that become isolated "islands" as

- a result of addressing the overlap issue above. This would apply to the areas north of the southern boundary of the utility corridor, and two small “islands” east of the main stem of Kanab Creek that are south of the southern boundary of the utility corridor.
- a. Change the VRM designation for the areas north of the utility corridor that are no longer in the ACEC and are also outside of the utility corridor (230.6 acres) from VRM Class II to VRM Class III. The area within the utility corridor would remain Class IV.
 3. RMPA Sub-alternative 3 (Figure 2.3-4; preferred sub-alternative). Amend Decision Nos. MA-LR-06 and LA-VR-01 as in RMPA Sub-alternative 1 and:
 - a. Amend the configuration of the utility corridor to:
 - i. Revise the utility corridor’s northern boundary to include the area on the north side where the Proposed Project leaves the existing corridor (for approximately 1/2 mile), to include an approximately 500-foot-long strip north of the centerline of the Proposed Project ROW. This amendment would also allow for other future utility lines (80.3 acres added).
 - ii. Revise the utility corridor’s southern boundary to exclude areas south of the existing Navajo-McCullough transmission line that overlap the ACEC in order to reduce the ACEC and utility corridor overlap. This would create an “irregular” utility corridor boundary (398.2 acres excluded). This would not change the total number of acres within the ACEC. However, it would reduce, by 175.5 acres, the area of overlap between the ACEC and the utility corridor.
 - b. Revise Decision No. MA-LR-12 to state that where the utility corridor overlaps the Kanab Creek ACEC: (1) the corridor is no longer 1 mile wide; and (2) the utility corridor would no longer be a ROW avoidance area.
 - c. Change the VRM designation for those areas excluded from the utility corridor to either Class II (lands within the ACEC) or Class III (lands outside the ACEC). Area added to/remaining within the utility corridor would be Class IV.

2.3.3 Highway Alternative

The Highway Alternative would satisfy all three screening criteria if an agreement between the Tribe and the UBRW can be reached. There is not an existing agreement between the Tribe and the UBRW regarding the potential use of KIR lands; discussions continue as of the date of this DEIS. For criteria 1 and 3, it would meet the need for and accomplish the purpose of the Proposed Project by meeting future water demands in Washington County by 2060 and would establish a more diverse and secure water supply that would mitigate uncertainties related to relying on a single source. It is economically feasible based on the ability of WCWCD to repay the costs of the Proposed Project (see Appendix C-23, Socioeconomics). It is hydraulically and geotechnically feasible. It also complies with the directives established by the Utah State Legislature as outlined in the 2006 Lake Powell Pipeline Development Act. Therefore, it was carried forward for detailed analysis.

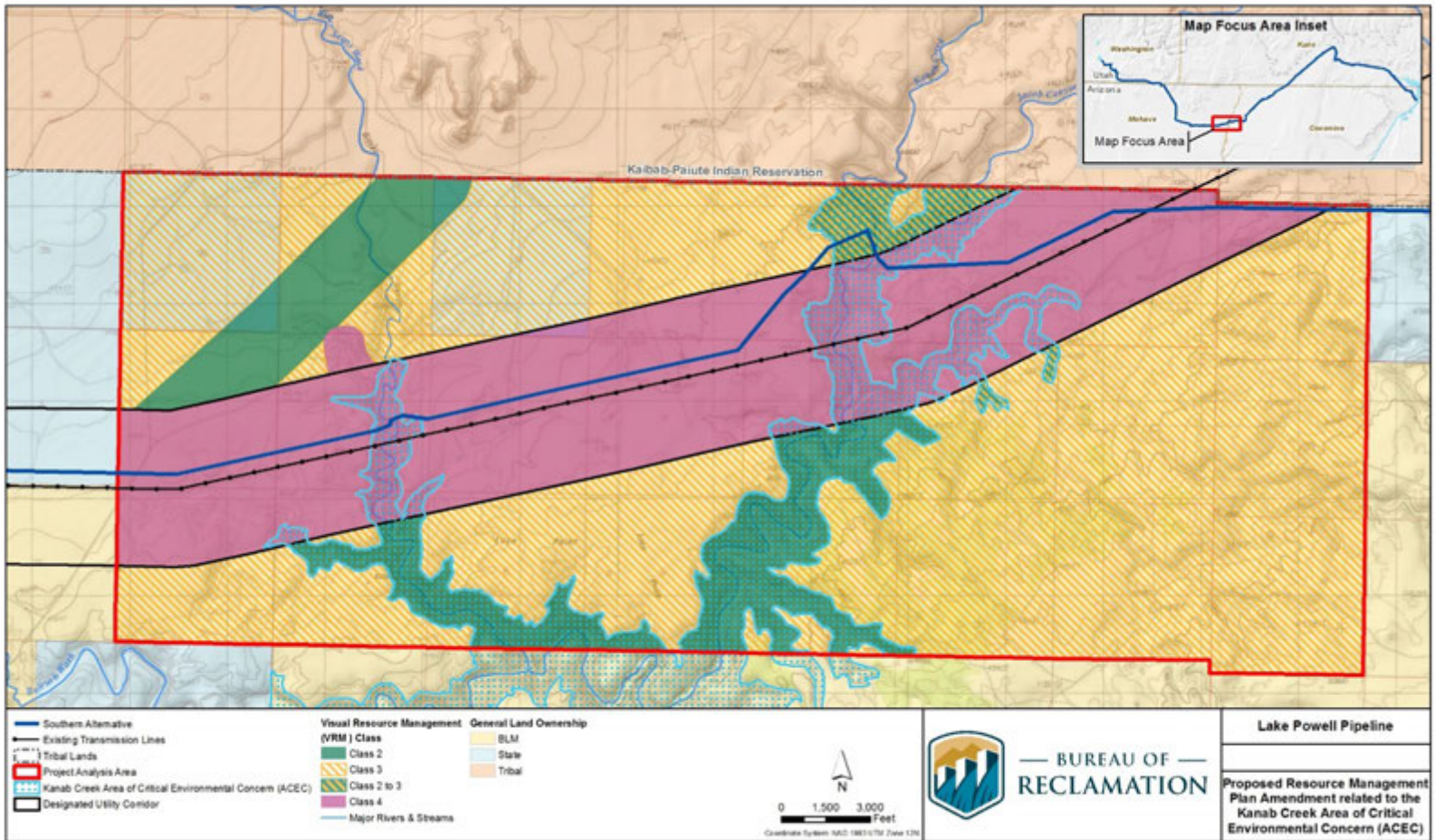


Figure 2.3-2 Proposed Resource Management Plan Amendment Related to the Kanab Creek Area of Critical Environmental Concern - Sub-alternative 1

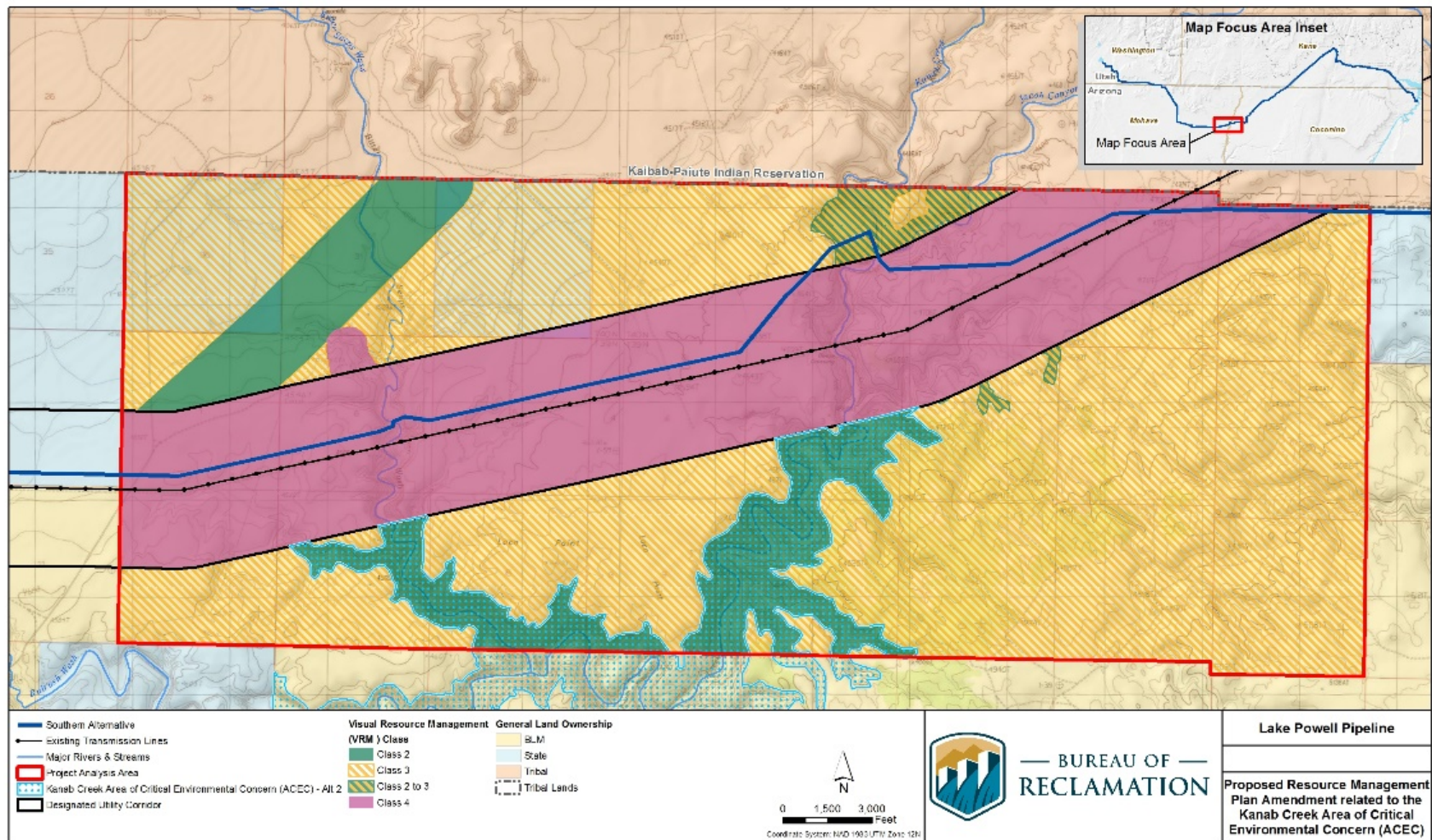


Figure 2.3-3 Proposed Resource Management Plan Amendment Related to the Kanab Creek Area of Critical Environmental Concern - Sub-alternative 2

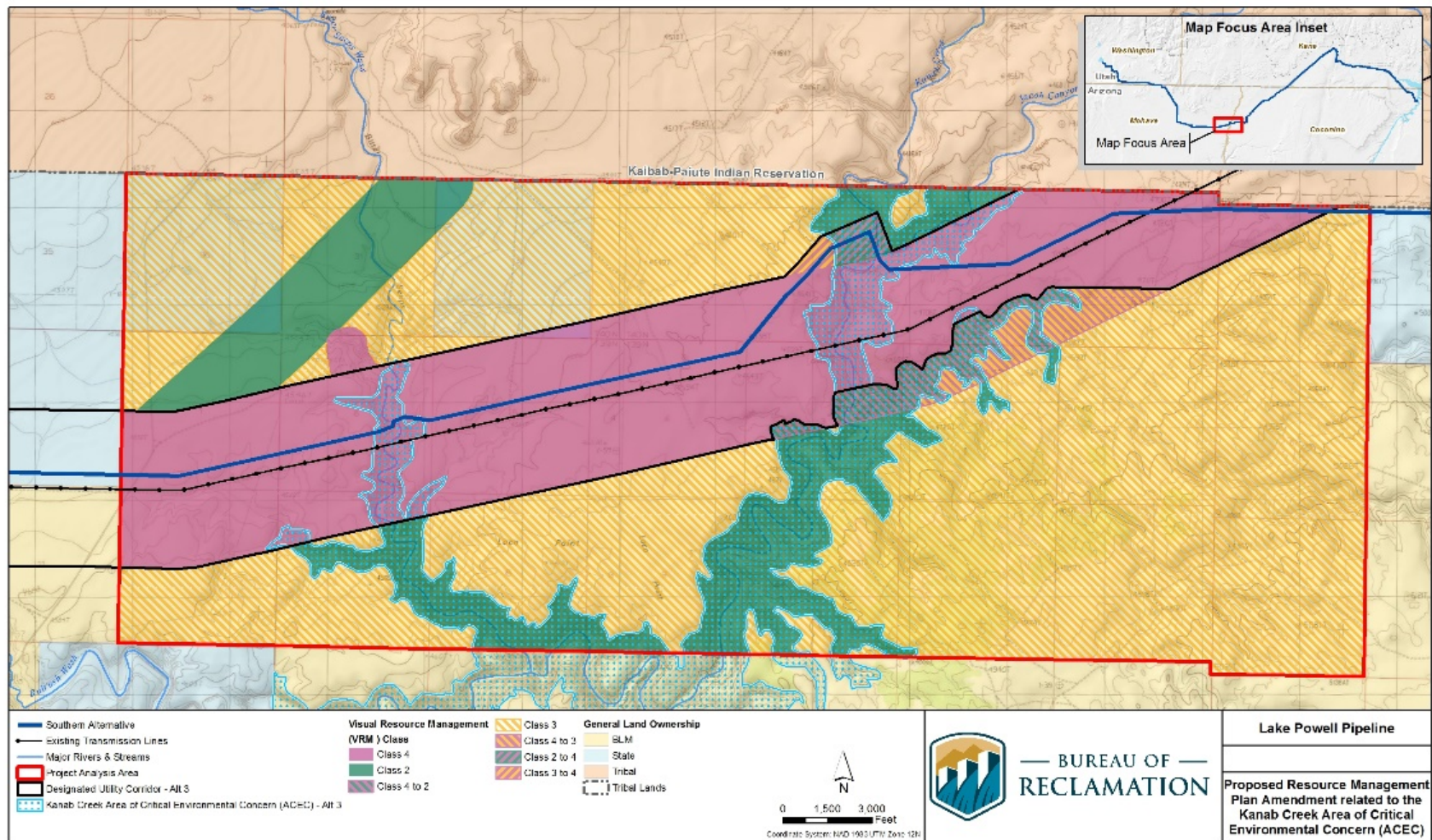


Figure 2.3-4 Proposed Resource Management Plan Amendment Related to the Kanab Creek Area of Critical Environmental Concern - Sub-alternative 3

The Highway Alternative is similar to the Southern Alternative except for the pipeline segment between HS-1 and HS-2, the location of HS-2, and access roads (Figure 2.3-5). Downstream from HS-1, the pipeline would follow U.S. Highway 89 past Johnson Wash and follow Lost Spring Gap southwest, crossing Highway 89 Alt. in the north end of Fredonia, Arizona. It would continue south, paralleling Kanab Creek to Arizona State Route 389, where it would run west along Route 389 through the KIR to the intersection of County Road 239, where it would rejoin the Southern Alternative alignment. HS-2 under the Highway Alternative would be located along Route 389 just prior to the County Road 239 intersection. Access roads for the segment unique to the Southern Alternative would not be used for the Highway Alternative. All other facilities, including the water intake system, BPSs, high point regulating tank, inline HSs, transmission systems, and other ancillary features, would be identical to the Southern Alternative. EPMs and duration of construction would be similar.

Table 2.3-3 provides a summary of the proposed permanent and temporary ROW for the Highway Alternative.

Table 2.3-3 Summary of Proposed Permanent and Temporary Rights-of-Way for the Highway Alternative by Type of Facility and Land Ownership/Management

Land Ownership/Management	Permanent ROW (acres)			Short Term or Temporary Construction Easement ROW ^(a) (acres)	Total ROW (acres)
	Pipeline ^(a)	Transmission Lines ^(a)	Pumping, Hydro, and Road Facilities ^(b)		
BLM	524	529	68	395	1,516
NPS	126	55	20	79	280
Reclamation	1	8	27	0	36
Tribe	140	0	0	99	239
State	242	375	11	161	790
Private	492	93	44	571	1,201
Total	1,526	1,060	170	1,305	4,062

Notes:

(a) Disturbed ROW would be restored.

(b) Disturbed ROW would not be restored due to permanent above ground facilities.

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = Right-of-way

Tribe = Kaibab Band of Paiute Indians

The total length of the Highway Alternative would be 134 miles. The LPP water exchange contract is also part of this alternative. The Highway Alternative is in conformance with the RMP; therefore, amending the RMP would not be required.

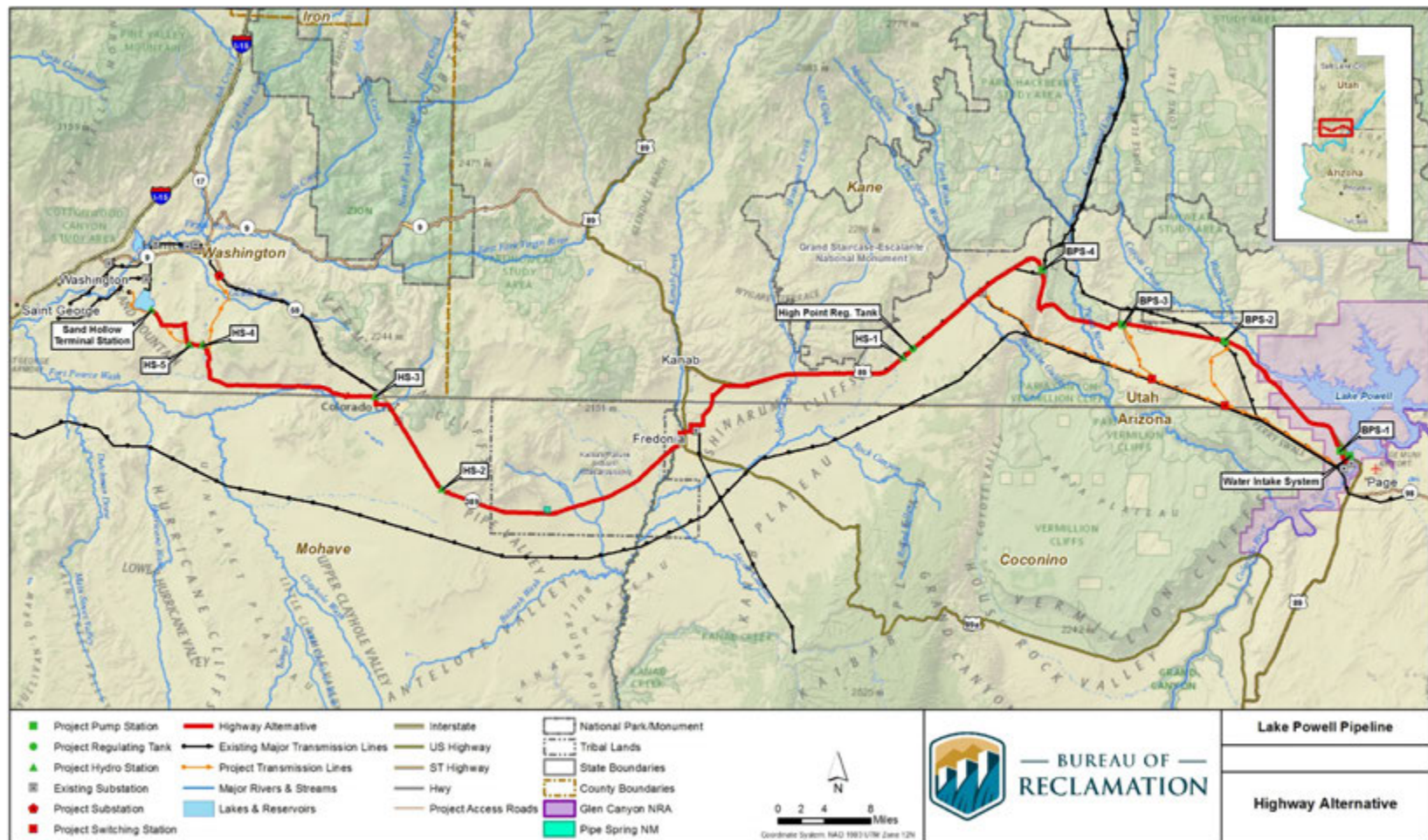


Figure 2.3-5 Highway Alternative

3 Affected Environment and Environmental Consequences

This chapter presents an assessment of the effects of the No Action Alternative and the two action alternatives on the human and natural environment. The affected environment and environmental consequences are described for each resource. All 24 resources were fully evaluated, as presented in Appendix C, Supplemental Resource Reports; a discussion of cumulative effects is provided in Chapter 5 of this DEIS and in Appendix C-25, Cumulative Effects. The only exception to the discussion of cumulative effects analysis is for Hydrology, where the cumulative effects analysis is contained within the resource's respective section in this DEIS and appendix due to the unique methodology in identifying and analyzing effects of past, present, and reasonably foreseeable future actions.

The reader is encouraged to review Appendix C, Supplemental Resource Reports, in conjunction with this chapter. In addition, some of the supporting documentation for the supplemental resource reports includes the UBWR's final study reports from 2016, which can be found on Reclamation's website at <https://www.usbr.gov/uc/envdocs/eis/LakePowellPipeline/index.html>, along with updates to the 2016 study reports, which are separated by resource. The analysis in this chapter and in Appendix C, Supplemental Resource Reports, only relied on the UBWR's study reports insofar as they remained relevant at the time this DEIS was prepared.

3.1 Resources Considered but Eliminated from Further Study

Four of the 24 resources were considered but eliminated from further study in Chapter 3 based on the rationale in Table 3.1-1, below.

Table 3.1-1 Resources Considered but Eliminated from Further Study

Resource	Rationale for Considering but Eliminating from Further Study
Air Quality	<p>Either action alternative would result in minimal localized, and short-term effects (primarily particulate emissions from site preparation), which would only occur during construction at the particular location and would be minimized with environmental protection measures defined in the Plan of Development to address dust issues. Estimated greenhouse gas emissions during construction (approximately 10,456 to 24,957 metric tons of CO₂ from year 1 to year 6) and operation of the Proposed Project (approximately 67,387 metric tons of CO₂ per year) under either alternative would represent less than one-fourth of a percent of the annual emissions from electricity generation. Negligible long-term effects would occur as a result of facility operations. See Appendix C-5, Air Quality, for additional information. If needed, the Project Proponent will obtain the necessary air quality permits.</p>
Electric and Magnetic Fields	<p>Electric and magnetic fields (EMF) was considered but eliminated from detailed analysis in Section 3 of this DEIS because sensitive receptors (e.g., occupied buildings, such as residences, schools, and commercial facilities) within 300 feet of the Proposed Project's electric power facilities would not be exposed to EMF above the most stringent occupational and general public magnetic field exposure limits available in the existing literature. Effects to sensitive receptors beyond 300 feet from the centerline or the center of the proposed electrical facilities would be negligible over the long term (i.e., during the operational life of the Proposed Project). Additional information regarding EMF is provided Appendix C-4, Electric and Magnetic Fields.</p>
General Fish and Wildlife	<p>Primary concerns for general fish and wildlife regarding the Proposed Project involved construction activities affecting the migration and winter range of mule deer (<i>Odocoileus hemionus</i>) and crucial habitat of resident desert bighorn sheep (<i>Ovis canadensis nelsoni</i>). Due to construction restrictions for these areas during crucial times, these potential effects have been minimized to have negligible long-term effects on the populations. Likewise, the Proposed Project would have negligible long-term effects on other fish and wildlife resources due to the temporary construction and minimized effects from implementing the environmental protection measures and mitigation measures. Minimal short-term effects would still be expected from construction. See Appendix C-16, General Fish and Wildlife, for additional information.</p>
Paleontology	<p>Both proposed pipeline alignments would cross fossil-bearing bedrock and unconsolidated alluvial units. However, construction in the pipeline rights-of-way would avoid directly impacting any known significant fossil sites. Three known significant fossil sites outside the rights-of-way but near the areas of direct disturbance would be monitored during construction by a qualified paleontologist to ensure the integrity of those sites. A paleontologist would also monitor areas with high potential to yield previously unknown significant fossil sites/specimens. See Appendix C-2, Paleontology, for additional details regarding paleontological resources.</p>

3.2 Geology and Soils

3.2.1 Affected Environment

3.2.1.1 Methodology

Potential effects to geology and soil resources were determined based on the distribution of these resources in relation to the topography of the surrounding area, the geologic conditions in which these resources are encountered, and the distance and volumes of disturbance expected. The effects discussed below are evaluated based on long-term, short-term, or temporary durations. Direct effects refer to the geologic feature or soil resource under discussion that is visually affected by activities within the Project Area during preliminary studies, construction and/or operation of the Proposed Project. Indirect effects refer to the specific resource affected without potentially having a visible effect within and additionally beyond the Project Area. Indirect effects also include effects from additional variables that may influence the resource at a later time or which is further removed from the Project Area.

Geology and soil resources analyzed in this study include the following: fault and seismic movements; unstable slopes; subsidence, expansion, and/or collapsible soils; biological soil crusts; soil erosion; geologic hazards to human health and safety; structures and mineral resources; and borrow and spoil. Preliminary geologic surveys and studies have been completed and discussed in detail in the following reports: 2008 Geology and Soils Study Plan (UBWR 2008), the LPP Final Study Report 4 - Geology and Soils Resources (UBWR 2016), BLM's Proposed RMP/Final EIS for the Arizona Strip (BLM 2007), and the Northern Arizona Proposed Mineral Withdrawal Final EIS (BLM 2011). Refer to Appendix C-1, Geology and Soils, for a detailed analysis of these resources.

3.2.1.2 Regulatory Framework

The Proposed Project would be located in areas managed by federal, state, and local agencies, as well as private land. Each federal agency manages lands and issues land use agreements (collectively, ROWs) under its applicable authorities. ROWs granted or permitted for the Proposed Project are subject to each agency's regulations in addition to federal laws that may apply to the Proposed Project. Various rules, regulations, plans, and policies related to geology and soils would apply to preliminary geologic and subsurface investigations and the construction and operation of the Proposed Project.

An easement for Reclamation is required under 43 CFR Subtitle B.1.429 for excavation and construction as well as removal of spoils from the Lake Powell Intake Structure. Under FLPMA, construction activities require ROW grants from the BLM as specified in 43 CFR Part 2800 and Sections 501 through 506 of FLPMA (BLM 2001). Permits for excavation, hauling, and disposal of spoils may be granted by the BLM under Section 302 of FLPMA. Sections 201 and 202 of FLPMA direct the BLM to prepare, continuously maintain, and inventory all public lands and to develop, maintain, and (when appropriate) revise resource management plans and their resources. The Project Area traverses land within four different management units of the BLM, each with its own resource management plan: Kanab-Escalante Planning Area, Kanab Field Office, Arizona Strip Field Office, and St. George Field Office. Each of these resource management plans includes management direction on soil resources and are outlined in Appendix C-1, Geology and Soils. The Project Area also traverses NPS-administered land within GCNRA. Management direction for soils and geologic resources within NPS units is guided by the 2006 NPS Management Policies. Additional federal laws

directly related to the geology and soils resources include the NPS Organic Act of 1916, (54 USC 100101 et seq.) as amended, and the Earthquake Hazard Reduction Act of 1977 (see Appendix C-1, Geology and Soils, for details).

3.2.1.3 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

Appendix B of the POD details EPMs that would minimize adverse effects (see Appendix E, Plan of Development). Refer to B.1, General Construction Practices within the ROWs (Sections B.1.1, B.1.3, and B.1.5, B.1.17, B.1.19, B.1.20, B.1.40 through B.1.47, B.1.50 through B.1.56, B.59 through B.61, B.1.63, and B.1.72), and B.3, Geologic Hazards and Soils (Sections B.3.1 and B.3.2) for EPMs directly related to geology and soils resources.

3.2.1.4 Existing Conditions

Geology and soil resources vary extensively throughout the Project Area and include the features listed in Section 3.2.1.1, above. Geologic maps (Figures 3.2-1 and 3.2-2) represent geologic units within the Proposed Project alignments. Locations of geology and soil resources have been identified and evaluated for potential effects within the Proposed Project pipeline corridor and are discussed in extensive detail in Section 1.4 in Appendix C-1, Geology and Soils.

Faulting Seismic Activity and Geologic Features along the Proposed Alignments

The Proposed Project crosses several fault crossings and geologic features (Figures 3.2-1 and 3.2.2 above). Table 3.2-1 summarizes fault crossings within each administrative land.

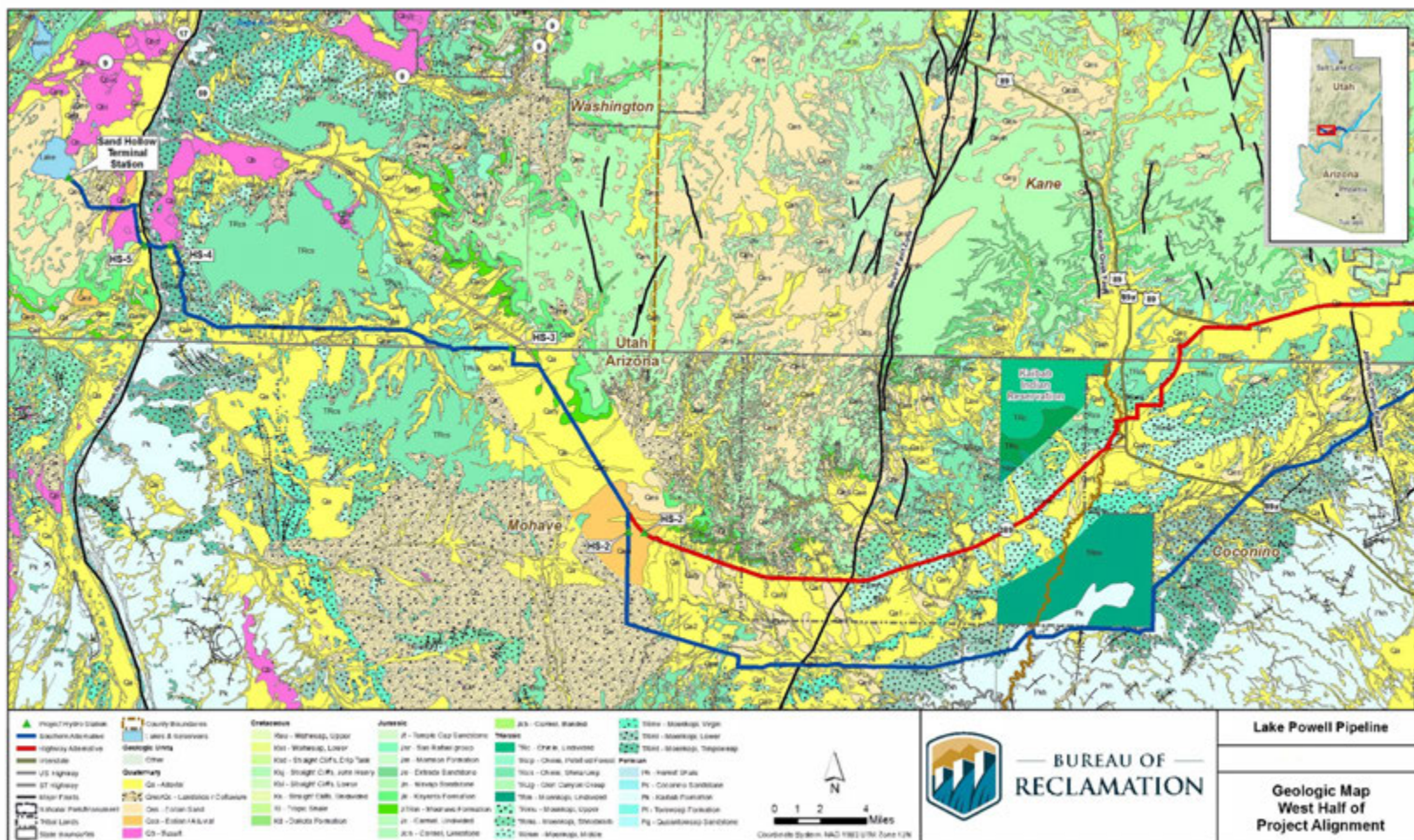


Figure 3.2-2 Geologic Map West Half of Project Alignment

Table 3.2-1 Fault Locations and Characteristics

Land Agency	Fault Name	Alignment	Stationing	Rupture Assessment	Urban Development	Preliminary Effect Risk	Remarks
BLM	Glen Canyon City Fault	All	823+00	Not significant	No	Low	N/A
BLM	East Kaibab fault–Cockscomb	All	1723+00	Not significant	No	Low	N/A
BLM	Central Kaibab fault	All	2289+00	Low significance	No	Low	N/A
BLM	West Kaibab fault	All	2596+00 and 2600+00	Low significance	No	Low	Fault locations inferred
BLM	West Kaibab fault	All	2600+00	Low significance	No	Low	Fault location inferred; possible splay at 2566+30
BLM	Paunsaugunt fault	Highway	2967+00	Low significance	Yes	Low	Fault locations inferred
BLM	Paunsaugunt fault	Southern	3024+00	Low significance	No	Low	Fault locations inferred
BLM	Johnson Canyon fault	Highway	3264+00	Not significant	No	Low	-
BLM	Johnson Canyon fault	Southern	3307+00	Not significant	No	Low	-
BLM	Quickwater fault	Southern	2440+00	Not significant	No	Low	-
Tribe	Sevier fault (N. Toroweap)	Highway	4723+00	High significance	No	Low	-
State	Sevier fault (N. Toroweap)	Southern	4920+00	High significance	No	Low	-
Private	Short Creek fault	All	6268+00	Not significant	No	Low	-
BLM	Hurricane fault	All	7112+00	High significance	No	Low	-
BLM	West Grass Valley fault	All	7229+00	High significance	Yes	High	Upslope of community
BLM	Remnants Basalt faults	All	7288+00	Not significant	No	Low	-
BLM	Remnants Basalt faults	All	7298+00	Not significant	No	Low	-
BLM	Western Sand Mountain fault	All	7381+00	Not significant	No	Low	-

Key:

BLM = Bureau of Land Management

N/A = not applicable

Tribe = Kaibab Band of Paiute Indians

Seismic activity has been determined as low to moderate potential (0.1 to 0.4 gravity peak ground acceleration) with 2 percent probability of exceedance over a 50-year period (MWH 2009).

Geologic and Soils Hazards

Geologic and soil hazards include expansive potential of soils, the presence of gypsum deposits, and rockfall hazards within the Project Area. The extent of geologic and soils hazards within each land agency along the Proposed Project alignments are provided in Tables 3.2-2 and 3.2-3. Locations where these features have been identified along the alignments are shown on Figures 3.2-3 through 3.2-6.

Table 3.2-2 Mileage of Rock Hazards within Each Agency along the LPP Alignments

Agency	Expansive Potential	Gypsum Observed	Possible Gypsum	Rockfall Hazard	Low Risk
Southern Alternative (miles)					
BLM	0.0	0.9	25.9	6.7	38.5
NPS	0.0	0.0	0.9	0.3	9.3
Reclamation	0.0	0.0	0.0	0.0	0.2
Tribe	0.0	0.0	0.0	0.0	0.0
State	0.0	0.3	7.0	0.0	18.0
Private	1.9	0.5	8.0	1.4	20.8
Highway Alternative (miles)					
BLM	1.7	1.6	22.1	5.0	12.6
NPS	0.0	0.0	0.9	0.3	9.3
Reclamation	0.0	0.0	0.0	0.0	0.2
Tribe	3.0	10.8	2.6	0.0	0.0
State	2.1	0.6	5.8	0.5	12.0
Private	14.9	1.4	9.6	1.8	15.3

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

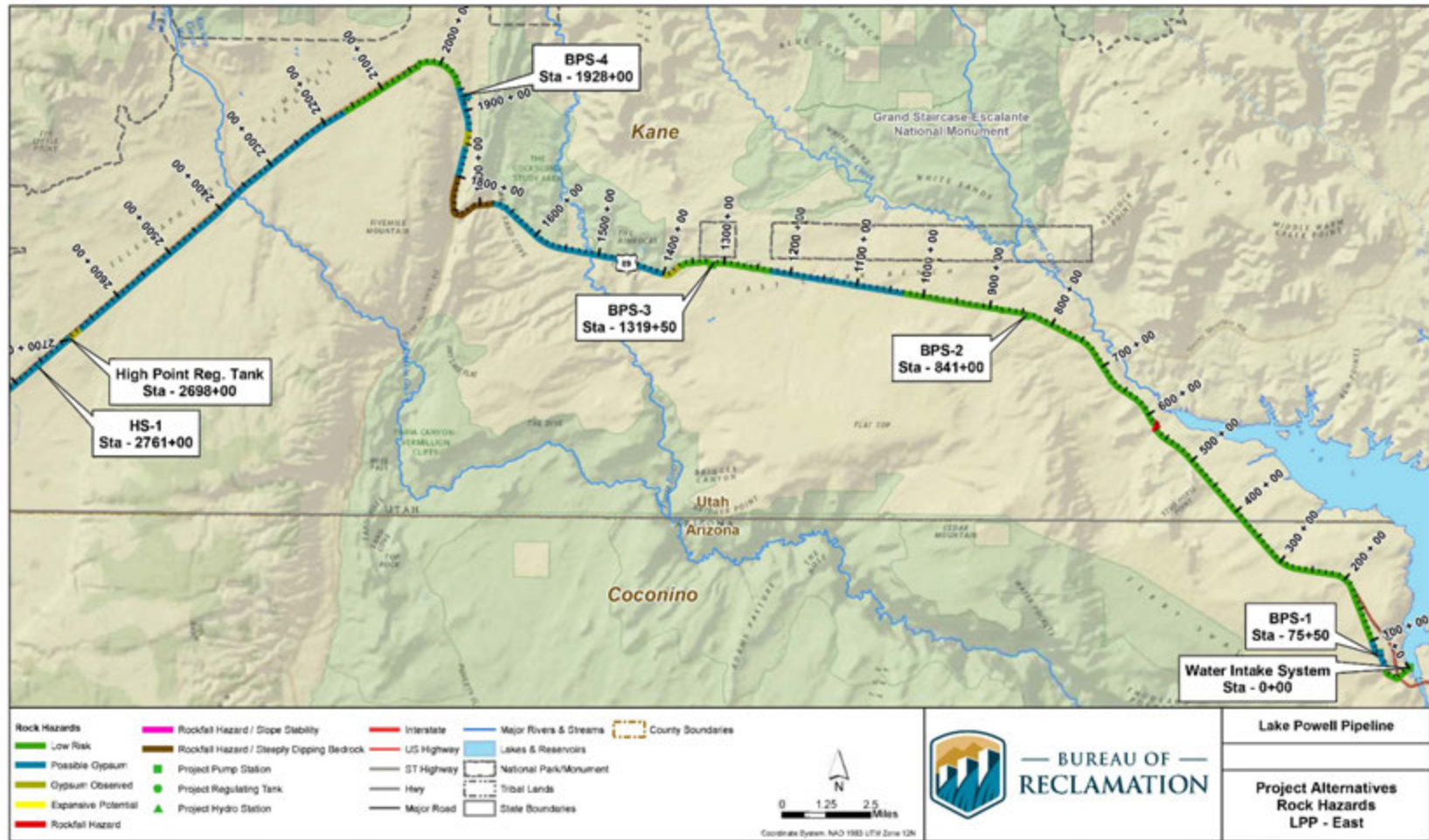


Figure 3.2-3 Rock Hazards East Half of Project Alignment

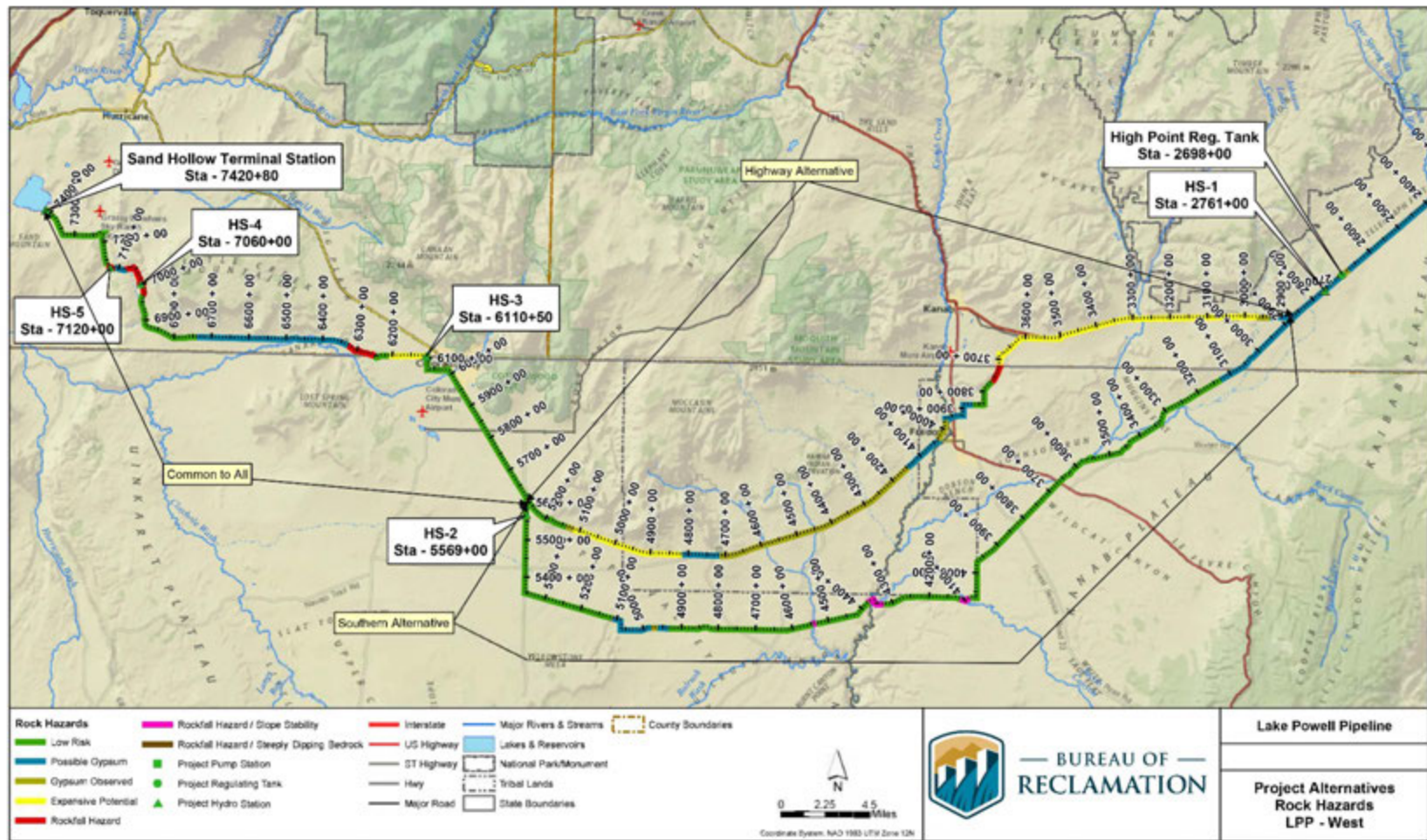


Figure 3.2-4 Rock Hazards West Half of Project Alignment

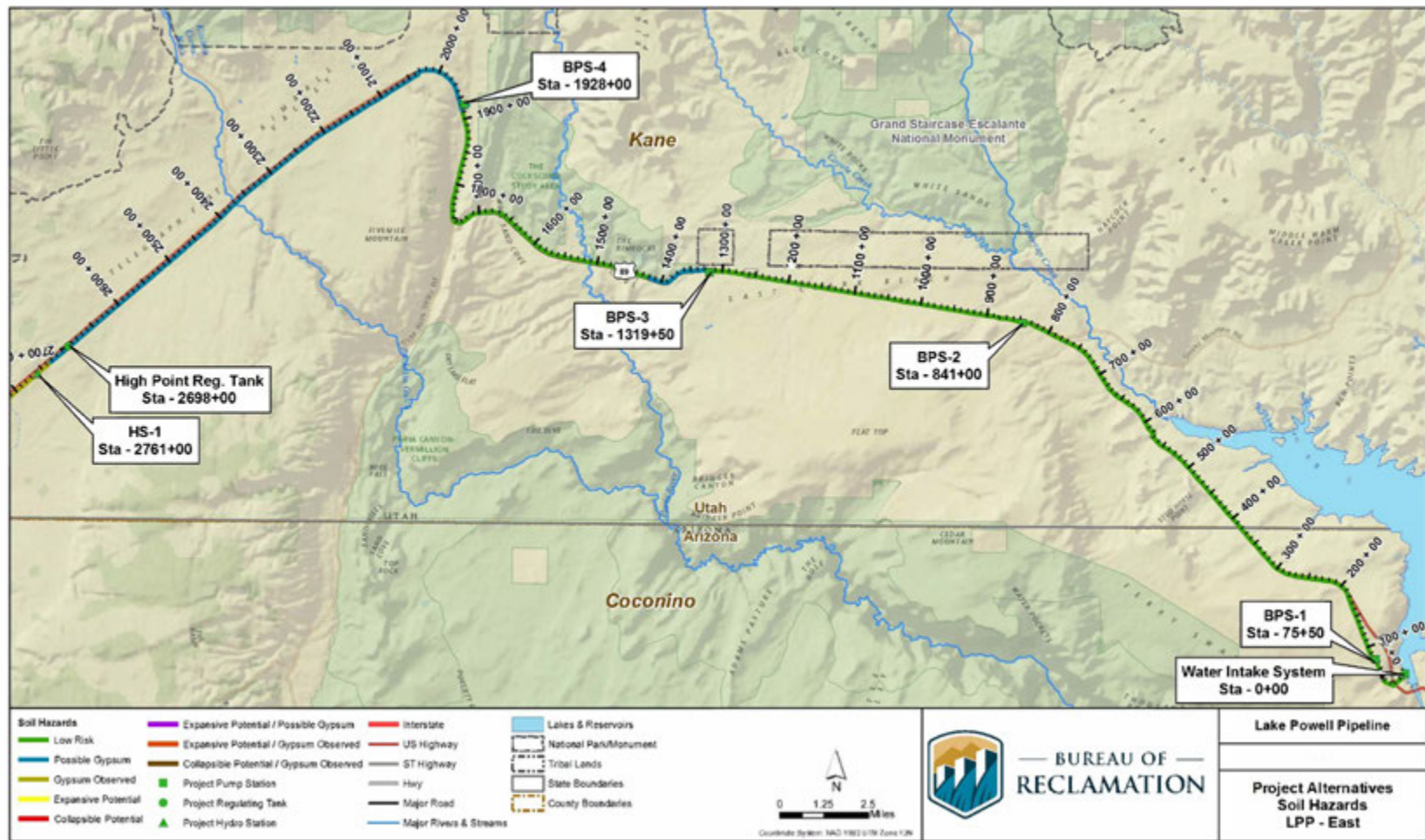


Figure 3.2-5 Soil Hazards East Half of Project Alignment

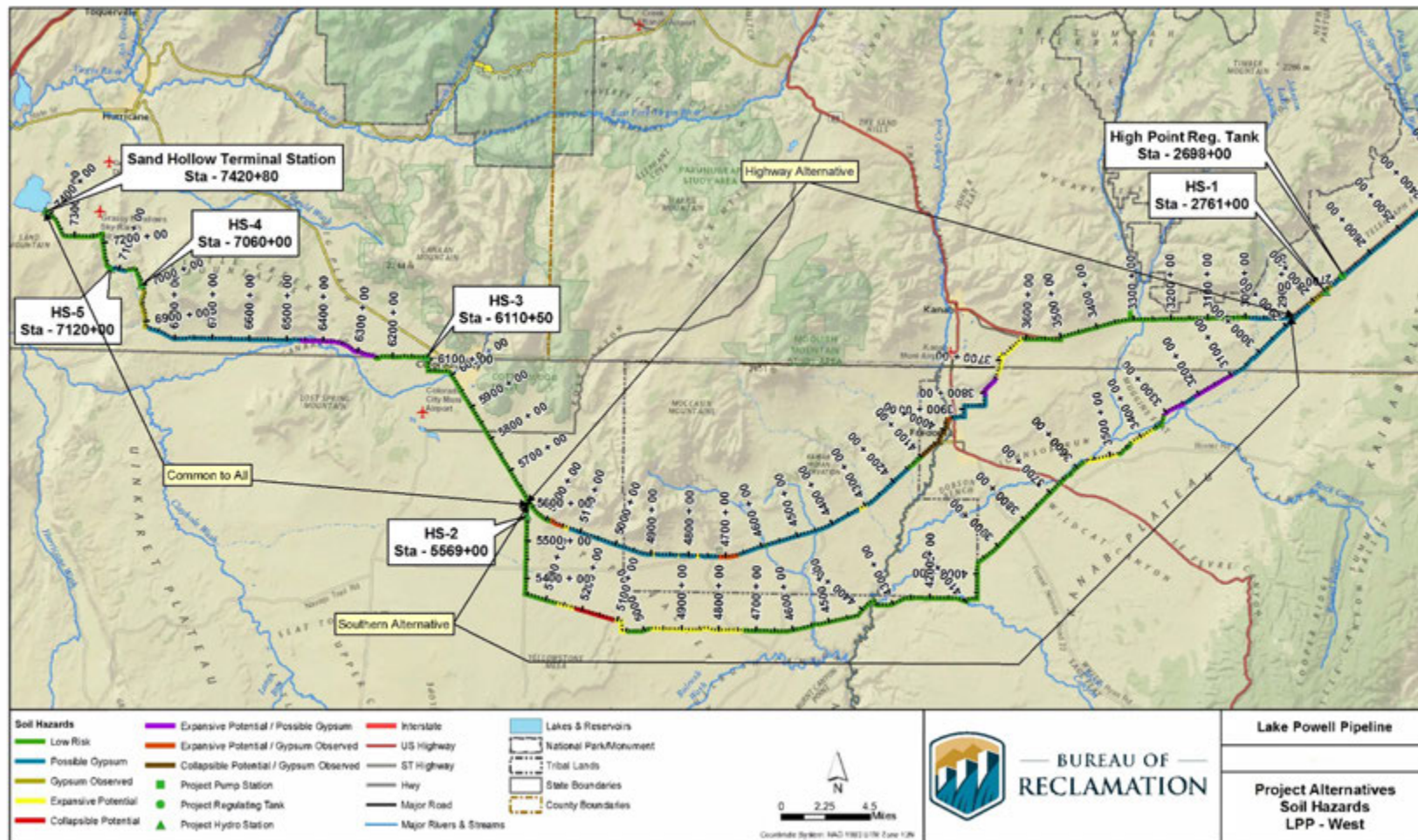


Figure 3.2-6 Soil Hazards West Half of Project Alignment

Table 3.2-3 Mileage of Soil Hazards within Each Agency along the LPP Alignments

Agency	Expansive Potential	Gypsum Observed	Possible Gypsum	Rockfall Hazard	Low Risk
Southern Alternative (miles)					
BLM	0.0	8.1	3.8	27.2	32.9
NPS	0.0	0.0	0.0	0.0	10.5
Reclamation	0.0	0.0	0.0	0.0	0.2
Tribe	0.0	0.0	0.0	0.0	0.0
State	1.3	3.2	0.0	2.0	18.7
Private	0.8	6.2	0.1	3.0	22.6
Highway Alternative (miles)					
BLM	0.0	0.3	3.8	25.2	13.8
NPS	0.0	0.0	0.0	0.0	10.5
Reclamation	0.0	0.0	0.0	0.0	0.2
Tribe	0.0	1.9	0.0	13.8	0.8
State	0.7	1.3	0.1	5.1	13.9
Private	1.6	7.5	0.1	5.1	28.6

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

Biological Crusts and Gypsiferous Soils

Biological soil crusts, also referred to as cryptobiotic, cryptogamic, microbiotic, or cyanobacterial lichen soil crusts occur along portions of the Proposed Project alignments. The soil crusts consist of lichens, mosses, and algae usually binding a matrix of clay, silt, and sand soil particles together.

Biological soil crusts play an important ecological role in the functioning of soil stability and erosion, water infiltration, atmospheric nitrogen fixation, nutrient contributions to plants, soil-plant-water relations, seedling germination, and plant growth. Biological soil crusts documented along the proposed alignments are generally associated with the presence of gypsiferous soils. Due to the correlation of gypsum deposits associated with biological soils crusts, the presence of biological soil crusts can additionally be expected to be encountered in areas designated as gypsiferous soils.

Gypsum deposits are noted in the rock and soil hazards where they were specifically encountered along the Proposed Pipeline alignments (Tables 3.2-2 and 3.2.3 and Figures 3.2-3 through 3.2-6 above) and correlate with the hazard potential gypsum deposits. The extent of which gypsiferous soils are distributed and the potential distribution of biological soils throughout the Project Area are shown on Figure 3.2-7 below. The acreage distribution of gypsiferous soils and potential for biological crusts within each administrative boundary area are detailed in Table 3.2-4.

Table 3.2-4 Effects on Gypsiferous Soils and Potential Biological Soil Crusts^(a) Within LPP Rights-of Way

Administrative Boundary Area^(b)/LPP ROW Component	Southern Alternative	Highway Alternative
Kanab-Escalante Planning Area and Kanab Field Office Administrative Boundary Area^(c)		
Pipeline	107.8	114.5
High Point Regulating Tank	5.2	5.2
In-Line Hydrostation	10.2	10.2
Transmission System	1.2	1.2
Access Road	2.3	2.3
Subtotal ROW Effect Area (acres)	126.7	133.4
Arizona Strip Field Office Administrative Boundary Area^(c)		
Pipeline	55.8	96.2
Access Road	12.1	0
Subtotal ROW Effect Area (acres)	67.9	96.2
Kaibab Indian Reservation Administrative Boundary Area^(c)		
Pipeline	0	144.1
Subtotal ROW Effect Area (acres)	0	144.1
St. George Field Office Administrative Boundary Area^(c)		
Pipeline	199.1	199.1
In-Line Hydrostation	4.3	4.3
Transmission System	54.9	54.9
Access Road	1.7	1.7
Subtotal ROW Effect Area (acres)	260.0	260.0
Total ROW Effect Area (acres)	454.6	633.7

Notes:

(a) Gypsiferous soils identified in Natural Resources Conservation Service -published soil surveys containing >5 percent gypsum and have potential for developing biological soil crusts or are documented to have biological soil crusts.

(b) Administrative boundaries include BLM-administered land, and adjacent state lands and private lands where they occur.

(c) Administrative boundary includes all land within Kaibab Indian Reservation boundary.

Key:

LPP = Lake Powell Pipeline

ROW = right of way

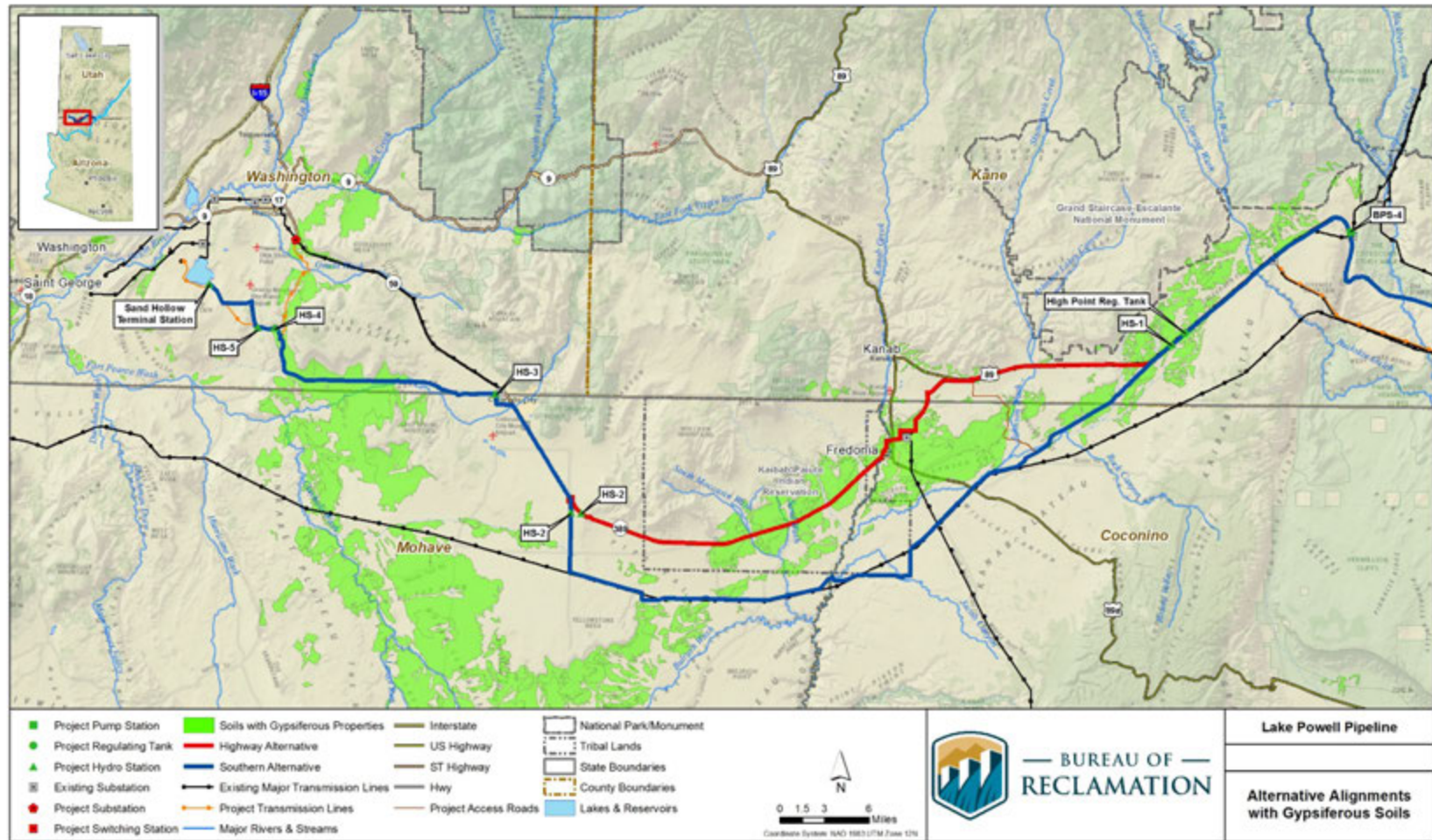


Figure 3.2-7 Alternative Alignments with Gypsiferous Soils

Soil Erosion Potential

Soils are rated under a water and wind erodibility grouping according to their susceptibility to erosion when devoid of all organic cover. Existing surface disturbances potentially increase the rating. The water erodibility rating would likely increase if the soil has been degraded by compaction or surface disturbances. Wind erodibility ratings can vary according to the percentage of coarse fragments at the surface. Soils with high wind erosion potential consist mainly of sand and loamy, sand-textured surfaces of medium or smaller sized sands. Most of the gypsum soils fall in this group based on their tendency to be crushed into fine, sandy particles (BLM 2007). Biological soil crusts cover a large percentage of these soils and help stabilize them, as well as contribute to plant growth.

Structures and Important Mineral Resources

The location coordinates of buildings and other structures within 1,000 feet of the proposed alignments have potential to some risk from the Proposed Project. Table 3.2-5 describes the structures and mineral sources encountered along the corridor of each Proposed Project alternative route. The structures have been generalized into categories: buildings, quarries, utilities, wells, or other.

Table 3.2-5 Field Survey Physical Features

Stationing	Feature Type	Description
Water Intake System to HS-1 (Southern and Highway Alternatives)		
0+00	Other	Construction staging area
675+30	Building	Town of Big Water
762+70	Building	BLM Welcome Center Building
839+60	Other	Brass cap survey marker, State Road Right-of-Way
1095+70	Building	Town of Church Wells
1410+00	Other	Brass cap, survey marker
2079+90	Other	Benchmark, Range R138
2357+90	Quarry	Gravel quarry
HS-1 to HS-2 (Highway Alternative)		
4003+60	Building	House
4705+80	Building	Tribal Headquarters Building and gas station
HS-1 to HS-2 (Southern Alternative)		
4039+70	Other	Survey marker, brass cap
4230+60	Other	Survey marker, brass cap
5421+50	Other	Windmill
5526+60	Well	Two water tanks
HS-2 to Sand Hollow Terminal Station (Southern & Highway Alternative)		
5755+40	Building	Five houses
6041+40	Building	Two houses
6231+50	Other	Windmill
6359+20	Building	House
6401+40	Well	Well
6430+10	Well	Well
6516+00	Other	Brass cap

Key:

BLM = Bureau of Land Management

HS = Hydrostation

Tribal = Kaibab Band of Paiute Indians

Borrow and Spoil

The soil and rock materials excavated from the trenches, road cuts, tunnels, and shafts would be reused for pipeline bedding and backfill and construction of maintenance roads, to the extent economically practical. Assuming that 75 percent of the excavated rock would be usable for bedding and the remaining rock would be used for road construction and backfill, all rock would potentially be used. Slope modifications in the Cockscomb Cut area would probably require controlled drill and blast methods (common to the highway construction industry). Rock material suitable for crushing and use as pipe bedding would be processed and used for that purpose. The remaining material would be used as backfill and/or spread as spoils along the ROWs outside of the cut area.

A breakdown of excavated volumes by agency is provided in Table 3.2-6 for the Southern Alternative and Table 3.2-7 for the Highway Alternative. Excavation on Tribal lands would not occur under the Southern Alternative, and approximately 144,450 acres less volume will be required on private lands under the Southern Alternative. Excavation volumes for all other agencies are estimated to be higher under the Southern Alternative.

Table 3.2-6 Southern Alternative Excavation Volumes (cubic yards) by Agency

Agency	Blasted Rock	Open Cut Soil Over Blasted Rock	Open Cut Soil/Ripped Rock	Subtotal
BLM	1,092,959	127,788	1,532,975	2,753,721
NPS	89,163	104,560	183,768	377,491
Reclamation	18,006	0	0	18,006
State	154,856	254,188	523,463	932,508
Private	197,004	217,747	818,566	1,233,318
Total	1,551,988	704,284	3,058,772	5,315,043

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

Table 3.2-7 Highway Alternative Excavation Volumes (cubic yards) by Agency

Agency	Blasted Rock	Open Cut Soil Over Blasted Rock	Open Cut Soil/Ripped Rock	Subtotal
BLM	440,037	21,842	1,102,360	1,564,239
NPS	78,364	42,260	156,013	276,637
Reclamation	17,135	0	0	17,135
Tribe	0	0	589,325	589,325
State	21,194	36,337	624,373	684,905
Private	177,427	54,753	1,145,588	1,377,768
Total	737,157	155,192	3,617,660	4,510,009

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

3.2.2 Environmental Consequences

3.2.2.1 No Action Alternative

No effects on geology, soil resources, or mineral resources are anticipated from implementation of this alternative. No soil disturbance along the proposed LPP corridor would occur, so no change in current erosion rates would occur. No loss of or disturbance to biological soil crusts would take place.

Under the No Action Alternative, no amendment to the RMP is required so current management of mineral resources would continue as currently prescribed by the RMP. This alternative would, therefore, not result in any changes to geology, soils, and mineral resources.

However, under this alternative, projects already planned by the Project Proponent would occur. Disturbance, due to these projects, would vary in space and time. Most effects would be short-term and project-specific, including localized soil erosion prior to reestablishment of vegetation. Most effects to geology and soils would be minimized through implementation of standard industry practices by the Project Proponent.

3.2.2.2 Southern Alternative

A preliminary estimate of the excavated volumes and the volumes of materials needed for construction of the Southern Alternative is shown in Table 3.2-8. The volumes used for construction assume that excavated soils would expand and would then be recompacted to 90 percent of their pre-excavated volume. Similarly, construction volumes for rock assume that excavated rock material would expand and would be recompacted to 65 percent of pre-excavated volume. There would be a surplus of soil totaling 2,959,583 cubic yards for the Southern Alternative. The surplus material would be spread across the ROW areas along the Project Area. The total estimated area of the ROWs for the Southern Alternative is 3,368 acres. The preliminary analysis indicates the spread and compacted spoils would be approximately 6.4 inches thick (see Appendix E, Plan of Development) for the Southern Alternative. The spoils would be spread in a manner to blend with original topography and drainages with periodic swales or rolling dips to promote natural drainage patterns.

Table 3.2-8 Summary of Excavation, Bedding, Backfill, and Spoil Quantities

Excavation Material	Southern Alternative (cubic yards)
Excavation – Blasted Rock, Pipeline/Facilities	1,374,059
Excavation – Open Cut Soil over Blasted Rock, Pipeline/Facilities (50% rock, 50% soil)	704,284
Excavation – Open Cut Soil/Ripped Rock, Pipeline/Facilities (100% soil)	3,058,772
Excavation – Rock from Intake	10,819
Excavation – Rock from Hurricane Cliffs Tunnels/Shafts (gypsum not usable for bedding)	12,546
Excavation – Rock from Cockscomb Reduction	154,564
Excavation Total	5,315,043
Pipeline Bedding – Blasted Rock	641,384
Pipeline Bedding – Open Cut Soil over Blasted Rock	313,112
Pipeline Bedding – Open Cut Soil/Ripped Rock	1,471,754

Table 3.2-8 Summary of Excavation, Bedding, Backfill, and Spoil Quantities (continued)

Excavation Material	Southern Alternative (cubic yards)
Pipeline Bedding Total	2,426,250
Pipeline Backfill – Blasted Rock	487,906
Pipeline Backfill – Open Cut Soil over Blasted Rock	279,894
Pipeline Backfill – Open Cut Soil/Ripped Rock	1,191,121
Pipeline Backfill Total	1,958,921
Total Rock Excavation Volume after Swell and Re-compaction	2,553,638
Rock Excavation Volume Used for Bedding	1,133,878
Imported Rock Volume Used for Bedding	1,292,372
Rock Excavation Volume Required for Maintenance Road Construction	334,293
Remaining Rock Excavation Used for Backfill	1,085,467
Total Excess Material to be Spread as Spoil	0
Total Soil Excavation Volume after Swell and Re-compaction	3,752,005
Soil Excavation Volume Used for Bedding	0
Soil Excavation Volume Used for Backfill	873,453
Permanent Pipeline ROW (acres)	1,802
Average Thickness of Compacted Soil if Only Spread on Permanent Pipeline ROW (acres)	11.9
Permanent Pipeline and Temporary Construction Area ROW (acres)	3,368
Average Thickness of Compacted Soil if Spread on Permanent Pipeline and Temporary Construction Area ROW (inches)	6.4

Key:

ROW = right-of-way

A breakdown of excavated volumes by agency is provided in Table 3.2-9 for the Southern Alternative. Excavation on tribal lands would not occur under the Southern Alternative.

Table 3.2-9 Southern Alternative Excavation Volumes (cubic yards) by Agency

Agency	Blasted Rock	Open Cut Soil Over Blasted Rock	Open Cut Soil/Ripped Rock	Subtotal
BLM	1,101,415	141,062	1,547,773	2,790,251
NPS	78,364	42,260	156,013	276,637
Reclamation	17,135	0	0	17,135
State	156,270	280,594	528,517	965,381
Private	198,804	240,367	826,468	1,265,639
Total	1,551,988	704,284	3,058,772	5,315,043

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

There are approximately 455 acres of gypsiferous soils and potential biological soil crusts within the Southern Alternative ROW. Where actively grazed by livestock, the soil crusts may already be broken and trampled in some areas. Surface disturbing activities such as excavation, grading, removal of vegetation, and removal of biological soil crust cover is expected to result in direct

effects associated with construction of LPP infrastructure. Areas disturbed during construction, or removed permanently for LPP facilities or roads, would support little or no vegetation. A summary of the estimated acreage for each federal, state and private land under the Southern Alternative is provided in Table 3.2-10.

Table 3.2-10 Southern Alternative LPP Right-of-Way Summary

Land Ownership	Permanent ROW (acres)			Short-term or Temporary Construction Easement ROW ^(a) (acres)	Total ROW (acres)
	Pipeline ^(a)	Transmission Lines ^(a)	Pumping, Hydro, and Road Facilities ^(b)		
BLM	876	533	68	649	2,127
NPS	126	55	20	79	280
Reclamation	1	8	27	0	36
State	302	375	11	186	874
Private	382	95	42	565	1,083
Total	1,687	1,067	168	1,479	4,401

Notes:

(a) Disturbed ROW would be restored.

(b) Disturbed ROW would not be restored due to permanent aboveground facilities.

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = right-of-way

Soil erosion could occur from increased stormwater runoff as a result of protective vegetative and biological soil crust cover removal, soil compaction, or alteration of drainage patterns related to construction of the pipeline, roads, and other associated infrastructure. These direct soil loss effects would occur within the LPP ROW areas during construction and operation activities. Disturbance in most areas would be short-term and effects would be controlled through implementation of EPMs. Once construction is complete, the construction corridor would be reclaimed, which would minimize soil erosion in the long-term. An exception is the Kanab Creek crossing, where steep topography and areas of sensitive and erosion-prone soils occur. This area has the potential for higher rates of erosion.

Fault movement along the alignment is expected to be below 75 millimeters (3 inches) during the Proposed Project design life. The alignment is not within a zone of high projected peak ground acceleration and is therefore not affected by the construction of the LPP infrastructure (USGS 2014). Construction and operation of the LPP and associated features has the potential to induce slope failures that could result in injury to humans, damage to major human structures, or damage to the environment, specifically in areas that would require blasting along steep slopes and localities where weak, weathered bedrock and gypsiferous deposits are encountered. Geologic rock and soil hazards have potential to cause deformation or failure of foundation conditions (specifically in gypsum-rich deposits, expansive and collapsible soils) which could be sufficient to cause pipeline rupture or failure of associated pipeline features. Adherence to the EPMs during construction activities would lower the direct effects related to geologic hazards along the alignment and would not result in human injury or death, present a serious risk to human health, or cause major damage to structures.

Borrow and spoil associated with the Southern Alternative would not cause new or substantial disturbance of land; substantial changes in runoff patterns; turbid runoff that would discharge to rivers, streams, or lakes; or unstable slope conditions.

Resource Management Plan Amendment

RMPA Sub-alternative 1

RMPA Sub-alternative 1 would not change the boundary of the ACEC and would not change any RMP decisions related to the management of locatable, salable, or leasable minerals. No effects to mineral resources within the planning area are therefore anticipated under Alternative 1.

RMPA Sub-alternative 2

Under RMPA Sub-alternative 2, the following effects related to management of mineral resources (locatable, salable, and leasable minerals) would occur:

- Locatable Minerals—RMP Decision No. MA-MI-02 (stating that “special mitigation will be required in mining plans of operation to avoid effects to cultural resources, special status species, and/or other sensitive resources in Areas of Critical Environmental Concern”) would no longer apply to lands excluded from the ACEC. However, existing federal laws (including the ESA, National Historic Preservation Act [NHPA], and Native American Graves Protection and Repatriation Act) would still apply. In addition, the lands within this ACEC were withdrawn from locatable mineral entry for 20 years in 2012 by the Secretary of Interior, so locatable mineral development could not occur unless the withdrawal were revoked or mining claims were determined to be valid.
- Salable Minerals—RMP Decision No. MA-AC-9 (stating that “new mineral material disposal sites in Areas of Critical Environmental Concern will not be authorized”) would no longer apply to lands excluded from the ACEC. Salable minerals would therefore become available on any lands removed from the ACEC (up to 905 acres), providing additional opportunities for extraction and disposal of this resource.
- Leasable Minerals—Decision No. MA-AC-08 (stating that “Areas of Critical Environmental Concern will remain open to leasable mineral exploration and development [but] special mitigation will be required to avoid effects to special status species and proposed or designated critical habitat and cultural resources”) would no longer apply to lands excluded from the ACEC. However, existing federal laws (including the ESA, NHPA, and Native American Graves Protection and Repatriation Act) would still apply.

RMPA Sub-alternative 3

Effects under RMPA Sub-alternative 3 would be the same as those described for RMPA Sub-alternative 1 because no change to the boundary of the ACEC would occur, and no RMP decisions related to the management of locatable, salable, or leasable minerals would occur.

Mitigation Measures

Minor changes to the EPMS should be implemented to meet agency-specific goals and objectives for management of geological and soil resources.

The BLM and NPS intend to avoid and/or minimize adverse effects to biological soil crust coverage but acknowledge if soil crust occurs in the Proposed Project alignment, such effects are unavoidable. However, avoidance and/or minimization measures could be achieved in other Project Areas where soil disturbance would and may have already occurred. To this end, the UBWR would consult with

the land management agencies regarding dense biological soil crust coverage associated with staging areas, electrical substations, electrical transmission corridors, and temporary access roads to identify any soil crust coverage. If this resource occurs at any site, the land management agencies would advise the UBWR on avoidance and minimization measures to reduce adverse effects, where practicable. This would include the land managing agencies working with the UBWR to determine alternative sites.

3.2.2.3 Highway Alternative

There would be a surplus of soil for the Highway Alternative, totaling 2,801,855 cubic yards. The surplus material would be spread across the ROW areas along the Project Area. The total estimated area of the ROWs for the Highway Alternative is 2,878 acres. The preliminary analysis indicates the spread and compacted spoils would be approximately 7.2 inches thick for the Highway Alternative. Table 3.2-11 provides a summary of the excavation, bedding, backfill, and spoil quantities.

Table 3.2-11 Summary of Excavation, Bedding, Backfill, and Spoil Quantities

Volumes (cubic yards)	Highway Alternative
Excavation–Blasted Rock, Pipeline/Facilities	559,228
Excavation–Open Cut Soil over Blast Rock, Pipeline/Facilities (50% rock, 50% soil)	155,192
Excavation–Open Cut Soil/Ripped Rock, Pipeline/Facilities (100% soil)	3,617,660
Excavation–Rock from Intake	10,819
Excavation–Rock from Hurricane Cliffs Tunnels/Shfts (Gypsum not usable for bedding)	12,546
Excavation–Rock from Cockscomb Reduction	154,564
Excavation Total	4,510,009
Pipeline Bedding–Blasted Rock	261,037
Pipeline Bedding–Open Cut Soil over Blast Rock	68,996
Pipeline Bedding–Open Cut Soil/Ripped Rock	1,740,668
Pipeline Bedding Total	2,070,700
Pipeline Backfill–Blasted Rock	198,573
Pipeline Backfill–Open Cut Soil over Blast Rock	61,676
Pipeline Backfill–Open Cut Soil/Ripped Rock	1,408,759
Pipeline Backfill Total	1,669,007
Total Rock Excavation Volume after Swell and Re-compaction	1,082,979
Rock Excavation Volume Used for Bedding	501,608
Imported Rock Volume Used for Bedding	1,569,092
Rock Excavation Volume Required for Maintenance Road Construction	183,330
Remaining Rock Excavation Used for Backfill	398,041
Total Excess Material to be Spread as Spoil	0
Total Soil Excavation Volume after Swell and Re-compaction	4,064,781
Soil Excavation Volume Used for Bedding	0
Soil Excavation Volume Used for Backfill	1,270,966
Permanent Pipeline ROW (acres)	1,538
Average Thickness of Compacted Soil if Only Spread on Permanent Pipeline ROW (acres)	13.5
Permanent Pipeline and Temporary Construction Area ROW (acres)	2,878
Average Thickness of Compacted Soil if Spread on Permanent Pipeline and Temporary Construction Area ROW (inches)	7.2

There are approximately 634 acres of gypsiferous soils and potential biological soil crusts within the Highway Alternative ROW. Where actively grazed by livestock, the soil crusts may already be broken and trampled in some areas. Surface disturbing activities such as excavation, grading, removal of vegetation, and removal of biological soil crust cover is expected to result in direct effects associated with construction of LPP infrastructure. Areas disturbed during construction, or removed permanently for LPP facilities or roads, would support little or no vegetation.

A summary of the estimated acreage for each federal, state, and private land under the Highway Alternative is provided in Table 3.2-12.

Table 3.2-12 Highway Alternative LPP Right-of-Way Summary

Land Ownership	Permanent ROW (acres)			Short Term or Temporary Construction Easement ROW ^(a) (acres)	Total ROW (acres)
	Pipeline ^(a)	Transmission Lines ^(a)	Pumping, Hydro, and Road Facilities ^(b)		
BLM	524	529	68	395	1,516
NPS	126	55	20	79	280
Reclamation	1	8	27	0	36
Tribe	140	0	0	99	239
State	242	375	11	161	790
Private	492	93	44	571	1,201
Total	1,526	1,060	170	1,305	4,062

Notes:

(a) Disturbed ROW would be restored.

(b) Disturbed ROW would not be restored due to permanent above ground facilities.

Key:

BLM = Bureau of Land Management

LPP = Lake Powell Pipeline Project

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = right-of-way

Tribe = Kaibab Band of Paiute Indians

Pipeline bedding under the Highway Alternative may not be sufficient due to the composition of materials expected below the surface. If bedrock excavated from the pipeline trenches are largely unsuitable for pipeline bedding, additional bedding material would have to be sourced and imported, resulting in additional land disturbance on private and/or public land in southwest Utah and northwestern Arizona. The potential quantity of bedding material needed for the Highway Alternative is estimated at 632,270 cubic yards and may require access to commercial gravel resources in the area.

A breakdown of excavated volumes by agency is provided in Table 3.2-13 for the Highway Alternative.

Table 3.2-13 Highway Alternative Excavation Volumes (cubic yards) by Agency

Agency	Blasted Rock	Open Cut Soil Over Blasted Rock	Open Cut Soil/Ripped Rock	Subtotal
BLM	440,037	21,842	1,102,360	1,564,239
NPS	78,364	42,260	156,013	276,637
Reclamation	17,135	0	0	17,135
Tribe	0	0	589,325	589,325
State	21,194	36,337	624,373	684,905
Private	177,427	54,753	1,145,588	1,377,768
Total	737,157	155,192	3,617,660	4,510,009

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

Soil erosion, as discussed under the Southern Alternative would have the same direct effects to soil loss as a result of removal and/or compaction of protective vegetative, biological soil crust and gypsiferous soil cover, and alteration of drainage patterns related to construction of the pipeline, roads, and other associated infrastructure. Disturbance in most areas would be short-term and effects would be controlled through implementation of EPMs. Once construction is complete, the construction corridor would be reclaimed, which would minimize soil erosion in the long-term.

Faulting encountered along the Highway alignment is expected to be below 75 millimeters (3 inches) during the Proposed Project design life. The alignment is not within a zone of high projected peak ground acceleration (USGS 2014) and is therefore not affected by the construction of the LPP infrastructure. Construction and operation of the LPP and associated features have potential to result in injury to humans, damage to major human structures, or damage to the environment, specifically in areas that would require blasting. Geologic rock and soil hazards have potential to cause deformation or failure of foundation conditions (specifically in gypsum-rich deposits, expansive and collapsible soils) which could be sufficient to cause pipeline rupture or failure of associated pipeline features. Adherence to the EPMs during construction activities would lower the direct effects related to geologic hazards along the alignment and would not result in human injury or death, present a serious risk to human health, or cause major damage to structures.

Borrow and spoil associated within the Highway Alternative may have direct effects to local borrow sources due to insufficient volumes of pipeline bedding materials require for pipeline foundation. Substantial disturbance of land; substantial changes in runoff patterns; turbid runoff that would discharge to rivers, streams, or lakes; or unstable slope conditions are not expected to occur. Under the Highway Alternative, no amendment to the RMP would be required.

Mitigation Measures

Mitigation measures would be the same as described for the Southern Alternative (see Appendix C-1, Geology and Soils for details) with the exception of the measure addressing Staging Area 2, which is not proposed to be developed in the Highway Alternative.

3.2.2.4 Comparative Analysis of Alternatives

The No Action Alternative would not require construction activities that would remove biological soil crusts and existing vegetation or disturb soils. Under the No Action Alternative, there would be no effect on geological resources. Ground disturbance would not occur, and all geologic features would remain as they are. In comparison to the No Action Alternative, the Southern Alternative would require mitigation for construction staging areas, blasting sites, and borrow and spoil.

Of the two action alternatives, the Southern Alternative would require construction/placement of the LPP in currently undisturbed areas, and in an area of steeper topography (Kanab Creek crossing), which would be more prone to accelerated soil loss due to exposure of soil particles to water and wind erosion from surface-disturbing activities. While Kanab Creek would be crossed under both alternatives, the crossing under the Highway Alternative is in an area where the drainage is very shallow, narrow, and contains little riparian vegetation; this is in contrast to the Southern Alternative Kanab Creek crossing, which is much deeper, wider, and contains well established riparian vegetation. The deep canyon at the Kanab Creek crossing for the Southern Alternative would likely be difficult to mitigate, and the potential exists for substantial erosion and siltation into the creek during construction, and restoration would be difficult due to the steepness of the canyon, resulting in the potential for long-term erosion and siltation into Kanab Creek.

Estimates of ground disturbance for the permanent pipeline ROWs under the Highway Alternative is 264 acres less than that of the Southern Alternative. For temporary ROWs, 1,305 acres would be impacted for the Highway Alternative, whereas the Southern Alternative would impact 1,479 acres. Estimated thickness of compacted soils on the Highway Alternative would be 0.8 feet greater than on the Southern Alternative.

Under the Highway Alternative, approximately 180 acres of additional soil resources (biological soil crusts, gypsiferous soils and soil erosion potential) would be disturbed as compared to the Southern Alternative. The Highway Alternative traverses through geologic deposits consisting of a thicker sequence of overburden composed of soils derived from the surrounding geologic formations. Localized soils along the route generally are concentrated with gypsum and biological crusts to a greater extent than those along the Southern Alternative. Effects on gypsiferous soils and potential biological soil crusts for each land agency are provided in Table 3.2-14.

Table 3.2-14 Acres of LPP Construction Effects on Gypsiferous Soils and Potential Biological Soil Crusts

Land Manager/Owner	Southern Alternative (acres)	Highway Alternative (acres)
BLM	361.4	313.1
NPS	0.0	0.0
Reclamation	0.0	0.0
Tribe	0.0	144.1
State	30.3	82.5
Private	62.8	93.9
Total	454.5	633.6

Key:

BLM = Bureau of Land Management

LPP = Lake Powell Pipeline Project

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

Ground disturbance and blasting of bedrock will need to occur throughout the entirety of the Proposed Project. Such activities will result in permanent and irreversible effects to geologic resources resulting in loss of their integrity and damage to the visual surface. Shallow bedrock deposits are encountered throughout the Southern Alternative and will require approximately 1,374,059 cubic yards of excavation in the form of blasting.

Blasting of bedrock through the Highway Alternative alignment would require approximately 814,831 cubic yards less compared to the Southern Alternative. The overall total excavation volumes, including open cut soil excavations, under the Highway Alternative are 4,510,009 cubic yards in comparison to 5,315,043 cubic yards excavated under the Southern Alternative. Although excavation volumes are lower under the Highway Alternative, and appear to indicate less disturbance to rock formations, the lack in volume would be insufficient for backfill and bedding required for pipeline design. Sourcing an alternate borrow material may be necessary to provide a foundation and backfill for the Proposed Project. More (632,270 cubic yards) crushed rock, sand, and/or gravel would be needed for the Highway Alternative than for the Southern Alternative.

Blasting of bedrock through the Highway Alternative alignment would require approximately 814,831 cubic yards less compared to the Southern Alternative. The overall total excavation volumes, including open cut soil excavations, under the Highway Alternative are 4,510,009 cubic yards, which is less than that of the 5,315,043 cubic yards excavated under the Southern Alternative.

3.3 Noise and Vibration

3.3.1 Affected Environment

For the purposes of this evaluation, the affected environment is considered land use or receptors within 750 feet of construction of the proposed alternatives. The Federal Highway Administration (FHWA) uses this distance for evaluating noise effects from proposed improvement projects (FHWA 2010). Even though the affected environment is considered as 750 feet from the Proposed Project alternative alignments, receptors as far as 2,278 feet away were evaluated as a precaution. Table 3.3-1, below, provides a summary of human receptors identified within the affected environment. Table 3.3-2, below, describes the wilderness and recreational areas within the affected environment, which have been identified with potential for presence of wildlife receptors. Appendix C-3, Noise and Vibration, includes additional details related to the affected environment.

3.3.2 Regulatory Framework and Methodology

The Proposed Project would be primarily located within designated utility corridors and along existing paved highways, in areas managed by federal, state, and local agencies, as well as private land. Various rules, regulations, plans, and policies related to noise and vibration would apply to construction and operation, including regulations and policies of the NPS (36 CFR §2.12 and the 2006 NPS Management Policies), and noise exposure guidelines from the EPA and Occupational Safety and Health Administration. A 75-decibel (A-weighted [dBA]) sound level is the threshold for significant noise effects on human receptors (for periods of up to 8 hours per day). A 45 dBA sound level is the threshold for significant noise effects on wildlife, based on recent studies, the requirements of 36 CFR §2.12, and American National Standards Institute recommendations. Each of the four counties that the Proposed Project would occupy has some type of noise restriction. The

rules are either included in a nuisance ordinance or a zoning ordinance and may prohibit noise that “disturbs the peace”; however, none of the rules cite a specific decibel level from a source as a violation.

The analysis of noise and vibration effects was completed by reviewing existing background noise and vibration data, performing field investigations to obtain background noise data at various locations, calculating probable construction and operation noise levels, and determining the spatial extent of the noise effect. Short-term noise effects occur within the duration of the construction period. Long-term effects are those that occur from ongoing operations of the pipeline after the construction period ends.

3.3.2.1 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

EPMs that would be used to address the noise and vibration effects include using equipment controls such as mufflers and conservative operation; enclosing pumping and hydroelectric generating stations and designing these permanent sources with a maximum operational noise level of 60 dBA at the boundary of the facility; working in daytime hours only (6:00 a.m. to 6:00 p.m.); and providing notifications of Proposed Project activity to the nearest residents (see Appendix C-3, Noise and Vibration, and Appendix B of the POD, provided in Appendix E, Plan of Development). Implementation of EPMs during construction (e.g., use of mufflers, silencers, and temporary construction sound barriers) is assumed to provide a reduction in noise up to 15 dBA at the source.

3.3.2.2 Existing Conditions

A field investigation to measure ambient sound levels was performed along the Proposed Project alternative routes in July 2009. Ambient sound levels varied from background sound levels in developed areas of less than 50 to 54 dBA to peak sound levels of 54 to 79 dBA. In undeveloped areas away from roads and out of the wind, ambient sound levels were lower. Publicly available data from the NPS geospatial ambient model suggests estimated natural ambient sound levels of 24 to 25 dBA and estimated existing ambient sound levels of 35 to 38 dBA on NPS lands in the vicinity of the intake pump station and BPS-1 (NPS 2020).

Table 3.3-1 Potential Human Receptors by Land Manager/Owner

Receptor ID	Potential Human Receptor Location	Receptor	Receptor Distance to Noise Source (feet)	Land Manager/Owner
Pipeline Construction				
Water Intake System to HS-1 – Both Alternatives				
1	Glen Canyon Dam Facilities	Visitor Center	2,278	Reclamation
2	Greenehaven	Residential	752	Private
3	Lower Big Water	Residential	175	Private
4	Upper Big Water	Residential	200	Private
5	Church Wells	Residential	450	Private
7	Adairville (W. of Paria R.)	Residential/Business	460	Private
6	Paria River Crossing	Visitors in Vehicles	140	BLM/Private
HS-1 to HS-2 - Highway Alternative				
18	Near S. Johnson Rd and 89	Residential	70	Private
19	Near Bryce Canyon Rd and 89	Residential	261	Private
20	Near Kaibab Trail and 90	Residential	328	Private
21	Near Old Hwy 89 and 89	Residential	105	Private
22	Near Fredonia	Residential	36	Private
23	Stagger Mountain Rd.	Residential	302	Private
24	Stagger Mountain Rd. and Highway 389	Residential	78	Private
25	Pipe Springs	Residential/business/ Government facility	63	Kaibab Indian Reservation
HS-1 to HS-2 – Southern Alternative				
17	Toroweap (Mt. Trumbull) Road	Visitors in Vehicles	20	BLM
HS-2 to Sand Hollow Terminal Station – Both Alternatives				
8	Cane Beds Area	Residential	137	Private
9	Near School Bound Rd. S. of Colorado City	Residential	133	Private
10	Colorado City	Business	53	Private
11	Colorado City Johnson Ave.	Residential	32	Private
12	Colorado City Township Ave.	Business	151	Private
13	Uzona Ave.	Residential	241	Private
14	Canaan Gap	Residential	287	Private
Transmission Line Construction				
15	Olympus Academy	School/Residential	237	Private
16	Sand Hollow State Park	Campground	1,168	State/Private

Source: LPP Final Study Report 7 – Noise, UBWR 2016; UBWR 2020

Key:

BLM = Bureau of Land Management

HS = hydrostation

Table 3.3-2 Wilderness and Recreational Areas with Potential Presence of Wildlife Receptors

Wilderness or Recreational Area	Distance of Wilderness/Recreational Area to Proposed Project Alternative
National Park Service	
Glen Canyon National Recreation Area	Both alternatives traverse the southwest section of the park, along U.S. Highway 89
Pipe Spring National Monument	Southern Alternative is approximately 20,600 feet from border; Highway Alternative is approximately 1,000 feet from border
Bureau of Land Management	
Sand Hills SRMA	Both alternatives (transmission lines only) traverse the area
Grand Staircase-Escalante National Monument, Kaiparowits Unit	Both alternatives are approximately 800 feet from the border
Grand Staircase-Escalante National Monument, Grand Staircase Unit	Southern Alternative is approximately 5,700 feet from border; Highway Alternative is approximately 1,775 feet from border
Paria Canyon-Vermillion Cliffs Wilderness	Both alternatives are approximately 15,000 feet from the border (pipeline), and approximately 900 feet from the border (transmission line)
The Cockscomb Wilderness Study Area	Both alternatives are adjacent to the southern border, along U.S. Highway 89
Wahweap Wilderness Study Area	Both alternatives are approximately 7,750 feet from the border
Paria-Hackberry Wilderness Study Area	Both alternatives are approximately 6,600 feet from the border
Kanab Community SRMA	Highway alternative is approximately 2,500 feet from the border
Freedonia SRMA	Southern Alternative is approximately 5,600 feet from border; Highway Alternative traverses the area
Canaan Mountain SRMA	Both alternatives are approximately 7,500 feet from the border
St. George Basin SRMA	Both alternatives are approximately 11,000 feet from the border
Sand Mountain SRMA	Both alternatives traverse the area
Utah State Parks	
Sand Hollow State Park	Both alternatives traverse the area

Key:

SRMA = Special Recreation Management Area

3.3.3 Environmental Consequences

3.3.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not be built, and no RMPA would be required. There would be no changes to existing background sound levels in the affected environment.

However, under this alternative, projects already planned by the Project Proponent would occur. Disturbance, due to these projects, would vary in space and time. Most effects would be short-term and project-specific, particularly during construction of these other planned projects. Noise levels would return to prior existing conditions, depending on new infrastructure. Most effects to noise and vibration would be minimized through implementation of standard industry practices by the Project Proponent.

3.3.3.2 Southern Alternative

There would be short-term noise effects anticipated to human and wildlife receptors during construction. There would be no long-term effects to human or wildlife receptors from construction, and localized long-term effects from operations.

Construction

Fourteen of the human receptors identified for the Southern Alternative would be exposed to peak noise levels above the 75 dBA threshold. However, the maximum calculated noise levels used in this analysis were worst-case projections based on temporary construction activities, without implementation of EPMs. The use of EPMs and mitigation measures would reduce the potential for noise exposure effects to occur. Short-term noise effects on human receptors located farther than 750 feet from construction activities and on visitors would occur, although these effects would be temporary and location would be transient with linear pipeline construction. Wildlife receptors near construction activities could be affected temporarily by construction noise, though wildlife would be expected to return to the area once construction is complete.

Much of the Southern Alternative alignment would be more than 1 mile south of the KIR boundary, and average construction noise levels would decay to background ambient sounds levels within 0.6 mile from the construction activities. The Southern Alternative alignment would be parallel to the KIR boundary near the southeast corner of the KIR for about 3.5 miles; in this area, short-term construction noise levels extending into the KIR would average about 79 dBA.

Construction would create perceptible vibration and ground borne noise from blasting, the use of heavy-duty construction equipment, tamping or compacting of ground surfaces, and excavation of trenches. Construction would be temporary, would only occur during daytime hours, and vibration would be intermittent. Noise from blasting would be instantaneous, not continuous, and decrease over a shorter distance compared to other types of construction noise.

Operation

The Southern Alternative would generate noise from the long-term use of electrical and mechanical equipment at the intake pump station, BPSs, inline HSs, electrical facilities, and water conveyance components. All of these facilities would operate per manufacturers' specifications and would follow occupational health and safety codes and the regulations listed above in Section 3.3.2, which would reduce the potential for generating operational noise levels in excess of 60 dBA at the nearest human receptors and 45 dBA at wildlife receptor areas. EPMs (see Section 3.3.2.1, above) include design measures for permanent facilities to operate at noise levels of 60 dBA at the site boundary, and mitigation measures would require further reductions to not exceed 52 dBA at recreational areas.

Mitigation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of noise and vibration resources. Mitigation measures would be implemented to mitigate noise effects from construction and operation of the Southern Alternative of the Proposed Project. These measures include the following:

- Use of sound barriers for construction occurring within 150 feet of any human receptors;
- Monitoring field noise levels during construction; and
- Construction noise levels within recreational areas would not exceed 52 dBA, in order to prevent speech interference of outdoor interpretive programs (assumes a raised voice speaker at a maximum distance of 10 meters [EPA 1974]).
- Total pumping station noise and Booster Pump Station 1 noise shall not exceed 45 dBA at the fence line or 50 feet from the building, whichever is closer, as agreed by NPS and UBWR.

3.3.3.3 Highway Alternative

There would be short-term noise effects to some human and wildlife receptors within the affected environment during construction. There would be no long-term effects to human or wildlife receptors from construction, and localized long-term effects from operations.

Construction

Twenty-two potential receptor locations were identified for the Highway Alternative; of these, 17 are residential. These residential areas would be located within 750 feet of the Highway Alternative alignment and could be exposed to noise levels above 75 dBA during construction activities. Potential noise effects on these receptors would be mitigated through implementation of EPMs. Effects to wildlife receptors in the area would be the same as the effects of the Southern Alternative.

Construction activities through the KIR along SR-389 would have average sound levels of 88 dBA, 50 feet from the construction noise source. Construction around Pipe Spring National Monument at the Tribal headquarters could cause short-term noise effects on people using the facility. These short-term noise effects would persist for several days.

Operation

The Highway Alternative would generate noise from the permanent use of electrical and mechanical equipment at the intake pump station, BPSs, inline HSs, electrical facilities, and water conveyance components. All of these facilities would operate per manufacturers' specifications and would follow occupational health and safety codes and the regulations listed in Section 3.3.2, above, which would reduce the potential for generating operational noise levels in excess of 60 dBA at nearest human receptors and 45 dBA at wildlife receptor areas. EPMs include design measures for permanent facilities to operate at noise levels of 60 dBA at the site boundary; therefore, peak operations noise levels are not anticipated to occur at the nearest sensitive receptors. Under the Highway Alternative, no RMPA would be required.

Mitigation Measures

The mitigation measures used for the Highway Alternative would be the same as those listed for the Southern Alternative.

3.3.3.4 Comparative Analysis of Alternatives

No noise and vibration effects would be expected under the No Action Alternative. There would be short-term noise effects anticipated to human and wildlife receptors within the affected environment during construction of the Southern Alternative. There would be localized long-term effects from operations of the Southern Alternative. Effects would be similar for the Southern and Highway Alternatives.

3.4 Land Use

3.4.1 Affected Environment

This section describes the affected environment and potential effects on land use, including land management and existing uses. Supplemental information is included in Appendix C-6, Land Use.

3.4.1.1 Regulatory Framework and Methodology

The Proposed Project would cross 4,401 acres total and 2,443 acres of federal lands under the Southern Alternative and 4,062 acres total and 1,832 acres of federal lands under the Highway Alternative (see Table 3.4-1, below, for more details). These federal lands are managed by Reclamation, NPS, and BLM. Two hundred thirty-nine acres of Tribal lands would be affected under the Highway Alternative. The BIA assists the Tribe in land management. Each federal agency is given authority to manage federal lands, including the issuance of ROWs, permits, leases and easements (Outgrants), and is subject to laws, codes, regulations, and policies listed below. All Outgrants requested by the UBWR for the Proposed Project would be processed in accordance with each agency's regulations and policy. Additionally, other federal laws and regulations that may apply to this project, including: FHWA laws, Agriculture and Food Act of 1981 (Public Law 97-98) containing the Farmland Protection Policy Act, and E.O. 11988 (Federal Emergency Management Agency [FEMA] floodplains).

Table 3.4-1 LPP Right-of-Way Summary by Alternative

Land Ownership/Management	Southern Alternative	Highway Alternative
	Total ROW (acres)	Total ROW (acres)
BLM	2,127	1,516
NPS	280	280
Reclamation	36	36
Tribe	0	239
State	874	790
Private	1,083	1,201
Total	4,401	4,062

Source: UDWRe 2020

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = right-of-way

Tribe = Kaibab Band of Paiute Indians

The following methods were used to gather data and develop the analysis of land use, land ownership, and related subjects:

- Review resource management plans from the BLM Arizona Strip, Kanab, and St. George Field Offices.
- Research and review the applicable existing land use authorizations and agreements.
- Review land use policy and procedures for Reclamation, BLM, BIA, and NPS. Also, research and review the applicable existing land use authorizations and agreements.
- Conduct research on the county websites to obtain general plans and land use maps from the following counties: Kane County and Washington County in Utah and Coconino County and Mohave County in Arizona.
- Review Comprehensive Economic Development Strategy for the Kaibab-Paiute Tribe of Arizona (November 2015) and any other land use planning documents/resolutions associated with the Tribe (Kaibab-Paiute Tribe 2015).
- Review and consider Energy Transport Corridor Siting for Tribal Planners Guidance Manual (BIA 2010). This manual provides guidance on establishing corridors that may be used by utilities to minimize effects.
- Research FHWA laws, the U.S. Department of Agriculture Farmland Impact Rating Form, the FEMA's No-rise Certificate for Floodways, and other federal regulations related to land management.
- Review research provided by the UDWRe in the POD, updated February 2020 (see Appendix E, Plan of Development).

Effects described in this section would occur if the Proposed Project:

- Conflicts with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the Proposed Project adopted for the purpose of avoiding or mitigating an environmental effect;
- Conflicts with existing ROWs;
- Conflicts with other existing or authorized land uses, specifically where the Proposed Project would create a direct long-term adverse effect;

- Causes effects (as described below) that, although not incompatible with other land uses, would otherwise not occur unless an action alternative was selected;
- Conflicts with existing residential, commercial, industrial, military, or agricultural uses (i.e., displacement of homes, businesses, solar energy facilities, or center-pivot irrigation agriculture fields);
- Conflicts with planned land uses, specifically residential subdivisions or other sensitive land uses at the final plat approval stage;
- Does not return to preconstruction use and existing land uses (for areas disturbed and not containing permanent structures); or
- Creates nuisance effects to existing land uses.

The intensity of effect is determined by duration using the following terms and definitions:

- Temporary – limited to active construction.
- Short-term – effects lasting up to five years.
- Long-term – effects lasting more than five years.

The scope of work covers the lands needed to construct, operate, and maintain the pipeline and associated infrastructure. The Southern Alternative would total 141 miles and includes 4,401 acres. The Highway Alternative would total 134 miles and includes 4,062 acres. The federal lands, as shown in Table 3.4-1 are managed by the BLM, NPS, and Reclamation. This includes 36 acres in the controlled access area near Glen Canyon Dam administered by Reclamation, 280 acres in GCNRA administered by the NPS, and as many as 2,127 acres administered by the BLM (UDWRe 2020).

3.4.1.2 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development (see Appendix E, Plan of Development) are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

EPMs include various safety measures; efforts to minimize soil and vegetation disruption; restoration plans including monitoring and reseeding; coordination with applicable land management agencies and permit holders, several measures to minimize effects on landowners or permit holders; and particular efforts to protect grazing livestock by ensuring access to water sources, repairing or replacing damaged range improvements (e.g., fences, pipelines, corrals), installing temporary fencing and cattle guards, and providing access to the livestock throughout the construction period.

3.4.1.3 Existing Conditions

Within the Proposed Project boundary, lands are managed as follows under the Southern and Highway Alternatives: BLM-2,127 and 1,516 acres, NPS-280 acres under each Action Alternative, and Reclamation-36 acres under each Action Alternative. The Tribe manages 239 acres potentially affected under the Highway Alternative. The Proposed Project would potentially cross or be near: 393 acres (Southern Alternative) and 276 acres (Highway Alternative) of prime farmland (as defined

by the U.S. Department of Agriculture) and about 70 acres of floodplains (as defined by FEMA). Both Action Alternatives would cross existing ROWs, utilize designated corridors, and cross GCNRA. The Southern Alternative would cross the ACEC, and the Highway Alternative would cross the KIR.

The Proposed Project would cross approximately 3,715.9 acres of grazing land under the Southern Alternative and approximately 3,077.3 acres under the Highway Alternative. Table 3.4-2 shows the breakout by agency. Range improvements (e.g., corrals, stock ponds, pipelines) that support grazing are also present in the Project Area (UDWRe 2020).

Table 3.4-2 Total Grazing Effects (in acres)

Land Manager/Owner	Southern Alternative	Highway Alternative
BLM	1,963.6	1,341.3
NPS	199.1	199.1
Reclamation	7.9	7.9
Tribe	0.0	239.0
State	763.9	629.8
Private	781.4	660.2
Total	3,715.9	3,077.3

Source: UDWRe 2020

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = right-of-way

Tribe = Kaibab Band of Paiute Indians

The Southern Alternative would cross through 17 grazing allotments on federal lands in Arizona and 15 allotments on federal lands in Utah. Of the 17 allotments in Arizona, nine meet all applicable standards for rangeland health, while the remaining eight are making progress toward meeting the applicable standards. In Utah, 11 allotments meet all applicable standards for rangeland health, while the remaining four are making progress toward meeting the applicable standards.

The Highway Alternative would cross through seven grazing allotments on federal lands in Arizona and the same 15 allotments in Utah as the Southern Alternative. Of the seven allotments in Arizona, four meet all applicable standards for rangeland health; while the remaining three allotments are making progress toward meeting the applicable standards. In addition to the BLM-managed grazing lands, under the Highway Alternative the Proposed Project would also cross the KIR and 12 grazing allotments managed by the Tribe. Range improvements (e.g., corrals, stock ponds) that support grazing are also present in the Project Area.

3.4.2 Environmental Consequences

3.4.2.1 No Action Alternative

Under the No Action Alternative, land use would be the same as the existing conditions. No amendment to the RMP would be required. Existing ROWs and grazing leases would continue without any disturbance from the Proposed Project.

3.4.2.2 Southern Alternative

Land ownership/management would be adversely affected by construction and operation of the Southern Alternative in several different ways. All pipeline facilities except for BPS-4 and HS-2 would be located on federal lands, requiring ROW approvals from the applicable land management agency prior to construction and operation. Under the Southern Alternative, the permanent ROWs for the pipeline would mostly be 100 feet wide, with 25 feet on either side as temporary construction easement. The Proposed Project would affect a total of 2,443 acres of federal lands, of which 115 acres would be a permanent adverse effect and 2,293 acres would be a temporary adverse effect. Table 3.4.-3 below shows the acres by land ownership/management. The 115 acres represents the land needed for aboveground ancillary facilities, which include BPSs, HSs, and access roads on federal lands (UDWRe 2020).

Table 3.4-3 Southern Alternative LPP Right-of-Way Summary

Land Ownership/Management	Permanent ROW (acres)			Short Term or Temporary Construction Easement, ROW, or Permit ^(a) (acres)	Total ROW (acres)
	Pipeline ^(a)	Transmission Lines ^(a)	Pumping, Hydro, and Road Facilities ^(b)		
BLM	876	533	68	649	2,127
NPS	126	55	20	79	280
Reclamation	1	8	27	0	36
Tribe	302	375	11	186	874
State	382	95	42	565	1,083
Total	1,687	1,067	168	1,479	4,401

Source: UDWRe 2020

Notes:

(a) Disturbed ROW would be restored.

(b) Disturbed ROW would not be restored due to permanent aboveground facilities.

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = right-of-way

Tribe = Kaibab Band of Paiute Indians

The Southern Alternative would have permanent, adverse effects on 5 acres of prime farmland and temporary adverse effects on 393 acres of prime farmland, as designated by the Natural Resources Conservation Service (NRCS) (see LPP Final Study Report 6 – Land Use Plans and Conflicts [UBWR 2016]). Construction, operation, and maintenance would require converting approximately 5 acres of designated prime farmland soil to industrial use for one proposed permanent facility (HS-2) and new road access. The temporary adverse effects would be a result of the construction of the pipeline and transmission lines. However, due to the aforementioned EPMS, adverse effects would be temporary, with construction timed to minimize interruptions to farming production.

The Southern Alternative would have a temporary, direct, adverse effect on 33 acres of floodplains at pipeline crossings during LPP construction (UBWR 2016). The Proposed Project would have adverse effects on vegetation and habitat at each of the floodplains crossed, but disturbed vegetation in floodplains and riparian areas would be restored and the floodway would remain unrestricted.

Use within the Development and Recreation and Resource Utilization zones, as identified in the 1979 Glen Canyon General Management Plan are consistent with the management objectives of those zones. Use within utility corridors would conform with the established management plan for those areas and therefore have no effect on land use.

There would be intermittent disruption of grazing activities depending on the location of the crossing with respect to the specific allotment. Adverse effects on grazing land would also result from converting grazing land use to aboveground, permanent features of the Southern Alternative. The Southern Alternative would cross approximately 3,716 acres of grazing land, of which 2,171 acres are managed by federal agencies. See Table 3.4-4, below. This includes 17 grazing allotments in Arizona and 15 in Utah, all administered by the BLM. Due to construction of permanent, aboveground features, the Proposed Project would permanently remove vegetation from 112.7 acres of grazing land, 77.2 acres of which are under federal management (UDWRe 2020).

Table 3.4-4 Southern Alternative-Grazing Effects (in acres)

Owner/Manager	Temporary Effects	Permanent Effects	Total Acres
BLM	1,903.8	59.8	1,964
Reclamation	7.9	0.1	8
NPS	181.8	17.3	199
State	755.4	8.5	639
Tribe	0	0	0
Private	754.4	27	776
Total	3,603.3	112.7	3,716

Source: UDWRe 2020

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

The areas temporarily disturbed by construction would be devoid of vegetation for a minimum of one growing season during revegetation and restoration activities. Depending on the amount of additional water provided during the restoration period, much of the vegetation, especially grasses, is expected to return within five years, although several species of plants would take longer, resulting in a short-term adverse effect. There would be temporary, effects during construction. As some disruption of grazing activities would occur, the UBWR would coordinate with all grazing permittees and landowners prior to construction to identify potential concerns that would minimize effects on grazing activities.

Resource Management Plan Amendments

All three sub-alternatives would resolve RMP management decision inconsistencies between the ACEC and the utility corridor, making this project and future projects in conformance with the RMP, thereby causing a beneficial effect on land use.

RMPA Sub-alternative 1

Utility Corridor and Land Use Authorizations within the ACEC

Decision No. MA-LR-06 would be amended so that the ACEC would no longer be an avoidance area for land use authorizations. The effects of the RMPJA on land use would be that it allows the LPP and potential future land uses to be located within the utility corridor in the ACEC, even when a reasonable alternative exists.

Livestock Grazing

The proposed amendments to Decision Nos. MA-LR-06 and LA-VR-01 would not change the current restriction on new corrals or water developments for management of livestock grazing within the ACEC. This alternative would therefore not affect livestock grazing management in the RMPA planning area.

RMPA Sub-alternative 2

Utility Corridor and Land Use Authorizations within the ACEC

Decision No. MA-AC-11 (stating that only temporary upgrading of existing roads could occur) and Decision No. MA-AC-12 (stating that “New roads will be authorized on a temporary basis only or when beneficial for relevant resources”) would no longer apply to lands excluded from the ACEC. Upgrading of existing roads, and construction of new roads, could therefore be authorized on any lands removed from the ACEC (905 acres), subject to site-specific environmental review and analysis, providing additional opportunities for access to these federal lands for management of land use authorizations. While this alternative would not change the boundary of the designated utility corridor, the provision for mitigation for new land use authorizations would no longer apply to the area excluded from the ACEC. Thus, the potential for new land use authorizations could increase.

Livestock Grazing

Decision No. MA-AC-04(KC) (stating that “No new corrals or water developments will be authorized or constructed within the ACEC boundary”) would no longer apply to lands excluded from the ACEC. These types of range developments could therefore be authorized and constructed, subject to site-specific environmental review and analysis, on any lands removed from the ACEC (905 acres), providing additional management options for livestock grazing operations.

RMPA Sub-alternative 3

Utility Corridor and Land Use Authorizations within the ACEC

RMPA Sub-alternative 3 would include the amendment of Decision No. MA-LR-06 as outlined in RMPA Sub-alternative 1, so the potential for additional land use authorizations could increase, as described for RMPA Sub-alternative 1. Additionally, moving the corridor northward would allow LPP and potentially other projects to cross Kanab Creek at an easier point, potentially increasing the opportunities for future land use authorizations. However, the utility corridor would decrease by 175.5 acres as compared to RMPA Sub-alternative 1, so opportunities for new land use authorizations would be reduced due to the change in land designation (e.g., smaller utility corridor). RMPA Sub-alternative 3 would not change the boundary of the ACEC and would not change any other RMP decisions related to the management of land use authorizations.

Livestock Grazing

The effects would be the same as those described for RMPA Sub-alternative 1 because no change to the boundary of the ACEC would occur, and no RMP decisions that affect livestock grazing management would be amended.

All three sub-alternatives would resolve RMP management decision inconsistencies between the ACEC and the utility corridor, making this project and future projects in conformance with the RMP, thereby causing a beneficial effect on land use. Additional analysis on the ACEC can be found in Section 3.5, Special Designations.

Mitigation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of land use resources.

To reduce effects on livestock grazing operations, the following mitigation measures could be implemented as part of the Southern Alternative: (1) relocating Staging Area 2 to the site of an inactive mineral material pit to ensure livestock would not enter the road due to removal of a fence; and (2) relocating Staging Area 3 to just south of the proposed location, on the other side of a small two-track dirt road, which would eliminate conflicts with a livestock watering facility.

Potential conversion of farmland to non-agricultural use would be mitigated through the Farmland Protection Policy Act; specifically, the use of the U.S. Department of Agriculture's AD 1006, Farmland Impact Rating Form.

3.4.2.3 Highway Alternative

Land ownership/management would be adversely affected by construction and operation of the Highway Alternative in similar ways as the Southern Alternative. All pipeline facilities except for BPS-4 and HS-2 would be located on federal lands, requiring ROW approvals from the applicable land management agency prior to construction and operation. As in the Southern Alternative, the permanent ROWs for the pipeline would mostly be 100 feet wide, with 25 feet on either side as temporary construction easement. The Proposed Project would affect a total of 1,832 acres of federal lands, of which 115 acres would be a permanent adverse effect and 1,717 acres would be a temporary adverse effect. Table 3.4-5 below shows the acres by land ownership/management (UDWRe 2020).

Table 3.4-5 Highway Alternative LPP Right-of-Way Summary

Land Ownership/Management	Permanent ROW (acres)			Short Term or Temporary Construction Easement, ROW, or Permit ^(a) (acres)	Total ROW (acres)
	Pipeline ^(a)	Transmission Lines ^(a)	Pumping, Hydro, and Road Facilities ^(b)		
BLM	524	529	68	395	1,516
NPS	126	55	20	79	280
Reclamation	1	8	27	0	36
Tribe	140	0	0	99	239
State	242	375	11	161	790
Private	492	93	44	571	1,201
Total	1,526	1,060	170	1,305	4,062

Source: UDWRe 2020

Notes:

(a) Disturbed ROW would be restored.

(b) Disturbed ROW would not be restored due to permanent aboveground facilities

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = right-of-way

Tribe = Kaibab Band of Paiute Indians

The Highway Alternative would cross the KIR and would therefore require an Outgrant from the Tribe. Similar to federal land-managing agencies, the consent of the Tribe is at its discretion and could be subject to terms and conditions that the BIA would incorporate into the ROW grant. The Tribe would be able to minimize effects on the lands through these terms and conditions. Tribal consent could be negotiated between the Tribe and the Project Proponent should the Highway Alternative be chosen in the Record of Decision. At this time there is no agreement between the Project Proponent and the Tribe to cross the KIR.

The Highway Alternative would have permanent, adverse effects on 5 acres of prime farmland and temporary adverse effects on 276 acres of prime farmland, as designated by the NRCS (UBWR 2016).

The Highway Alternative is proposed to parallel a waterway (Lost Spring Wash), thus potentially affecting the floodplain for an extended length of the stream (see LPP Final Study Report 6 – Land Use Plans and Conflicts [UBWR 2016]). However, the alignment is located outside of the floodplain to avoid disturbance of existing floodplain functions. Otherwise, the effects on floodplains under the Highway Alternative would be the same as those described for the Southern Alternative.

Table 3.4-6 shows total acreage of grazing allotments, or potential grazing lands. Not all of these allotments have grazing leases.

Table 3.4-6 Highway Alternative-Grazing Effects (in acres)

Owner	Temporary Effects	Permanent Effects	Total Acres Affected
BLM	1,281.5	59.8	1,341.3
Reclamation	7.9	0.1	8
NPS	181.8	17.3	199.1
Tribe	239	0	239
State	621.6	8.2	629.8
Private	630.6	29.6	660.2
Total	2,962.4	115	3,077.4

Source: UDWRe 2020

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = right-of-way

Tribe = Kaibab Band of Paiute Indians

Similar to the Southern Alternative, there would be intermittent disruption of grazing activities depending on the location of the crossing with respect to the specific allotment. Permanent adverse effects on grazing land would also result from converting grazing land use to aboveground, permanent features of the Highway Alternative. The Highway Alternative would cross approximately 3,077.4 acres of grazing land, 1,548.4 of which is managed by federal agencies (UDWRe 2020), including seven grazing allotments in Arizona and 15 in Utah, all administered by the BLM. This alternative would also cross 12 allotments and 239 acres of grazing lands managed by the Tribe. Due to construction of permanent, above-ground features, the Proposed Project would permanently remove vegetation from 115 acres of grazing land, of which 77.2 acres are managed by federal agencies. The land that would be permanently affected by the Proposed Project is about 3.7 percent of the total affected lands under this alternative. Otherwise, the effects on grazing lands under the Highway Alternative would be the same as those described for the Southern Alternative.

Under the Highway Alternative, no RMPA would be required. All other effects would be the same as the Southern Alternative.

Mitigation Measures

Mitigation to potential farmland conversion would be the same as the Southern Alternative. No mitigation would be required for staging area under this alternative.

3.4.2.4 Comparative Analysis of Alternatives

Under the No Action Alternative, land use would be the same as under the existing conditions. No amendment to the RMP would be required. Existing ROWs and grazing leases would continue without any disturbance from the Proposed Project.

However, under this alternative, projects already planned by the Project Proponent would continue to occur. Disturbance, due to these projects, would vary in space and time. Most effects would be short-term and project-specific, including effects to existing land use (e.g., grazing, prime farmland, floodplains). Most effects to land use would be minimized through implementation of standard industry practices by the Project Proponent and coordination with landowners and land-managing agencies.

A comparison of the two action alternatives shows similar effects between the two. As shown in Table 3.4-7, below, the Southern Alternative would affect an additional 339 acres, but the permanent effects, not restorable due to aboveground construction of facilities and roads is the same between the two alternatives: 115 acres. Compared to the overall total acres, these permanent effects account for 2.6 percent of the overall land totals affected on the Southern Alternative and 2.8 percent on the Highway Alternative.

Table 3.4-7 Comparison of Total ROW

Land Ownership/Management	Southern Alternative Total ROW (acres)	Highway Alternative Total ROW (acres)
BLM	2,127	1,516
NPS	280	280
Reclamation	36	36
Tribe	0	239
State	874	790
Private	1,083	1,201
Total	4,401	4,062

Source: UDWRe 2020

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = right-of-way

Tribe = Kaibab Band of Paiute Indians

Effects on farmland, floodplains, existing ROWs, utility corridors and GCNRA are likewise similar between the action alternatives, short-term to temporary in duration, account for small percentages of the total effect, and minimized by planning and EPMs.

As shown below in Table 3.4-8, the Southern Alternative affects about 640 acres more land than the Highway Alternative. However, including the Tribe's grazing, the two action alternatives have almost the same number of allotments (32 and 34, respectively) and the same number of permanent acres of lost grazing lands: 115 acres. Again, this accounts for 3.1 percent of the total lands on the Southern Alternative and 3.7 percent of the Highway Alternative totals.

Table 3.4-8 Total Grazing Effects (in acres)

Land Manager/Owner	Total Grazing Effects (in acres)	
	Southern Alternative	Highway Alternative
BLM	1,963.6	1,341.3
NPS	199.1	199.1
Reclamation	7.9	7.9
Tribe	0.0	239.0
State	763.9	629.8
Private	781.4	660.2
Total	3,715.9	3,077.3

Source: UDWRe 2020

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = right-of-way

Tribe = Kaibab Band of Paiute Indians

The Southern Alternative would cross the ACEC, but the land use effects would be negligible. The Highway Alternative would cross the KIR, resulting in temporary adverse effects on 239 acres and 12 grazing allotments. These effects would be minimized by the EPMS and coordination between the Project Proponent and the landowner/managing agency or Tribe.

3.5 Special Designations

3.5.1 Affected Environment

3.5.1.1 Regulatory Framework Methodology

Kanab Creek Area of Critical Environmental Concern: FLPMA provides for areas of critical environmental concern designation and establishes national policy for the protection of public land areas where special management attention is needed to protect important historic, cultural, and scenic values, or habitat for endangered, sensitive, or threatened species. Section 202(c)(3) of FLPMA mandates the agency to give priority to the designation and protection of areas of critical environmental concern in the development and revision of land use plans, while the BLM's planning regulations (43 CFR 1610.7-2) and policy (BLM Manual 1613 – Areas of Critical Environmental Concern) establish the process and procedural requirements for areas of critical environmental concern designations. The designation of areas of critical environmental concern is achieved only through the resource management planning, either in the pertinent resource management plan itself or through a plan amendment—areas having potential for areas of critical environmental concern designation and protective management are identified and considered through the resource management planning process using the best available information and extensive public involvement (see 43 CFR 1610.4-1 through 1610.4-9).

The areas of critical environmental concern designation indicates to the public that the BLM recognizes that an area has significant values and has established special management measures to protect those values. In addition, this designation also serves as a reminder that significant values or resources exist that must be accommodated when future management actions and land use proposals are considered near or within an area of critical environmental concern. Designation may also support a funding priority. The BLM recognizes that areas of critical environmental concern have significant values and establishes special management measures to protect and prevent irreparable damage to those values. “Special management attention” refers to management prescriptions developed during preparation of a resource management plan expressly to protect the relevant and important values of an area from the potential effects of actions permitted by the resource management plan. These are management actions that would not be necessary if the relevant and important values were not present—the designation is a reminder that significant values exist that must be accommodated when future management actions and land use proposals are considered within the area of critical environmental concern.

Effects to the ACEC involve the proposed RMPA Sub-alternatives, and the related change in size and management of the ACEC. Specific effects to the resources for which this ACEC was designated (southwestern willow flycatcher habitat, riparian resources, scenic resources, and cultural resources) are discussed under those specific resource sections in this DEIS.

Cockscomb Wilderness Study Area: The BLM manages WSAs consistent with BLM Manual 6330, which states: “The BLM’s management policy is ... to continue resource uses on lands designated as WSAs in a manner that maintains the area’s suitability for preservation as wilderness. The BLM’s policy will protect the wilderness characteristics of all WSAs in the same or better condition than they were on October 21, 1976 (or for Section 202 WSAs not reported to Congress, the date the WSA was designated), until Congress determines whether or not they should be designated as wilderness.” Additionally, “[f]or actions that are proposed on public lands adjacent to a WSA the NEPA document for the proposed action should consider impacts on the WSA.” The Cockscomb WSA is adjacent to the Project Area, so effects on that WSA are considered in this DEIS.

Paria River: Although several river segments are located in the vicinity of the Proposed Project that were found eligible for congressional designation under the Wild and Scenic Rivers Act, none of these rivers and river segments have been formally designated by the Wild and Scenic Rivers Council as of this writing. The Paria River is the only river deemed by the BLM to be suitable for designation as a wild and scenic river that is within the analysis area for the LPP. Until Congress acts to designate or release from further consideration rivers determined to be eligible and suitable, the rivers’ free-flowing condition, identified tentative classification, and outstandingly remarkable values are to be preserved. However, the portion of the Paria River overlapped by the Project Area is within a designated utility corridor, where avoidance of ROWs for wild and scenic rivers is not applicable (Public Law 90-542; 16 USC 1271 et seq.). The ROD for the Kanab-Escalante Planning Area Resource Management Plan states that all suitable river corridors “will be ... managed to avoid ROWs (including communication sites) except in designated utility corridors” (also RMP Decision No. WSR-5, from BLM 2020).

Old Spanish National Historic Trail: The National Historic Trails System was created in 1968 by the National Trails System Act (16 USC) was established to identify and protect historic routes and their remnants for public use and enjoyment. These are extended trails that follow as closely as possible original routes of travel that are of national historical significance. Public Law 107-325 was signed on December 4, 2002, and amended the National Trails System Act to designate the Old Spanish Trail as a National Historic Trail. By memorandum from the Secretary of the Interior, the Old Spanish National Historic Trail is jointly administered by the BLM and the NPS, working in partnership with other federal, state, and local government agencies, as well as private landowners who manage or own lands along the trail route.

The legislation authorizing the Old Spanish National Historic Trail requires protection of the resources and values of the trail. Section 5(f) of the National Trails System Act requires the development of a comprehensive plan for all designated trails. The BLM and NPS jointly prepared the Comprehensive Administrative Strategy for the Old Spanish National Trail (BLM and NPS 2017), which establishes the protocols, processes, and management guidelines necessary to fulfill the preservation and public use goals established by Congress in the National Trails System Act. This strategy does not change existing land use planning decisions for the trail corridor.

BLM Manual 6280 establishes the agency's policies for managing National Trails and trails under study for National Trail designation, and it provides direction for identifying and evaluating effects on "the nature and purposes of the trail, trail resources, qualities, values, uses (including public access and enjoyment) and associated settings" (BLM 2012). The trail would be crossed by the LPP in the Kanab-Escalante Planning Area and the Arizona Strip Field Office. The geographic scope for the area of analysis uses the Congressionally designated alignment for the trail as a starting point to determine the most probable avenue(s) of travel and extent of scenic resources. To evaluate potential effects and visibility of the LPP from the trail, an analysis area of up to 5 miles was used for the high potential segments, including the Box of the Paria High-Potential Segment and the Pipe Spring National Monument High Potential Site. However, the area in which management actions/mitigation would be implemented was determined to be 0.5 miles on either side of the centerline of the Box of the Paria High-Potential Segment and up to 5.0 miles from the Pipe Spring National Monument High-Potential Site (since the larger landscape, particularly that viewed by the visitor to Pipe Spring National Monument looking south, west, and east remains largely unchanged from the historic period of significance). Adverse effects are those that would interfere with the nature and purpose of the trail or result in an intact trail segment or associated resource losing the integrity it now possesses for inclusion in the National Register of Historic Places (NRHP).

Pipe Spring National Monument: Pipe Spring National Monument was established by Presidential Proclamation on May 31, 1923. The monument was primarily set aside because of the natural springs that flow out of the Sevier Fault at this location and for the sandstone fort known as Winsor Castle. The significance of Pipe Spring National Monument "lies in its preservation of an early Mormon settlement site and its commemoration of an important segment of the history of American westward migration" (NPS 1987). Pipe Spring National Monument was administratively listed on the NRHP in 1966 and is classified as an historic zone. As a result, Advisory Council clearance is required under Section 106 of the NHPA before any kind of development can be initiated within the monument. In 1987, a Statement for Management of the monument was prepared, to "[provide] a format for evaluating conditions and identifying major issues and information voids." One important part of the monument is the quality of the air, and the view across the Arizona Strip.

3.5.1.2 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

There are no EPMs proposed specifically for management of special designations. However, the applicant's EPMs identified in Appendix B of the POD were considered when assessing initial and residual effects on special designations (the ACEC, Cockscomb WSA, Paria River, Old Spanish National Historic Trail, and PSNM) (see Appendix E, Plan of Development). EPMs for other resources would provide benefits to special designations such as those identified for restoration, biological resources, cultural resources, air quality, and visual resources.

3.5.1.3 Existing Conditions

Kanab Creek Area of Environmental Concern: To be designated as an area of critical environmental concern, an area must require special management attention to protect the important and relevant values. The ACEC was designated for its cultural, endangered bird species, riparian and scenic values, which are as follows:

- **Cultural** – Significant regionally important cultural resources are vulnerable to vandalism and effects.
- **Endangered Bird Species and Riparian Values** – The riparian area is a natural system that includes rare, endemic plant communities and suitable unoccupied habitat for endangered southwestern willow flycatcher and has regional significance. The riparian area is fragile, irreplaceable, and unique and is vulnerable to adverse change. Causes for concern include dewatering, loss of habitat due to development, soil erosion, sedimentation, flooding, and alteration of the stream channel.
- **Scenery** – The canyon depths, intricacies, and colors of Kanab Creek provide high scenic quality.

The RMP includes special management prescriptions that provide additional protection to the values listed above. See Table 2.15 in the RMP (BLM 2008) for the complete suite of applicable management prescriptions.

Cockscomb WSA: The Cockscomb WSA is approximately 40 miles east of Kanab, Utah, and covers 10,827 acres. This WSA was recommended for wilderness designation in the October 1991 Wilderness Report to Congress. The WSA possesses naturalness, outstanding opportunities for solitude, outstanding opportunities for primitive and unconfined recreation, as well as an impressive geologic formation, a sandstone ridge known as the Cockscomb, which is a supplemental value. Wilderness characteristics vary across the WSA. Sightseeing, cultural site investigation, photography, nature study, day hiking, outdoor artwork, bird watching, and other pursuits are possible recreation endeavors within this WSA.

Paria River: The Paria River is the only river determined by the BLM to be suitable for designation as a wild and scenic river that is within the analysis area for the Proposed Project. The Paria River, in the vicinity of the Project Area, flows south through private land at the U.S. Highway 89 crossing to the Arizona State line. The segment outside of wilderness (which is the segment crossed by the LPP) was tentatively classified as recreational. The outstandingly remarkable values of this segment are high quality scenery, recreational attraction, exposed geologic strata and arches, and historic sites (BLM 2019). While the actual LPP crossing of the Paria River would be on private land, the river study corridor is 0.25 mile of land from the ordinary high water mark on each side of the river, so part of the study corridor is on BLM-managed land. This portion of the Paria River corridor within the LPP analysis area has substantial existing development – there are large gravel pits and several private residences/buildings on the adjacent private lands, and the highway runs directly across this segment. In addition, the LPP alignment would be within a utility corridor (designated by Congress in 1998, pursuant to Section 202 of Public Law 105-355), so avoidance of ROWs for wild and scenic rivers is not applicable (Public Law 90-542; 16 USC 1271 et seq.; BLM 2020).

Old Spanish National Historic Trail: The Old Spanish Trail was primarily a mule- and horse-pack trade route between the Mexican frontier outposts of Santa Fe, New Mexico, and Mission San Gabriel, California, between 1829 and 1848. The trail routes resembled stock driveways more than well-worn trails and connected water and forage, and no single set of tracks developed along the route. The routes ultimately came to be known as the “Old Spanish Trail.” Although few traces of the trail routes have survived, the landscapes through which the pack mule trains and New Mexico traders passed remain. The trail is believed to follow the U.S. Highway 89 corridor through Utah and generally follow the SR-389 corridor across the Arizona Strip. It was designated by Congress as a National Historic Trail in December 2002.

Recreational opportunities along the trail include camping, hiking, landscape photography, and wildlife viewing. The trail passes through the Box of the Paria, which is one of the more popular hikes in the Kanab-Escalante Planning Area. Many points of historical or cultural interest can be found along the trail as well. The trail does not currently have any visitor facilities or services, except at Pipe Spring National Monument, which encompasses the Pipe Spring National Monument High-Potential Site of the trail (see below for information on the national monument).

Historic Character: The entirety of the trail within the Project Area is along the Armijo (or Southern) Route of the Old Spanish National Historic Trail. The LPP is associated with the trail both inside and outside of the Box of the Paria High Potential Route Segment, and the Pipe Spring National Monument High Potential Site. The top resources, qualities and values that were identified in the inventory for the entirety of the trail in this area are the integrity of the setting and the scenery. Opportunities for recreation were also identified. No cultural artifacts or trail trace from the period of significance were identified, but general route location was verified.

Antonio Armijo traversed the Old Spanish Trail in 1828 and kept a brief journal; thus this route is the only portion of the Old Spanish Trail for which there are descriptions (albeit terse and cryptic ones) from the period of significance. Archaeological survey verified trail location based on the assumption that Armijo used pre-existing trails which likely continued to be used after his 1828 journey. The archeological survey conducted in 2010 recorded inscriptions along the trail route, all of which post-date the Old Spanish Trail period of significance, but which may be historic.

Existing Condition: The Box of the Paria High Potential Route Segment is 12.7 miles, all of which is on BLM-managed land in Utah. The trail route today is typified by land that has been reclaimed by the river, erosion, and vegetation; no traces of the trail (e.g., ruts) were positively identified by pedestrian archeological survey as being from the period of significance for the Old Spanish Trail. At the western mouth of the Box, the Paria town site is evident at the base of the cliffs. The analysis unit continues west from this point, through the low area between Calico Peak and the Cockscomb.

Non-contributing and non-compatible with historic setting character: The most noticeable non-historic features in the historic setting of this analysis unit are the existing transmission line and U.S. Highway 89.

Non-contributing but compatible with historic setting character: The Paria town site and associated movie set elements are not from the period of significance but may be considered historic in their own right. They do not intrude on the historic setting.

Integrity assessment: The Box of the Paria analysis unit's historic setting retains integrity.

Pipe Spring National Monument: Pipe Spring National Monument served as a water oasis for American Indians and Mormon ranchers, and includes historic forts, gardens, and a ridge trail. This isolated outpost served as a way station for people traveling across the Arizona Strip, including Antonio Armijo when he established the Armijo Route of the Old Spanish Trail in 1829. In 1923 the Pipe Spring ranch was purchased and set aside as a national monument (National Park Foundation 2020). Pipe Spring was listed on the NRHP on October 15, 1966, and the boundary of the Pipe Spring National Monument Historic District (a portion of the monument) was expanded in October 2000. This national monument also contains the Pipe Spring National Monument High Potential Site of the Old Spanish National Historic Trail. An important part of the monument is the view south across the Arizona Strip.

3.5.2 Environmental Consequences

The effects of the LPP alternatives on special designations are described as temporary (up to one year during construction and restoration), short-term (one to five years), and long-term (more than five years). Potential effects of the LPP on the identified special designations may be adverse (negative) or beneficial (positive). In addition, effects on special designations may be direct or indirect. Direct effects alter the resources for which the special designations were established, while indirect effects affect the setting of the special designations.

3.5.2.1 No Action Alternative

Kanab Creek Area of Critical Environmental Concern: This alternative would have no effect on the ACEC. No pipeline or associated infrastructure would be constructed, so current management of the resources for which the ACEC was designated, as prescribed in the RMP, would continue, as the RMP would not be amended.

Cockscomb WSA: This alternative would have no effect on the Cockscomb WSA. No pipeline or associated infrastructure would be constructed. No activities would be authorized that would affect the WSA's wilderness characteristics of naturalness, outstanding opportunities for solitude,

outstanding opportunities for primitive and unconfined recreation, or the Cockscomb geologic formation.

Paria River: This alternative would have no effect on the Paria River. No pipeline or associated infrastructure would be constructed. No activities would be authorized that would affect the river's free-flowing condition, tentative recreational classification, and outstandingly remarkable values.

Old Spanish National Historic Trail: This alternative would have no effect on the Old Spanish National Historic Trail. No changes to any trail segments or associated resources (including historic sites and scenic values related to historical resources) would occur. No activities would occur that would affect the nature and purpose of the trail or result in the trail losing the integrity it now possesses for inclusion in the NRHP.

Pipe Spring National Monument: This alternative would have no effect on Pipe Spring National Monument. No pipeline or associated infrastructure would be constructed. No activities would occur that would result in changes to the visual landscape or views across the Arizona Strip. The scenery, the natural and historic objects, and the wildlife therein for which the monument was established, would be unaffected by the LPP.

3.5.2.2 Southern Alternative

Kanab Creek Area of Critical Environmental Concern: The Southern Alternative would amend the RMP in order to allow for authorization of the LPP. While amending the RMP would not directly involve ground disturbance or development, these actions could allow for the construction, operation, and maintenance of the LPP and potentially other utility lines. Future development proposals would be analyzed under project specific NEPA analysis. Amending the RMP could also allow for additional ground-disturbing activities other than utility ROWs, since management direction for the area would change due to reducing the size of the ACEC or changing the configuration of the utility corridor. Amending the RMP could affect salable, locatable, and leasable mineral resources, livestock grazing management, land use, and other resources. Changing the VRM classifications would affect the management of visual resources within the area. These effects, as well as potential effects from the three RMPA sub-alternatives on the resource values for which the ACEC was designated, are discussed under the corresponding sections in this DEIS.

Resource Management Plan Amendment Sub-alternatives

RMPA Sub-alternative 1

No changes to the size of the ACEC or the utility corridor are proposed. RMPA Sub-alternative 1 would remove the prohibition on new land use authorizations in the ACEC if no other reasonable alternative exists. While mitigation to address impacts to sensitive resources would be required for new land use authorizations, there would be an increased likelihood of adverse effects to ACEC values from these authorizations. This sub-alternative also clarifies that the VRM Class for the utility corridor is IV in the ACEC, which allows major modifications to the landscape and could have an adverse effect on the ACEC visual values as described in the visual resources section.

RMPA Sub-alternative 2

Under RMPA Sub-alternative 2, the ACEC would be reduced by 905 acres, but no changes to management of the amended ACEC area would occur. For lands no longer within the ACEC, the following changes to management would occur:

- Salable minerals would become available;
- Special mitigation for leasable mineral exploration and development would no longer be required;
- The area would no longer be an avoidance area for new land use authorizations;
- Upgrading of existing roads, and construction of new roads, could be authorized; and
- New corrals and water developments (for management of livestock grazing) could be authorized and constructed.

Without the protective ACEC management prescriptions on the lands removed from the ACEC, there would greater potential for adverse impacts to the sensitive resources found on these lands.

RMPA Sub-alternative 3

Effects to the ACEC under RMPA Sub-alternative 3 would be similar to those described for RMPA Sub-alternative 1. However, in addition, the portion of the ACEC overlapped by the utility corridor would no longer be an avoidance area for land use authorizations, which could adversely affect ACEC values. This sub-alternative would result in a net decrease of 175.5 acres within the ACEC that is overlapped by the utility corridor (no change in the size of the ACEC would occur). Thus, these lands would no longer be identified as an area where new ROWs are encouraged. Adjusting the corridor northward decreases the area of overlap between the corridor and the ACEC, which could potentially affect the values of the ACEC, thereby having a beneficial effect on the ACEC.

Cockscomb WSA: The pipeline, BPS-3, and BPS-4 would have temporary direct and indirect effects on visitors to the Cockscomb WSA during construction of these features. Direct effects would result from pipeline construction blocking established access (via Cottonwood Canyon Road) to this WSA from U.S. Highway 89. Indirect effects would result from visual changes, air pollutants, noise, and additional LPP construction traffic. Noise generated during construction activities would decay to below baseline levels within 0.6 mile from the construction activities (see Appendix C-3, Noise and Vibration) and would disrupt recreational experiences of users in the south and west portions of the WSA. Air pollutants would mostly disperse to below National Ambient Air Quality Standards (NAAQS) concentrations within the ROW corridor. Visitors to the WSA may temporarily detect nitrogen dioxide from construction equipment emissions under worst-case conditions. Construction activities would therefore temporarily affect opportunities for solitude and outstanding opportunities for primitive and unconfined recreation. Following construction and restoration, LPP operations would have no direct effects on visitors to the Cockscomb WSA. However, visitors to the WSA could experience indirect effects from viewing BPS-3 and BPS-4 facilities, if recreating on the edges of the WSA where these facilities would be visible.

Paria River: The Paria River corridor within the LPP analysis area already has substantial existing development. There are large gravel pits on the adjacent private lands, the highway runs directly across this segment, and several private residences/buildings are located south of the highway. The segment is tentatively classified as recreational, and the applicable resource management plan (the Kanab-Escalante Planning Area Resource Management Plan) states that wild and scenic river corridors will not be managed as ROW avoidance within designated utility corridors. While there

may be some short-term effects to the Paria River's values during construction activities, these effects would be relatively unnoticeable due to the existing development in the area. Long-term effects are also likely to be unnoticeable due to Project Area restoration and the existing development in the area.

Old Spanish National Historic Trail: The pipeline alignment and associated appurtenances would run parallel to and cross the Old Spanish National Historic Trail and associated high potential segments and sites and would be located within the viewshed of the Trail. Approximately 1.0 mile of the trail would be within the ROW areas, and the LPP would cross the trail six times under this alternative. Construction-related activities would result in increased dust, noise, visible land and vegetation disturbance, and presence of construction-related equipment within the viewshed of the trail, and may temporarily prevent access to portions of the trail that would affect recreational opportunities of the trail, although temporary bypass trails would provide access to the trail during this period. The placement of facilities and appurtenances, and the presence of access routes that would remain throughout pipeline operations, would result in long-term effects to the historic character, historic setting, scenery, and recreational opportunities of the Box of the Paria High Potential Segment, and long-term effects to the historic character, historic setting, scenery, and recreational opportunities of the Pipe Spring High Potential Site. For the pipeline alignment, effects would be short-term until revegetation and restoration are successful, which would minimize the view of the pipeline corridor, so the nature and purpose of the trail would be preserved. Direct effects related to the Old Spanish National Historic Trail viewshed are analyzed in Section 3.16, Visual Resources, and in Appendix C-19, Visual Resources.

The HSs, including HS-2 South and HS-3, would have short-term, direct, and indirect effects on recreational users of the trail during construction. Short-term direct effects would occur on recreational users as the pipeline construction crosses the trail. Short-term indirect effects would occur due to increased dust, noise, creation of a visual landscape disturbance, and presence of construction-related equipment within the viewshed of the trail. Following construction and restoration, LPP operations would have no direct effects on recreational users of the trail. These operations would not interfere with access to, or use of, the historic trail. However, users would experience indirect effects as they view HS-2 South and HS-3.

Pipe Spring National Monument: The LPP alignment would be approximately 4 miles from Pipe Spring National Monument, and would therefore not directly affect lands or resources within the monument boundary. From that distance, views of the project components from the monument would not be visually evident, with no apparent change to the setting. While fugitive dust generated from construction activities would temporarily affect visibility/views across the area, most air pollutants would disperse to below NAAQS concentrations within the ROW corridor. Following construction and restoration, LPP operations would have no direct effect on Pipe Spring National Monument. Indirect effects could occur if maintenance activities require ground disturbance (that generate fugitive dust), but this would be a rare occurrence.

Mitigation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of special designation resources. The following mitigation measures would be implemented as part of the Southern Alternative to reduce effects to Special Designations:

- The construction methods for each crossing would ultimately be determined in coordination between the UBWR and the applicable jurisdictional agency during final design stages.
- Revegetation efforts within 0.5 miles on either side of the centerline of the Old Spanish National Historic Trail, or 5.0 miles of the Pipe Spring National Monument High Potential Site, should adequately match the adjacent vegetation communities and landscape to minimize the visual landscape disturbance resulting from construction-related activities. In accordance with the National Trails System Act, trail administrators shall be consulted during the design of pipeline appurtenances and infrastructure viewable from the Old Spanish National Historic Trail to minimize effects to the viewscape and historic feeling/setting and to preserve to a high degree the integrity of location, design, feeling, and association with the historic period.

3.5.2.3 Highway Alternative

Kanab Creek Area of Critical Environmental Concern: Under the Highway Alternative, no pipeline or associated infrastructure would be constructed within the ACEC, so current management of the ACEC and the resources for which it was designated (habitat for the endangered southwestern willow flycatcher and riparian, scenic, and cultural resources) as prescribed in the RMP would continue. This alternative would therefore not result in effects to the ACEC, its relevant and important values, or its management.

Cockscomb WSA: Effects would be the same as those described for the Southern Alternative.

Paria River: Effects would be the same as those described for the Southern Alternative.

Old Spanish National Historic Trail: Under the Highway Alternative, effects to the Old Spanish National Historic Trail would be similar to those described for the Southern Alternative, except that more of the trail (4.2 miles, as compared to 1.0 mile for the Southern Alternative) would be within the LPP area of effect, an additional 6 miles are in close proximity to the LPP corridor (but outside the proposed ROW areas), and effects to the Pipe Spring National Monument High-Potential Site are much more likely to occur under the Highway Alternative since this site is immediately adjacent to the LPP corridor. The HS would have short-term, direct, and indirect effects on recreational users of the trail during construction of the pipeline as this construction crosses the trail, although temporary bypass trails would provide access to the trail during this period. The HS would have short-term, indirect visual, noise, and air pollution effects during construction. Noise generated during construction activities would attenuate to background levels within 800 feet of the pipeline alignment and facility sites and would disrupt recreational experiences of historic trail users. Air pollutants would mostly disperse to below NAAQS concentrations within the ROW corridor; recreational users along the trail may temporarily detect nitrogen dioxide from construction equipment emissions under worst-case conditions. Several dispersed access points for the historic trails would be temporarily affected by construction activities and traffic during construction. Direct effects related to the Old Spanish National Historic Trail viewshed are analyzed in Section 3.16, Visual Resources, and in Appendix C-19, Visual Resources.

Pipe Spring National Monument: The LPP alignment proposed under this alternative would be approximately one-quarter mile from Pipe Spring National Monument and would therefore not directly affect lands or resources within the monument boundary. However, views of the Proposed Project components from the monument would be visually evident. Although the LPP alignment would be alongside an existing paved two-lane highway, which would minimize changes to the setting, fugitive dust generated from construction activities would temporarily affect visibility/views across the Arizona Strip. Temporary indirect effects, including visual changes, air pollutants/dust, and noise, would be visible and audible from the monument trails and fort and would temporarily affect the historic setting. Indirect effects from construction noise would attenuate to background levels within about 0.6 miles of the sources along the pipeline alignment. Most air pollutants and dust would disperse to below NAAQS concentrations within the construction ROW. Windblown dust from the unconsolidated pipeline construction area would continue to affect local visibility until vegetation is sufficiently reestablished. In the short term, this would adversely affect local visibility and a visitor's feeling and association with the historic period from within the historic district. Direct effects related to the Old Spanish National Historic Trail viewshed are analyzed in Section 3.16, Visual Resources, and in Appendix C-19, Visual Resources.

Construction of the LPP would have temporary direct effects on access to the monument. Pipeline construction along SR-389 at the access road intersection would temporarily delay or disrupt access to and from the monument for a maximum of 8 hours during the construction of this crossing. A temporary bypass road would provide access, and the original access would be restored to pre-construction conditions by the end of the 8-hour duration. LPP operations would have long-term indirect effects on recreational users of the monument following construction and restoration as a result of the ROW access corridor, which would be visible from the monument and could affect the historic setting.

3.5.2.4 Comparative Analysis of Alternatives

Kanab Creek Area of Critical Environmental Concern: The No Action Alternative and Highway Alternative would have no effect on the ACEC. The Southern Alternative could allow for additional ground-disturbing activities to occur since management direction for the ACEC/utility corridor overlap area would change due to the RMPA, and (depending on RMPA sub-alternative chosen) the size of the ACEC or the utility corridor could change.

Cockscomb WSA: The No Action Alternative would have no effect on the WSA. The two action alternatives would have temporary direct and indirect effects on visitors to the Cockscomb WSA during construction of the LPP and associated features the pipeline, BPS-2 and BPS-4). Direct effects would result from pipeline construction blocking established access (via Cottonwood Canyon Road) to this WSA from U.S. Highway 89, although a temporary bypass road would provide access to the area. Indirect effects would result from visual changes, air pollutants, noise, and additional LPP construction traffic. Construction activities would temporarily affect opportunities for solitude and outstanding opportunities for primitive and unconfined recreation. Following construction and restoration, LPP operations would have no direct effects on visitors to the Cockscomb WSA, although visitors to the WSA could experience indirect effects from viewing BPS-3 and BPS-4 facilities, if recreating on the edges of the WSA where these facilities would be visible.

Paria River: The No Action Alternative would have no effect on the Paria River's outstandingly remarkable values. While there may be some short-term effects to the Paria River's values during construction activities from both of the action alternatives, these effects would be relatively unnoticeable due to the existing development in the area. Long-term effects are also likely to be unnoticeable due to Project Area restoration and the existing development in the area.

Old Spanish National Historic Trail: The No Action Alternative would have no effect on the trail. Under the two action alternatives, construction-related activities would result in increased dust, noise, creation of a visual land disturbance, and presence of construction-related equipment within the viewshed of the trail and may temporarily prevent access to portions of the trail that would affect recreational opportunities in some locations. These construction activities would result in short-term effects to the historic character, historic setting, scenery, and recreational opportunities of the trail. The placement of facilities and appurtenances, and the presence of access routes that would remain throughout pipeline operations, would result in long-term effects to the historic character, historic setting, scenery, and recreational opportunities of the Box of the Paria High Potential Segment.

Effects from the Highway Alternative would be similar to the Southern Alternative, except that more of the trail (4.2 miles, as compared to 1.0 mile for the Southern Alternative) would be within the LPP area of effect, an additional 6 miles are in close proximity to the LPP corridor (but outside the proposed ROW areas), and effects to the Pipe Spring National Monument High-Potential Site are much more likely to occur under the Highway Alternative since this site is immediately adjacent to the LPP corridor.

Pipe Spring National Monument: The No Action Alternative would have no effect on Pipe Spring National Monument. The two action alternatives would have local, temporary visibility effects from fugitive dust during construction, although this would be more noticeable for the Highway Alternative due to its closer proximity to the national monument.

3.6 Transportation

3.6.1 Affected Environment

This section describes the affected environment and potential effects on transportation resulting from the Proposed Project. For the purpose of this analysis, transportation resources include roadways used by motorized vehicles (e.g., cars and trucks). Supplemental information is included in Appendix C-8, Transportation.

3.6.1.1 Regulatory Framework and Methodology

Federal, state, and local agencies administer and regulate roadways and are responsible for maintenance and future additions, traffic management, and issuance of permits; they also govern the use of ROWs and construction activities that parallel or cross existing roads.

Potential effects on transportation resources as a result of the construction and operation and maintenance (O&M) of the Proposed Project would occur in areas where LPP facilities, including the pipeline and access roads, cross or would be located adjacent to existing transportation infrastructure. The evaluation of effects considers the following:

- Use of existing roadways and roadway ROW;
- Number and locations of roadway crossings and those in which the pipeline would parallel existing roads;
- Amount of traffic added (i.e., changes in Average Annual Daily Traffic [AADT]);
- Qualitative changes to the level of service (LOS);
- Total mileage of disturbance through the construction and operation of access roads;
- Conformance with existing transportation regulations, policies, and/or plans; and
- Measures taken to address public safety and traffic management.

The geographic scope of this analysis includes roads that would be crossed by or adjacent to the Proposed Project; access roads managed or owned by federal/state or other agencies; and private roads near the Proposed Project. The temporal scope accounts for the present and immediate future (i.e., less than 10 years).

3.6.1.2 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts (see Appendix E, Plan of Development). EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

EPMs for transportation include adherence to ROW grant/permit conditions; development of a construction traffic management plan; coordination (e.g., closures, signage, and directives); restoration of roads to pre-construction conditions; control of dust and debris; and vehicle cleaning and driving speeds. A full listing of EPMs that address transportation resources is provided in Section 1.3 of Appendix C-8, Transportation.

3.6.1.3 Existing Conditions

Existing infrastructure includes roads that would be crossed by or adjacent to the Proposed Project. Traffic is typical of rural areas, with higher traffic associated with seasonal levels of tourism. Federal/state roadway ROWs range in width from 100 to 400 feet (see LPP Final Study Report 14 – Transportation [UBWR 2016]). AADT for highway segments near the Proposed Project ranges from 850 to approximately 5,300 vehicles (ADOT 2018; UDOT 2016). LOS is generally LOS A or B for highway segments within the affected environment (see LPP Final Study Report 14 – Transportation [UBWR 2016]).

3.6.2 Environmental Consequences

This section describes the effects of the Proposed Project's No Action Alternative, Southern Alternative, and Highway Alternative on transportation resources.

3.6.2.1 No Action Alternative

No effects would occur to transportation resources as a result of the Proposed Project, because it would not be constructed. No roadway crossings or parallel locations would be needed; no additional traffic or increases to AADT or interruptions of traffic that may affect LOS would result from the Proposed Project. In addition, no access roads would be constructed. Under this alternative, no conformance issues would arise due to the lack of activity that would affect existing transportation regulations, policies, and/or plans. No public safety and traffic management issues would occur beyond those associated with the No Action Alternative.

However, under this alternative, projects already planned by the Project Proponent would still occur. Disturbance due to these projects would vary in space and time. Most impacts would be short term and project-specific, including roadway closures or delays. Most effects to transportation would be minimized through implementation of standard industry practices by the Project Proponent in future projects.

3.6.2.2 Southern Alternative

This section addresses the potential effects of the Southern Alternative during construction and O&M on transportation resources.

Use of Existing Roadways and ROWs

The approximately 141-mile Southern Alternative generally would parallel U.S. Highway 89 and Arizona State Highway 389. In portions of the Southern Alternative, the Proposed Project would be constructed outside of the running surface of the roads and within the established road ROW (UDWRe 2020). Approximately 77 miles of the pipeline would be within Department of Transportation, highway ROW, and/or within a designated utility corridor; among the 77 miles, approximately 46.1 would be located on BLM-managed lands and 7.2 on NPS-managed land. The remainder would be located on state or private lands (UBWR 2020a).

Ownership and Number of Crossings/Parallel Locations

The Southern Alternative would cross existing roadways 35 times, would cross/parallel existing roadways three times, and would parallel existing roadways five times. The highest number of crossings or locations in which the Proposed Project would parallel roads would be along roadways under the jurisdiction of Mohave County, Arizona. Six crossings or parallel locations would occur on those roadways under the jurisdiction of the BLM, as well as one location identified as being jointly under the jurisdiction of the BLM and Washington County, Utah. The Proposed Project would cross or parallel locations three times for roadways under the jurisdiction of the NPS (UBWR 2020b).

Anticipated Traffic Levels from Construction

Construction activities would increase AADT, as vehicles added to local traffic as a result of construction of the Southern Alternative would include a range of 14 to 212 vehicles on any given highway segment per day, as calculated from estimated construction spreads (UBWR 2020b). Table 3.6-1 provides an analysis of the potential increase in traffic levels; it considers the maximum number of vehicles added as a result of construction (i.e., 212 vehicles).

Table 3.6-1 Average Annual Daily Traffic Changes from Southern Alternative Construction Activities

	Location Description ^(a)	Existing AADT	Cumulative AADT ^(b)	Percent Change from Current AADT
Utah				
U.S. Highway 89	Arizona State Line to Big Water, Utah	4,000	4,212	5.3%
U.S. Highway 89	Big Water, Utah to Johnson Canyon Road	3,000	3,212	7.1%
Average		3,500	3,712	-
Arizona				
U.S. Highway 89A	Ryan Road to Arizona SR-67 – Jacob Lake	850	1,062	24.9%
Arizona SR-389	Pipe Spring National Monument Road to Cane Beds Road	2,410	2,622	8.8%
Arizona SR-389	Cane Beds Road to Central Road	3,253	3,465	6.5%
Arizona SR-389	Central Road to Utah State Line	4,495	4,707	4.7%
Average		2,752	2,964	-

Source: UDOT 2016; ADOT 2018; UBWR 2020b

Notes:

(a) Traffic counts were drawn from highway segments proximate to the Southern Alternative that may be used for construction traffic.

(b) The contribution to each highway segment is expected to range between 14 and 212, depending on year and intensity of labor assumed. For this analysis, the highest contribution of 212 was used.

Key:

AADT = Average Annual Daily Traffic

SR = State Route

Localized effects would occur as a result of increased AADT. During spring, summer, and fall months, higher levels of tourism (e.g., near GCNRA, Grand Canyon, Zion, and Bryce Canyon) increase overall traffic in the affected environment. Additional spikes in traffic occur during the fall hunting season. Effects experienced by roadway users as a result of the increased number of vehicles from construction activities in these locations may be perceived as higher during these times.

Level of Service

Because of the temporary and segmented nature of the construction and localized traffic delays, changes to LOS may occur for areas in which traffic controls and/or closures are implemented. Free flow or reasonably free flow of traffic could be slowed. The localized effect would occur because of the temporary nature of the construction activities and the anticipated length of delays. Overall LOS on each segment would not be permanently affected as a result of the construction of the Proposed Project.

As noted in the LPP Final Study Report 14 – Transportation (UBWR 2016), Utah Department of Transportation (UDOT) and Arizona Department of Transportation (ADOT) defined 15 minutes as the maximum allowable traffic closure under state requirements. Appropriate traffic controls and

roadway closures for the Southern Alternative would be coordinated and approved by the appropriate jurisdiction in which the construction activities would occur.

Access Road Construction and Improvements

Access roads would be required for construction and operation of the Southern Alternative; these include temporary and permanent access roads. For the Southern Alternative, access roads would be constructed on BLM, NPS, Reclamation, state, and private land. Table 3.6-2 details the access roads that would be constructed or improved for the Southern Alternative. Figures 2.2-1 and 2.2-2 in Appendix C-8, Transportation, depict the locations of the access roads.

Table 3.6-2 Southern Alternative Road Construction and Improvement Lengths

Road Name	New Permanent Access Road Construction (Miles) ^(b,c)	Existing Dirt Roads That Would Be Improved During Construction (Miles) ^(a,b,d)	Land Ownership or Management ^(e)
Water Intake System Access Road	0.13	-	Reclamation
	0.23	-	NPS
Water Intake System I/E Road	0.39	-	NPS
BPS-1 Access Road	0.54	-	NPS
BPS-1 I/E Road	0.18	-	NPS
Two-Track Buckskin Transmission Line Access Road	22.00	-	BLM
	11.22	-	AZ and UT State Land
Two-Track Spur roads (17 spur roads @ variable lengths) from Existing Road along Glen Canyon Substation to Buckskin Substation on NPS Land	1.10	-	NPS
BPS-2 Access Road	0.02	-	UT State Land
BPS-2 I/E Road	0.38	-	UT State Land
Two-Track BPS-2 Transmission Line Access Road	7.15	-	UT State Land
BPS-3 Access Road	0.08	-	BLM
BPS-3 I/E Road	0.38	-	BLM
BPS-3 Transmission Line Access Road	-	1.96	BLM
	-	3.75	UT State Land
BPS-4 Access Road	0.46	-	Private
Two-Track Pipeline Access Road near US89	15.09	-	BLM
High Point Reg. Tank Access Road	0.07	-	BLM
High Point Reg. Tank I/E Road	0.38	-	BLM
HS-1 Access Road	0.07	-	BLM
HS-1 I/E Road	0.34	-	BLM
Two-Track Spur roads from Existing Road to Pipeline along Highway 89 (10 @ 500 feet each)	0.90	-	BLM
8 Mile Gap Road	-	4.86	BLM
	-	3.85	Private

Table 3.6-2 Southern Alternative Road Construction and Improvement Lengths (continued)

Road Name	New Permanent Access Road Construction (Miles) ^(b,c)	Existing Dirt Roads That Would Be Improved During Construction (Miles) ^(a,b,d)	Land Ownership or Management ^(e)
Two-Track Pipeline Access Road near White Sage Wash	14.15	-	BLM
	1.27	-	AZ State Land
Yellowstone Road	-	1.55	BLM
	-	3.00	AZ State Land
Two-Track Spur roads from Existing Road along Hwy 239 (5 @ 200 feet each)	0.07	-	BLM
	0.13	-	AZ State Land
HS-2 Access Road - Southern	0.07	-	Private
	0.01	-	AZ State Land
HS-3 Access Road	0.08	-	Private
Two-Track Pipeline Access Road through Canaan Gap	4.34	-	BLM
	2.84	-	Private
	2.01	-	UT State Land
HS-4 Access Road	0.44	-	BLM
HS-5 Access Road	0.44	-	BLM
Two-Track Spur roads from Existing Road to Pipeline between HS-5 to Sand Hollow Terminal Station	0.12	-	BLM
	0.08	-	Private
Two-Track Transmission Line Access Road HS-5 to Sand Hollow Terminal Station	3.73	-	BLM
	0.50	-	Private
Sand Hollow Terminal Station Access Road	0.05	-	Private
	0.03	-	UT State Land
Total	91.47	18.97	-

Source: UBWR 2020c – Update of Table 3-7 LPP Road Crossings/Paralleling in LPP Final Study Report 14 - Transportation Notes:

(a) This list only includes existing dirt roads that would be improved for access. Existing dirt roads that intersect the ROW and would be used for access but do not need improvement are not included in this list. Existing paved and maintained highways and local streets that would be used for access are not included.

(b) Temporary construction roads built along the ROW are not included in this list.

(c) Road construction work includes installing new access roadways to facilities, pipeline, and transmission lines. The work would include clearing, grubbing, grading, and installing gravel to allow safe access by trucks, other vehicles, and maintenance equipment. Permanent new access roads would be gravel or a two-track road.

(d) Road improvement work includes minor clearing and grading, where needed, and installation of gravel to existing unimproved roads as needed to allow access to the new facilities, pipeline, and transmission lines.

(e) Existing roads may have a different owner (e.g., road easement) than the underlying landowner.

Key:

AZ = Arizona

BLM = Bureau of Land Management

BPS = booster pump station

HS = hydrostation

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = right-of-way

UT = Utah

As shown in Table 3.6-2, a majority of the new permanent access roads would be on BLM-managed lands (62.6 miles). In addition, a majority of the dirt roads that would be improved would be on BLM-managed lands (8.37 miles).

Conformance with Existing Regulations, Policies, and/or Plans

No conformance issues are anticipated to occur as a result of the construction of the Proposed Project under the Southern Alternative. The Proposed Project would be consistent with existing transportation regulations, policies, and/or plans.

Public Safety and Traffic Management

Public safety and traffic management would be addressed through the issuance of traffic management plans. Signs and flaggers would be used during construction as necessary to direct traffic in accordance with all applicable UDOT, ADOT, and federal agency requirements, as well as county and local laws and ordinances.

Operation

During operation, increases in traffic levels associated with O&M vehicles and trips would consist of up to approximately 29 visits per week (UBWR 2020d). Infrequent roadway closures or delays would be expected to occur during prolonged maintenance activities (thereby, resulting in limited effects to LOS). New permanent access roads constructed for the Proposed Project would be maintained as part of LPP operation. Access controls for these roads, such as fences or gates, would be coordinated with applicable landowners and agencies during final design.

No conformance issues are anticipated to occur during O&M activities; the Proposed Project would be consistent with existing transportation regulations, policies, and/or plans. Due to the limited traffic anticipated with O&M activities, no effects to public safety and traffic management would be anticipated to occur. However, if extraordinary roadway maintenance activities were needed, these activities would be coordinated with the applicable federal, state, or local agency.

Resource Management Plan Amendment Sub-alternatives

RMPA Sub-alternative 1

This alternative would not amend any RMP decisions that affect transportation resources.

RMPA Sub-alternative 2

Under this alternative, the size of the ACEC would be reduced. Three decisions would no longer apply to lands excluded from the ACEC:

- Decision No. MA-AC-11 stating that only temporary upgrading of existing roads could occur.
- Decision No. MA-AC-12 stating that “New roads will be authorized on a temporary basis only or when beneficial for relevant resources” (i.e., the resources for which the ACEC was designated).
- Decision No. MA-AC-10 stating in part that “Motorized use will keep within the designated route with reasonable use of the shoulder and immediate roadside, allowing for vehicle passage, emergency stopping, or parking, unless otherwise posted.”

RMPA Sub-alternative 3

This alternative would result in the same effects as RMPA Sub-alternative 1.

As a result of these decisions, upgrades of existing roads and construction of new roads could be authorized on any lands removed from the ACEC (905 acres), subject to site-specific environmental review and analysis. Currently, approximately 0.8 miles of designated roads are on lands that would be excluded from the ACEC. This would provide for additional opportunities for access to these public lands and would allow construction of new roads (including for the Proposed Project) without the requirement of being “beneficial for relevant resources.” However, it is likely that these opportunities would be minimal since the area is relatively remote and inaccessible.

Mitigation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of transportation resources. Mitigation measures would include scheduling essential deliveries and heavy truck trips during off-peak hours/times; accommodating existing and programmed, approved, and/or funded transportation projects into the final design; implementing traffic control plans; and scheduling construction deliveries near GCNRA during non-peak hours (between 6 pm and 6 am). In addition, due to the sacred nature of the Kanab Creek Canyon area, once construction is complete, any access roads that lead into the canyon and that are owned or managed by the Tribe would be gated and locked to prevent unauthorized access.

3.6.2.3 Highway Alternative

The following provides a discussion of the potential effects of the Highway Alternative during construction and O&M on transportation resources.

Use of Existing Roadways and Right-of-Way

The approximately 134-mile Highway Alternative generally would follow U.S. Highway 89 and Arizona State Highway 389. Similar to the Southern Alternative, in portions of the Highway Alternative, the Proposed Project would be constructed outside of the running surface of the roads and within the established road ROW (UDWRe 2020). Approximately 78 miles of the pipeline would be within Department of Transportation, highway ROW, and/or within a designated utility corridor. Among the 78 miles, approximately 30.9 miles would be on BLM-managed lands, 7.2 on NPS-managed lands, and 0.2 miles on Tribal lands. The remainder would be on state or private lands (UBWR 2020a).

Ownership and Number of Crossings/Parallel Locations

The Highway Alternative would cross existing roadways 43 times, would cross/parallel existing roadways three times, and would parallel existing roadways ten times. The highest number of crossings or locations in which the Proposed Project would parallel roads would be along roads under the jurisdiction of Kane County, Utah. Seven crossings or parallel locations would occur on those roadways under the jurisdiction of the BLM, as well as one location identified as being jointly under the jurisdiction of BLM and Washington County, Utah. The Proposed Project would cross or parallel locations three times for roadways under the jurisdiction of the NPS. Unlike the Southern Alternative, the Highway Alternative also would cross or parallel roadways located on the KIR and in Fredonia, Arizona. It would not cross or parallel those in Coconino County, Arizona (UBWR 2020b).

Anticipated Traffic Levels from Construction

Vehicles added to local traffic as a result of construction of the Highway Alternative would be the same as those noted for the Southern Alternative (UBWR 2020b). Table 3.6-3 provides an analysis of the potential increase in traffic levels; it considers the maximum number of vehicles (i.e., 212 vehicles).

Table 3.6-3 Average Annual Daily Traffic Changes from Highway Alternative Construction Activities

Roadway	Location Description ^(a)	Existing AADT	Cumulative AADT ^(b)	Percent Change from Current AADT
Utah				
U.S. Highway 89	Arizona State Line to Big Water, Utah	4,000	4,212	5.3%
U.S. Highway 89	Big Water, Utah to Johnson Canyon Road	3,000	3,212	7.1%
U.S. Highway 89	Johnson Canyon Road to 900 East, Kanab, Utah	3,800	4,012	5.6%
Average		3,600	3,812	-
Arizona				
U.S. Highway 89A	Utah State Line to Arizona SR-389, Fredonia, Arizona	5,321	5,533	4.0%
U.S. Highway 89A	Arizona SR-389, Fredonia Arizona to Ryan Road	1,647	1,859	12.9%
Arizona SR-389	Altus Lane, Fredonia, Arizona to BIA 50	3,840	4,052	5.5%
Arizona SR-389	BIA 50 to Pipe Spring National Monument Road	2,909	3,121	7.3%
Arizona SR-389	Pipe Spring National Monument Road to Cane Beds Road	2,410	2,622	8.8%
Arizona SR-389	Cane Beds Road to Central Road	3,253	3,465	6.5%
Arizona SR-389	Central Road to Utah State Line	4,495	4,707	4.7%
Average		3,411	3,622	-

Source: UDOT 2016; ADOT 2018; UBWR 2020b

Notes:

(a) Traffic counts were drawn from highway segments proximate to the Highway Alternative that may be used for construction traffic.

(b) The contribution to each highway segment is expected to range between 14 and 212, depending on year and intensity of labor assumed. For this analysis, the highest contribution of 212 was used.

Key:

AADT = Average Annual Daily Traffic

BIA = Bureau of Indian Affairs

SR = State Route

The Highway Alternative and Southern Alternative follow the same route at the eastern and western terminus of the Proposed Project; therefore, effects on transportation resources associated with construction generally would be similar.

Access Road Construction and Improvements

Access roads would be required for construction and operation of the Highway Alternative; these include temporary and permanent access roads. For the Highway Alternative, access roads would be constructed on BLM, NPS, Reclamation, Tribal, state, and private land. Table 3.6-4 details the access roads that would be constructed or improved for the Highway Alternative. Figures 2.3-1 and 2.3-2 in Appendix C-8, Transportation, depict the locations of the access roads.

Table 3.6-4 Highway Alternative Road Construction and Improvement Lengths

Road Name	New Permanent Access Road Construction (Miles) ^(b,c)	Existing Dirt Roads That Would be Improved During Construction (Miles) ^(a,b,d)	Land Ownership or Management ^e
Water Intake System Access Road	0.13	-	Reclamation
	0.23	-	NPS
Water Intake System I/E Road	0.39	-	NPS
BPS-1 Access Road	0.54	-	NPS
BPS-1 I/E Road	0.18	-	NPS
Two-Track Buckskin Transmission Line Access Road	22.00	-	BLM
	11.22	-	AZ and UT State Land
Two-Track Spur roads (17 spur roads @ variable lengths) from Existing Road along Glen Canyon Substation to Buckskin Substation on NPS Land	1.10	-	NPS
BPS-2 Access Road	0.02	-	UT State Land
BPS-2 I/E Road	0.38	-	UT State Land
Two-Track BPS-2 Transmission Line Access Road	7.15	-	UT State Land
BPS-3 Access Road	0.08	-	BLM
BPS-3 I/E Road	0.38	-	BLM
BPS-3 Transmission Line Access Road	-	1.96	BLM
	-	3.75	UT State Land
BPS-4 Access Road	0.46	-	Private
Two-Track Pipeline Access Road near US89	15.09	-	BLM
Two-Track Pipeline Access Road near US89 - Highway	2.25	-	BLM
High Point Reg. Tank Access Road	0.07	-	BLM
High Point Reg. Tank I/E Road	0.38	-	BLM
HS-1 Access Road	0.07	-	BLM
HS-1 I/E Road	0.34	-	BLM
Two-Track Spur roads from Existing Road to Pipeline along Highway 89 (10 @ 500 feet each)	0.90	-	BLM
Two-Track Spur roads from Existing Road to Pipeline along Highway 389 (10 @ 200 feet each)	0.28	-	Tribe
	0.05	-	AZ State Land
	0.07	-	Private
HS-2 Access Road - Highway	0.10	-	Private

Table 3.6-4 Highway Alternative Road Construction and Improvement Lengths (continued)

Road Name	New Permanent Access Road Construction (Miles) ^(b,c)	Existing Dirt Roads That Would be Improved During Construction (Miles) ^(a,b,d)	Land Ownership or Management ^(e)
HS-2 I/E Road	0.34	-	Private
HS-3 Access Road	0.08	-	Private
Two-Track Pipeline Access Road through Canaan Gap	4.34	-	BLM
	2.84	-	Private
	2.01	-	UT State Land
HS-4 Access Road	0.44	-	BLM
HS-5 Access Road	0.44	-	BLM
Two-Track Spur roads from Existing Road to Pipeline between HS-5 to Sand Hollow Terminal Station	0.12	-	BLM
	0.08	-	Private
Two-Track Transmission Line Access Road HS-5 to Sand Hollow Terminal Station	3.73	-	BLM
	0.50	-	Private
Sand Hollow Terminal Station Access Road	0.05	-	Private
	0.03	-	UT State Land
Total	78.86	5.71	-

Source: UBWR 2020c – Update of Table 3-7 in LPP Final Study Report 14 - Transportation

Notes:

(a) This list only includes existing dirt roads that would be improved for access. Existing dirt roads that intersect the ROW and would be used for access but do not need improvement are not included in this list. Existing paved and maintained highways and local streets that would be used for access are not included.

(b) Temporary construction roads built along the ROW are not included in this list.

(c) Road construction work includes installing new access roadways to facilities, pipeline, and transmission lines. The work would include clearing, grubbing, grading and installing gravel to allow safe access by trucks, other vehicles, and maintenance equipment. Permanent new access roads would be gravel or a two-track road.

(d) Road improvements work includes minor clearing and grading, where needed, and installation of gravel to existing unimproved roads as needed to allow access to the new facilities, pipeline, and transmission lines.

(e) Existing roads may have a different owner (e.g., road easement) than the underlying landowner

Key:

BLM = Bureau of Land Management

BPS = booster pump station

HS = hydrostation

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = right-of-way

SR = State Route

Tribe = Kaibab Band of Paiute Indians

UT = Utah

As shown in Table 3.6-3, a majority of the new permanent access roads would be on BLM-managed lands (50.63 miles).

Effects under the Highway Alternative to LOS; conformance with existing transportation regulations, policies, and/or plans; and public safety and traffic management, as well as anticipated effects associated with operation and maintenance, would be similar to the Southern Alternative.

Mitigation Measures

Mitigation measures would be similar to those described for the Southern Alternative.

3.6.2.4 Comparative Analysis of Alternatives

As shown in this analysis, no new effects are anticipated to occur as a result of the Proposed Project under the No Action Alternative.

No quantifiable differences between the Southern Alternative and Highway Alternative could be described for LOS, conformance with existing regulations, policies, and/or plans, or public safety and traffic management due to the qualitative nature of the analysis. The highest mileage within Arizona and/or Utah Department of Transportation ROW and/or within a designated utility corridor is on BLM-managed lands. In addition, the highest number of crossings/locations in which roadways are paralleled would be associated with BLM-managed lands. Increases in AADT for the Southern Alternative would range from 4.7 to 24.9 percent; while for the Highway Alternative, this would range from 4.0 to 12.9 percent. The Southern Alternative would require more mileage of access roads as a whole as compared to the Highway Alternative, with more mileage required on BLM-managed lands than any other land management agency. The Highway Alternative generally would have the same effects as the Southern Alternative, but because it would traverse the KIR, access roads would be needed during construction on Tribe-managed lands.

3.7 Recreation

3.7.1 Affected Environment

3.7.1.1 Regulatory Framework and Methodology

The federal regulations identified below provide a regulatory framework for the recreation resources analysis provided in the Appendix C-9, Recreation, and within this section. The methodology used to analyze the Proposed Project's effects on recreation resources involved the review of recreation resources within 1 mile of the alternative alignments that make up the study area, and the analysis of effects from construction and operation on recreation areas, facilities, and use.

Bureau of Indian Affairs

On October 4, 1996, the Wildlife, Fisheries & Parks Ordinance was enacted by the Tribal Council of the Kaibab Tribe, and, the next year, 1997, the Tribe received an Indian Self-determination and Education Assistance Act contract for these functions from the BIA. Under the Wildlife, Fisheries & Parks Ordinance #08-96, the Tribe provides for general management of all big game wildlife and setting up rules and regulations for hunting, fishing, and other outdoor activities on the KIR.

Bureau of Land Management

Recreation resource analysis for the BLM regarding the LPP would be performed pursuant to FLPMA (43 USC §1701 et seq.) and the BLM's Planning for Recreation and Visitor Services Handbook (H-8320-1) and Travel and Transportation Management Manual (M-1626).

Bureau of Reclamation

Recreation resource analysis for Reclamation regarding the LPP would be performed pursuant to the Reclamation Act of June 17, 1902 (32 Stat. 388), the acts amendatory thereof and supplementary thereto; the CRSP Act of April 11, 1956 (43 USC §620, et seq.); and the Reclamation Project Act of 1939, Section 14 (43 USC §389).

National Park Service

Recreation resource analysis for the NPS regarding the LPP would be performed pursuant to the NPS Organic Act of 1916, (54 USC 100101 et seq.) as amended, and other laws, regulations, and NPS Management Policies that further the purpose of the Organic Act and the NPS mission.

The environmental consequences or effects of the LPP alternatives on recreation resources identified in this appendix are described as temporary (up to one year during construction and restoration), short-term (one to five years), and long-term (more than five years). A full description of the regulatory framework and methodology is contained in Sections 1.1 and 1.2 of Appendix C-9, Recreation.

3.7.1.2 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts (see Appendix E, Plan of Development). EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

This section briefly identifies EPMs designed to avoid or minimize effects of LPP construction, operation, and maintenance on recreation resources. A full description of the EPMs is contained in Section 1.3 of Appendix C-9, Recreation.

Noise

Where campgrounds, recreation sites, other similar facilities, and high use areas are located within 0.5 miles of the LPP, signage would be posted at appropriate locations indicating the construction schedule, and construction would occur during daytime hours to avoid disturbances to campground users. The intake, BPS, and HS would be enclosed and utilize noise design features to minimize operational noise levels. All construction equipment would be equipped with manufacturer's standard noise control devices (i.e., mufflers, acoustical lagging, and/or engine enclosures).

Air Quality

Active construction sites and unpaved roads used for construction would be watered, or a chemical dust suppression approved by the permitting agencies would be applied, as needed, to maintain effective dust control.

Visual Resources

Existing vegetation that screens pipeline alignments, flow-control facilities, parking lots, and other features from key viewing areas would be retained if it does not impede construction activities. Rock cuts and other construction areas along the ROWs in sensitive visual areas or landscapes would be restored to blend with adjacent geological structure. LPP facilities would utilize architectural details and be painted or constructed of colored block or colored materials to blend with the colors of the surrounding landscape, per BLM Manual 8400 – Visual Resources Management. Nighttime lighting used on or visible from BLM- or NPS-managed lands would be compliant with International Dark Sky Association guidelines for dark sky lighting, as well as the Glen Canyon Lighting Management Plan.

Planning and Permitting

The final LPP POD would contain an extensive list of detailed plans. A description of these plans is contained in Section 1.3 of Appendix C-9, Recreation. The permitting agencies would review and approve these plans. The plans would be submitted to the permitting agencies would review and must receive approval before activities may commence. A Public Information Plan would be developed by the Project Proponent in coordination with the BLM to notify the public and appropriate agencies in advance of the start of each construction phase. Measures that would be implemented to inform the public may include public notices, public meetings, letters to nearby residents, road signs, and other measures.

Access Roads

A Construction Traffic Management Plan would be developed and coordinated with the permitting agencies and other relevant state and local authorities prior to the start of construction for each major phase of the Proposed Project. The plan would consider active seasons for hunting, camping, and/or other recreational activities that occur within the same time and place as each phase of construction. Public access routes (roads or designated trails) within or crossing the ROWs would be maintained or closed, or detour routes would be identified during construction activities. Signing and traffic controls would be placed well in advance of the construction area to warn motorists of detour routes available during construction. Site-specific recreation access issues would be coordinated with applicable agencies during construction.

Fencing

To protect human safety during construction, temporary signs warning the public of the presence and danger of open trenches in the area would be installed where paved roads, gravel roads, or off-highway vehicle (OHV) trails occur within 0.25 miles of an open trench. The signs would be designed according to permitting agencies and other federal agency requirements and would be coordinated with agency communications staff.

Restoration

A detailed Restoration Plan would be prepared and submitted to permitting agencies for approval prior to the start of construction. The Restoration Plan would describe restoration and rehabilitation objectives and methods to be used, species of plants and/or seed mixture to be used, time of planting, blending with existing vegetation at ROW edges, fertilizer mix reviews and approvals, success standards, and follow-up monitoring. Soils and cut/fill areas would be restored to reasonably blend into existing landforms and would be placed in a manner to minimize stark contrast with adjacent undisturbed areas.

3.7.1.3 Existing Conditions

Construction and operation activities associated with the LPP would occur on federal, state, Tribal, and private lands in Utah's Kane and Washington Counties, and in Arizona's Coconino and Mohave Counties. The following recreation areas, facilities, and recreation opportunities on public, Tribal, and private lands are located in the recreation resources study area (Tables 3.7-1 to 3.7-7, and intervening text). In addition to the specific areas identified in the tables, on BLM-managed lands, all lands are open to dispersed recreational activities, which includes hiking, camping, hunting, fishing, off-highway vehicle driving, and a myriad of other uses. Existing conditions for each area are described in Section 1.4 of Appendix C-9, Recreation.

Table 3.7-1 Recreation Opportunities – Glen Canyon National Recreation Area

Recreation Area	Recreation Opportunities
Ferry Swale Area	Camping, hiking, access to recreational ORV routes and the Ropes Trail
Glen Canyon Rafting Hospitality d.b.a. Horseshoe Bend Rafting	Rafting tours and trips
U.S. Highway 89	Access route to many tourist destinations and recreation opportunities
Carl Hayden Visitor Center, Glen Canyon Dam, and Bridge	Dam tours, exhibits, video shows, ranger talks, solar telescope viewing, tourist attractions
Glen Canyon Dam Overlook	Scenic views of the dam and Colorado River
The Chains Day Use Area and Hanging Garden Trail	Scenic views of Lake Powell and the dam, hiking, fishing, swimming
Wahweap District	Lake Powell Resort, boat rentals and launch ramps, marinas, refueling stations, campground, stores, amphitheater, fishing, swimming, hiking, picnic area
Wahweap Overlook	Scenic view of Lake Powell and surrounding landscape
Lone Rock Beach and Off-Road Vehicle Play Area	Boat launch, primitive camping, ORV play area
Studhorse Mesa and Skylight Arch	Hiking, scenic view of Lake Powell and surrounding landscape
Blue Pools Canyon and Arch	Hiking, canyoneering

Key:

ORV = off-road vehicle

BLM – Vermilion Cliffs National Monument

- Viewing of spectacular geologic formations, hiking, photography, vehicle touring, wildlife viewing, dispersed camping, horseback riding, hunting

BLM – Paria Canyon – Vermilion Cliffs Wilderness

- Untrammeled, natural, undeveloped, and solitude or primitive and unconfined recreation

BLM – Grand Staircase-Escalante National Monument

Table 3.7-2 Recreation Opportunities – Grand Staircase-Escalante National Monument

Recreation Area	Recreation Opportunities
Guided Trips	Services for automobile tours, hiking, backpacking, bicycling, horseback riding, ranch recreation, hunting, fishing, therapeutic recreation, geology and natural history tours, photography classes, environmental education, pack trips
Cockscomb Wilderness Study Area	Hiking, horseback riding, sightseeing, cultural site investigation, photography, nature study, outdoor artwork, bird watching
Wahweap Wilderness Study Area	Hiking, sightseeing
Historic Trails	Sightseeing, hiking, cultural and historic tourist attraction
Grand Staircase-Escalante National Monument Visitor Center in Big Water	Exhibits, interpretive signage, outdoor amphitheater, picnic area, bookstore, RV parking area
Off-Highway Vehicle Use and Hunting	Hiking, hunting, wildlife viewing
Grand Staircase-Escalante National Monument Visitor Center in Kanab	Exhibits, restrooms, trailer parking, hiking permits

BLM – Kanab Field Office

Table 3.7-3 Recreation Opportunities – Kanab Field Office

Recreation Area	Recreation Opportunities
U.S. Highway 89 Corridor	Scenic driving, day-use hiking, camping, road and mountain bicycling, and scenic and interpretive viewing
Paria Canyons and Plateaus	Canyoneering, equestrian use, backpacking, hiking, hunting, scenic touring
Paria Contact Station, White House Campground, and Paria River Canyon	Modern restrooms, interpretive signage, campground, picnic tables, grills, fire pits, hiking
Toadstools Trailhead	Hiking, sightseeing, interpretive signage
Catstair Canyon	Hiking, sightseeing
House Rock Valley Road	Provides access to popular OHV areas, trailheads, and camping
Paria Movie Set and Pahreah Townsite	Historical markers, interpretive signage, picnic area, hiking, horseback riding
Great Western Trail	Trail sign-in station, vehicle touring, equestrian use

Key:

OHV = off-highway vehicle

BLM – Arizona Strip Field Office

Table 3.7-4 Recreation Opportunities – Arizona Strip Field Office

Recreation Area	Recreation Opportunities
Sand Hills Special Recreation Management Area and Uplands Recreation Management Zone	Hiking, camping, OHV use, sightseeing, horseback riding
Fredonia Special Recreation Management Area and Associated Recreation Management Zones	Exploring, managed target shooting, sightseeing, horseback riding, hiking, cross-country OHV use
Cottonwood Point Wilderness	Hiking, scenic landscape viewing
Historic Trails	Sightseeing, hiking, cultural and historic tourist attraction
Fredonia – Vermilion Cliffs Scenic Drive	Scenic motor vehicle travel, sightseeing
Antelope Valley Road	Main access point to many recreation opportunities, camping, hiking

Key:

OHV = off-highway vehicle

KIR

Table 3.7-5 Recreation Opportunities – KIR

Recreation Area	Recreation Opportunities
Kaibab Tribe Campground and Recreational Vehicle Park	Campground, restrooms, showers, grills, picnic tables, and fire rings
Trails	Hiking, sightseeing

Key:

KIR = Kaibab Indian Reservation

Pipe Spring National Monument

- Visitor center, bookstore, museum, ranch building and grounds (including corrals, orchard, seasonal garden, cabins), Winsor Castle fort, hiking, scenic viewing, living history demonstrations

BLM – St. George Field Office

Table 3.7-6 Recreation Opportunities – St. George Field Office

Recreation Area	Recreation Opportunities
Off-Highway Vehicle Use	Open to OHV use, open for OHV use on existing or designated roads/trails, or closed to OHV use
Sand Mountain Special Recreation Management Area	OHV riding, competitive events (such as the OHV Rhino Rally), horseback riding, scenic driving and viewing, visiting historic and paleontological sites, natural history education, semi-private recreation, undeveloped camping, picnicking, guided tours, recreation instruction
Red Cliffs National Conservation Area	Mountain biking, hiking, horseback riding, wildlife viewing, geologic viewing, dispersed camping, rock climbing
Hurricane Cliffs Non-Motorized Trail System	Hiking, biking, equestrian use, spectacular views of the surrounding geographic features, designated dispersed camping, kiosks

Key:

OHV = off-highway vehicle

Private/Local/State/Recreational Facilities

Table 3.7-7 Recreation Opportunities – Private/Local/State Recreational Facilities

Recreation Area	Recreation Opportunities
Amangiri Resort Spa and Villas at Lake Powell	Pavilion, living room, gallery, library, dining room, private dining room, cellar, spa and beauty salon, fitness center, pool, suites, home
Paria Outpost Resort and Paria River Ranch	Rustic bed and breakfast accommodations, restaurant, RV camping, tent camping, guide and shuttle services, horseback riding, wading fountain, outdoor volleyball area, bunk house, horse corrals, shower house, laundry facilities, bathrooms
Fredonia Welcome Center	Vehicle and trailer parking, shaded picnic tables, restrooms, interpretive signage, pet exercise area, outdoor exhibit, shop
Arizona Strip Pull-Off	Vehicle parking, interpretive signage
WillowWind RV Park	RV park sites, dumping facilities, flush toilets, full hook-ups, hot and cold running water, restrooms, clubhouse, laundry facilities, picnic tables, cable television, wireless internet, group sites, phones and phone hook-ups, tent sites, teepees
Sand Hollow Resort	Golf courses, golf practice facilities, clubhouse, accommodations (for permanent, seasonal, or overnight purchase/rental)
Sand Hollow State Park	Water sports recreation, boating, beaches, campgrounds for RV and tent camping, restrooms, showers, primitive camping, fishing, OHV use

Key:

OHV = off-highway vehicle

RV = recreational vehicle

3.7.2 Environmental Consequences

3.7.2.1 No Action Alternative

The No Action Alternative would have no effect on recreation resources within the study area. The No Action Alternative would not have any construction or operation effects on recreation resources within the LPP study area as no construction or operational activities would occur.

However, under this alternative, projects already planned by the Project Proponent would continue to occur. Disturbance due to these projects, would vary in space and time. Most impacts would be short-term and project-specific, including localized ground disturbing effects to trailheads and recreational areas. Most effects to recreation resources would be minimized through implementation of standard industry practices by the Project Proponent.

3.7.2.2 Southern Alternative

Under the Southern Alternative, construction and operation of the LPP would affect recreational resources in different ways at different times. Construction activities would cause visual changes, air pollutants, noise, and traffic effects that could include temporary closures, detours, and congestion

on roads and at recreational sites. Operation of the LPP would affect recreational resources due to noise and visual effects, as well as permanent closures of some small portions of recreation areas. For example, approximately 18 acres (0.05 percent of 34,247 acres) of recreational land in the Sand Mountain Special Recreation Management Area (SRMA) would be unavailable for recreational use where the Hurricane Cliffs Waterway would be constructed, and approximately 11 acres of recreational land around the proposed Sand Hollow HS within Sand Hollow State Park would be unavailable for recreational use. Recreational boating and water sports would also be restricted in the immediate area of the Sand Hollow HS tailrace.

However, because the hydrology analysis (see Appendix C-10, Hydrology) indicated little difference in flows at the 10th and 50th percentiles, no adverse impacts to recreation resources below Glen Canyon Dam would be anticipated.

A summary of the effects to recreation resources for the Southern Alternative is provided in Tables 3.7-8 through 3.7-18, below. A more detailed analysis of effects to recreation resources within the LPP study area from the Southern Alternative is contained in Section 2.2 of Appendix C-9, Recreation.

GCNRA

Table 3.7-8 Southern Alternative Effects Analysis – GCNRA

Recreation Area	Construction Effects (short term)	Operation Effects (long term)
Ferry Swale Area	Noise, dust, visual, and traffic effects, closure	Long-term visual effect
Glen Canyon Rafting Hospitality d.b.a. Horseshoe Bend Rafting	Air pollutant/dust, noise effects	No effect
U.S. Highway 89	Visual, air pollutant/dust, noise effects, traffic effects, closure	Visual effect
Carl Hayden Visitor Center, Glen Canyon Dam, and Bridge	Visual, air pollutant/dust, noise effects, traffic effects	No effect
Glen Canyon Dam Overlook	No effect	No effect
The Chains Day Use Area and Hanging Garden Trail	Visual, noise, and dust effects and minor concentrations of PM ₁₀	Visual effect
Wahweap District	Visual, air pollutants/dust, noise, traffic effects, closure	Long-term visual effect
Wahweap Overlook	Visual, air pollutants/dust, noise, traffic effects, closure	Long-term visual effect
Lone Rock Beach and Off-Road Vehicle Play Area	Visual effect	No effect
Studhorse Mesa and Skylight Arch	Short and long-term visual, noise	Long-term visual effect
Blue Pools Canyon and Arch	Noise, dust, traffic, and visual effects, potential closure/inaccessible trailheads	Visual effects

Key:

d.b.a. = doing business as

PM₁₀ = particulate matter 10 microns or less in diameter

BLM/NPS – Old Spanish National Historic Trail

Table 3.7-9 Southern Alternative Effects Analysis – Old Spanish National Historic Trail

Construction Effects	Operation Effects
Reduced access; visual, noise, and air pollutants	No effect

BLM – Vermilion Cliffs National Monument

Table 3.7-10 Southern Alternative Effects Analysis – Vermilion Cliffs National Monument

Construction Effects	Operation Effects
Reduced access; visual, noise, air pollutants, and traffic effects	No effect

BLM – Paria Canyon – Vermilion Cliffs Wilderness

Table 3.7-11 Southern Alternative Effects Analysis – Paria Canyon – Vermilion Cliffs Wilderness

Construction Effects	Operation Effects
Reduced access; visual, noise, air pollutants, and traffic effects	No effect

BLM – Grand Staircase-Escalante National Monument

Table 3.7-12 Southern Alternative Effects Analysis – Grand Staircase-Escalante National Monument

Recreation Area	Construction Effects	Operation Effects
Guided Trips	Reduced access; visual, noise, air pollutants, and traffic effects	Visual effect
Cockscomb Wilderness Study Area	Reduced access; visual, noise, air pollutants, and traffic effects	Visual effect
Wahweap Wilderness Study Area	Reduced access; visual, noise, air pollutants, and traffic effects	No effect
Grand Staircase-Escalante National Monument Visitor Center in Big Water	Reduced access; visual, noise, air pollutants, and traffic effects	No effect
Off-Highway Vehicle Use and Hunting	Reduced access; visual, noise, air pollutants, and traffic effects	Visual effect
Grand Staircase-Escalante National Monument Visitor Center in Kanab	Reduced access; visual, noise, air pollutants, and traffic effects	No effect

BLM – Kanab Field Office

Table 3.7-13 Southern Alternative Effects Analysis – Kanab Field Office

Recreation Area	Construction Effects	Operation Effects
U.S. Highway 89 Corridor	Reduced access; visual, noise, air pollutants, and traffic effects	Visual effect
Historic Trails	Reduced access; visual, noise, air pollutants, and traffic effects	Visual effect
Paria Canyons and Plateaus	Reduced access; visual, noise, air pollutants, and traffic effects	No effect
Paria Contact Station, White House Campground, and Paria River Canyon	Reduced access; visual, noise, air pollutants, and traffic effects	No effect
Toadstools Trailhead	Reduced access; visual, noise, air pollutants, and traffic effects	No effect
Catstair Canyon	Reduced access; visual, noise, air pollutants, and traffic effects	No effect
House Rock Valley Road	Reduced access; visual, noise, air pollutants, and traffic effects	No effect
Paria Movie Set and Pahreah Townsite	Reduced access; visual, noise, air pollutants, and traffic effects	No effect
Great Western Trail	Reduced access; visual, noise, air pollutants, and traffic effects	Visual effect

BLM – Arizona Strip Field Office

Table 3.7-14 Southern Alternative Effects Analysis – Arizona Strip Field Office

Recreation Area	Construction Effects	Operation Effects
Sand Hills Special Recreation Management Area and Uplands Recreation Management Zone	Reduced access; visual, noise, air pollutants, and traffic effects	No effect
Fredonia Special Recreation Management Area and Associated Recreation Management Zones	No effect	No effect
Cottonwood Point Wilderness	Visual, noise, air pollutants, and traffic effects	Visual effect
Historic Trails	Reduced access; visual, noise, air pollutants, and traffic effects	Visual effect
Fredonia – Vermilion Cliffs Scenic Drive	Reduced access; visual, noise, air pollutants, and traffic effects	No effect
Fredonia – Vermilion Cliffs Scenic Road	Reduced access; visual, noise, air pollutants, and traffic effects	No effect

KIR

Table 3.7-15 Southern Alternative Effects Analysis – KIR

Recreation Area	Construction Effects	Operation Effects
Kaibab Tribe Campground and Recreational Vehicle Park	No effect	No effect
Trails	No effect	No effect

Key:

KIR = Kaibab Indian Reservation

Pipe Spring National Monument

Table 3.7-16 Southern Alternative Effects Analysis – Pipe Spring National Monument

Construction Effects	Operation Effects
No effect	No effect

BLM – St. George Field Office

Table 3.7-17 Southern Alternative Effects Analysis – St. George Field Office

Recreation Area	Construction Effects	Operation Effects
Off-Highway Vehicle Use	Reduced access; visual, noise, air pollutants, and traffic effects	Visual effect
Sand Mountain Special Recreation Management Area	Permanent loss of acres; reduced access; visual, noise, air pollutants, and traffic effects	Permanent loss of acres; reduced access; visual, noise, air pollutants, and traffic effects
Red Cliffs National Conservation Area	No effect	No effect
Hurricane Cliffs Non-Motorized Trail System	Visual, noise, air pollutants, and traffic effects	Traffic effects

Private/Local/State/Recreational Facilities

Table 3.7-18 Southern Alternative Effects Analysis – Private/Local/State/Recreational Facilities

Recreation Area	Construction Effects	Operation Effects
Amangiri Resort Spa and Villas at Lake Powell	Temporary direct and indirect effect	No effect
Paria Outpost Resort and Paria River Ranch	Visual, air pollutants, noise, and traffic effects	No effect
Fredonia Welcome Center	No effect	No effect
Arizona Strip Pull-Off	Public access and traffic effects	Visual
WillowWind RV Park	No effect	No effect
Sand Hollow Resort	Visual and noise effects	Visual
Sand Hollow State Park	Camping; visual, air pollutants, noise, and traffic effects	Permanent loss of acres, visual, water recreational restrictions, and camping

Key:

RV = recreational vehicle

Resource Management Plan Amendment

RMPA Sub-alternative 1

RMPA Sub-alternatives 1 and 3 would not amend any RMP decisions that affect management of recreation or recreation access opportunities in the ACEC. These sub-alternatives would not result in effects to recreation resources. These sub-alternatives would, however, amend Decision No. MA-LR-06 to allow for new land use authorizations in the ACEC when effects on the sensitive resources for which the area was designated could be mitigated. However, it is likely that these opportunities would be minimal since the area is relatively remote and inaccessible.

RMPA Sub-alternative 2

Under RMPA Sub-alternative 2, Decision No. MA-AC-11 (stating that only temporary upgrading of existing roads could occur) and Decision No. MA-AC-12 (stating that “New roads will be authorized on a temporary basis only or when beneficial for relevant resources”) would no longer apply to lands excluded from the ACEC. Upgrading of existing roads, and construction of new roads, could therefore be authorized on any lands removed from the ACEC (905 acres), subject to site-specific environmental review and analysis, providing additional opportunities for motorized access to these public lands. Additionally, Decision No. MA-AC-10 (stating in part that “Motorized use will keep within the designated route with reasonable use of the shoulder and immediate roadside, allowing for vehicle passage, emergency stopping, or parking, unless otherwise posted”) would no longer apply to lands excluded from the ACEC. Any lands removed from the ACEC (905 acres) would therefore become subject to the direction contained within Decision No. MA-TM-05, stating that “motorized vehicles may be allowed to pull off a designated route 100 feet either side of centerline.” There are currently approximately 0.5 miles of designated routes on lands that would be excluded from the ACEC; allowing motorized vehicles to pull 100 feet off these routes for camping or other purposes would provide additional motorized access opportunities for the public on these lands.

RMPA Sub-alternative 3

This alternative would result in the same effects as RMPA Sub-alternative 1.

Mitigation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of recreation resources. In addition to the EPMs described in Section 3.7.1.2, above, and Section 1.3 of Appendix C-9, Recreation, the mitigation measures listed below would be applicable to the Southern Alternative. A full description of mitigation measures is provided in Section 1.3 of Appendix C-9, Recreation.

- LPP monitoring, operations, and maintenance vehicles would be restricted to safe operating speeds according to road locations.
- The Toadstools Trailhead parking area would be restored immediately after LPP construction in the vicinity is complete.
- The Great Western Trail south parking area would be restored immediately after LPP construction in the vicinity is complete, in coordination with the BLM recreation management specialist and other resource specialists, as applicable.

- Effects on the Sand Mountain SRMA would be mitigated using a combination of on-site and off-site measures. On-site measures would include: 1) maintaining vehicle access during and after construction through and/or around all LPP development; 2) developing an all-terrain vehicle (ATV) trailhead (trailer parking, restroom, information kiosk with maps and other interpretation) south of Hurricane, but north of the Hurricane Cliffs Waterway; and 3) developing an ATV trailhead at Washington Dam Road. If this trailhead has already been developed, access in this area would be expanded by constructing new ATV trails that access upper Sand Mountain. Off-site mitigation would include developing maps and other interpretation for recreation in the Sand Mountain vicinity.
- Physical disturbance to the Ferry Swale Area and the Blue Pools trailhead areas within GCNRA would be restored to previous conditions immediately after LPP construction.

3.7.2.3 Highway Alternative

Under the Highway Alternative, a range of no effect, to short-term direct and indirect effects would occur to recreation resources and users within the Project Area during construction of the LPP. Also, operation of the LPP would have a range of no effect, to long-term direct and indirect effects to recreation resources and users within the study area.

The construction and operation effects of the Highway Alternative would be the same as the Southern Alternative (Section 3.7.2.2, above, and Section 2.2 of Appendix C-9, Recreation) except for the alignment segment from White Sage Wash (east of Kanab) to Yellowstone Road west of the KIR.

All effects analyses would be the same for GCNRA as under the Southern Alternative since the alignment does not change on Glen Canyon land between the two alternatives.

Below is a brief effects analysis of recreation resources for the Highway Alternative alignment segment from White Sage Wash (east of Kanab) to Yellowstone Road west of the KIR (Tables 3.7-19 to 3.7-23). The full effects analysis of constructing and operating the LPP Highway Alternative on recreation resources from White Sage Wash (east of Kanab) to Yellowstone Road west of the KIR is presented in Section 2.3 of Appendix C-9, Recreation.

BLM – Kanab Field Office

Table 3.7-19 Highway Alternative Effects Analysis – Kanab Field Office

Construction Effects	Operation Effects
Visual, air pollutants, noise, and traffic effects	No effect

BLM – Arizona Strip Field Office

Table 3.7-20 Highway Alternative Effects Analysis – Arizona Strip Field Office

Recreation Area	Construction Effects	Operation Effects
Fredonia Special Recreation Management Area and Associated Recreation Management Zones	Reduced access; visual, air pollutants, noise, dust, and traffic effects	No effect
Cottonwood Point Wilderness	Visual, air pollutants, noise, and traffic effects	Visual
Historic Trails	Reduced access; visual, air pollutants, noise, dust, and traffic effects	Visual
Fredonia – Vermilion Cliffs Scenic Drive	Reduced access; visual, air pollutants, noise, dust, and traffic effects	No effect

KIR

Table 3.7-21 Highway Alternative Effects Analysis – KIR

Recreation Area	Construction Effects	Operation Effects
Kaibab Tribe Campground and Recreational Vehicle Park	Reduced access; visual, air pollutants, noise, dust, and traffic effects	No effect
Trails	Reduced access; visual, air pollutants, noise, dust, and traffic effects	No effect

Pipe Spring National Monument

Table 3.7-22 Highway Alternative Effects Analysis – Pipe Spring National Monument

Construction Effects	Operation Effects
Reduced access; visual, air pollutants, noise, dust, and traffic effects	Visual

Private/Local/State/Recreational Facilities

Table 3.7-23 Highway Alternative Effects Analysis – Private/Local/State/Recreational Facilities

Recreation Area	Construction Effects	Operation Effects
Fredonia Welcome Center	Reduced access; visual, air pollutants, noise, dust, and traffic effects	No effect
Arizona Strip Pull-Off	Reduced access; visual, air pollutants, noise, dust, and traffic effects	Visual

Mitigation Measures

The Highway Alternative would have the same mitigation measures for recreation resources as described for the Southern Alternative in Section 3.7.2.2, above.

3.7.2.4 Comparative Analysis of Alternatives

Under both the Southern and Highway Alternatives, a range of no effect, to short-term direct and indirect effects would occur to recreation resources and users within the study area during construction of the LPP. Also, operation of the LPP would have a range of no effect, to long-term direct and indirect effects to recreation resources and users within the study area. The Highway Alternative has some direct and indirect temporary and long-term effects upon specific high use areas where no effects would occur under the Southern Alternative due to the location of those recreational use sites. These effects include temporary road and trail closures, visual landscape changes, air pollution, noise and long-term visual effects from landscape disturbance. The recreation areas where these effects would occur include the Fredonia SRMA and Associated Recreation Management Zones, Kaibab Tribe Campground and Recreational Vehicle Park, Trails, Pipe Spring National Monument, and the Fredonia Welcome Center as shown in Tables 3.7-18 to 3.7-22, above. These effects are more fully described in Section 2.4 of Appendix C-9, Recreation.

All effects on the GCRNRA would be the same under the Highway Alternative as under the Southern Alternative since the alignment does not change on NPS-managed land between the two alternatives.

3.8 Hydrology

3.8.1 Affected Environment

3.8.1.1 Regulatory Framework and Methodology

Through coordination with the state, Reclamation conducted several hydrologic modeling runs using Reclamation's long-term planning model, the Colorado River Simulation System (CRSS). The CRSS modeling tool was used to assess the effects of the LPP alternatives on water resources and to provide relevant information for other models used to assess other resources. Hydrologic modeling provides projections of potential future Colorado River system conditions (e.g., reservoir elevations, reservoir releases, river flows) under the No Action Alternative for comparison with conditions under the Southern and Highway Alternatives. This section presents the results of two hydrologic modeling runs: one for the No Action Alternative and one that represents either the Southern or Highway Alternative. This is due to the fact that there is no difference between the Southern and Highway Alternatives in how or when water would be diverted from Lake Powell.

Due to uncertainties associated with future inflows into the Colorado River system, multiple simulations were performed for each alternative to quantify the uncertainties in future conditions, and the modeling results are typically expressed in probabilistic terms. Further details regarding the CRSS and its standard assumptions are available in the modeling appendix of the 2007 Interim Guidelines Environmental Impact Statement (EIS) (Appendix A of Reclamation 2007). Appendix C-10, Hydrology, provides a brief background on CRSS, all relevant modeling assumptions used in the CRSS, and a description of any changes made to the CRSS, specifically for the Proposed Project modeling.

The results of these model runs were used to determine potential effects on the hydrology of the Colorado River system from development of the UBWR's water right. These depletions and diversions were covered in the 2005 Operation of Flaming Gorge Dam Final EIS and are being

analyzed for the purpose of signing Contract No. 17-WC-40-656 for Exchange of Water-Lake Powell Pipeline between the United States of America and the State of Utah. The LPP water exchange contract was designed to be in compliance with the Flaming Gorge Record of Decision. In other words, executing the water exchange contract would not change operations at Flaming Gorge Dam.

General Model Assumptions

The following general assumptions were made for CRSS; Table 3.8-1 shows modeling assumptions by alternative:

- January 2020 initial conditions for all modeled reservoirs;
- Powell 3,608.24 feet;
- Run duration: 2020 to 2060;
- Runs revert to the Interim Guidelines No Action Alternative in 2027;
- Drought Contingency Plan (DCP) Operational Parameters revert in 2027;
- Index Sequential Method used for the direct natural flow (DNF) period of record (1906 to 2018): 113 simulations; and
- Climate change inflows: 112 simulations.

Table 3.8-1 Modeling Assumptions for Inflow Hydrology and Demand Scenarios by Alternative

Model Assumptions	No Action	Southern and Highway Alternatives	Sensitivity Analysis No Action	Sensitivity Analysis Southern and Highway Alternatives
Direct Natural Flow Inflow Hydrology	X	X	X	X
Climate Change Inflow Hydrology	X	X	X	X
2012 Basin Study Current Projected 2020 Constant Demands	X	X		
2012 Basin Study Current Projected Reasonably Foreseeable Constant 2060 Demands	X	X		
2012 Basin Study Current Projected Increasing Demands			X	X
LPP Depletion Increasing Demands	X	X	X	X

Source: Reclamation 2012

Key:

LPP = Lake Powell Pipeline Project

Water from Lake Powell would be delivered to Sand Hollow Reservoir through the pipeline. The UDWRe applied the Virgin River Daily Simulation Model (VRDSM) to determine the impacts of the additional water into the Virgin River system. The VRDSM is a mean daily simulation model of the Virgin River developed by the UDWRe. The model is a FORTRAN-based yield model used to evaluate potential changes in operations on the Virgin River in southwest Utah. The model simulates the river system from the Virgin River at the Virgin gage to the Utah-Arizona state line for a 78-year period from 1941 to 2018. The model simulates the Quail Creek Project, Sand Hollow Reservoir, pump-back from the Washington Fields diversion to Sand Hollow Reservoir, hydropower plants in operation within the WCWCD, and stream-flow requirements (UDWRe 2020). The model has the capability to simulate additional regulating storage, an expanded secondary system for the St. George area, and the importation of Lake Powell reservoir water to Sand Hollow Reservoir by the Proposed Project.

Lake Powell, along with its associated major tributaries, is the second-largest man-made reservoir on the Colorado River (Lake Mead is the largest) and the largest reservoir constructed by Reclamation under the authority of the CRSP Act of 1956. Lake Powell has a maximum live storage capacity of around 24.3 million acre-feet (maf). At full pool capacity, the mean depth is approximately 165 feet, with a maximum depth of about 560 feet in the forebay area of the dam. Lake Powell provides water storage for use in meeting the compact obligations consistent with the Law of the River (Reclamation 2007). Specifically, Lake Powell provides storage needed to assist the Upper Division States in meeting their CRC obligations. Annual releases from Glen Canyon Dam are made pursuant to the Long-Range Operating Criteria (LROC) and its current implementation through the 2007 Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lakes Powell and Mead (Interim Guidelines), and the 2019 DCPs. Hourly, daily, and monthly releases are made pursuant to the 2016 Long Term Experimental Management Plan.

The modeling runs described in Appendix C-10, Hydrology, present modeling results comparing the LPP depletion against the No Action Alternative using historic natural flow hydrology and climate change hydrology.

3.8.1.2 Environmental Protection Measures

There are no EPMs for hydrology.

3.8.1.3 Existing Conditions

The analysis of impacts requires a baseline (existing conditions) for comparison of conditions during and after construction of the Proposed Project.

Colorado River/Lake Powell

The primary source for the total annual water flow in the Colorado River Basin is mountain snowmelt emanating from the Rocky Mountains in the Upper Colorado River Basin. Therefore, unregulated river flows are typically very high in the late spring and early summer and diminish rapidly by midsummer, although flows in late summer through autumn sometimes increase following monsoonal rain events (Reclamation 2007). In general, the average annual natural flow of the Colorado River at Lees Ferry over the 113-year period (water years 1906 through 2010) has averaged around 14.6 maf but has ranged between approximately 5.4 and 24.18 maf.

Overall, approximately 95 percent of the reservoir's inflow originates from the mainstream of the Colorado River and two major tributaries, the San Juan and Green Rivers. Specifically, since water year 2005, the Upper Colorado River Basin has experienced significant year-to-year hydrologic variability. The unregulated inflow (i.e., the inflow that would occur if no upstream reservoir storage regulation existed) to Lake Powell has averaged a water year volume of 10.64 maf (98 percent of 30-year 1981 to 2010 period) from 1963 through 2018. The hydrologic variability during this same period (1963 to 2018) resulted from a low water year unregulated inflow volume of 2.64 maf (24 percent of the 30-year average) in water year 2002 and a high water year unregulated inflow volume of 20.85 maf (193 percent of the 30-year average) in water year 1984 (Reclamation 2016).

The majority of the inflow into Lake Powell, around 60 percent, occurs in late spring and early summer as a result of snowmelt in the Rocky Mountains and Upper Colorado River Basin (Reclamation 2016). This runoff tends to be warm, low in salinity, and turbid (i.e., sediment laden) as a result of its passage through the canyonlands and, because of its temperature, it represents the lowest-density water entering the reservoir during the year. Consequently, this water travels along the top of the reservoir as an overflow density current, leaving the waters below the pipeline level (i.e., elevation 3,470 feet) essentially untouched (Reclamation 2016).

Virgin River

The Virgin River lies within the lower Colorado River basin. The Virgin River basin is bounded by mountains with elevations reaching over 10,000 feet, with the Bull Valley and Beaver Dam mountains to the west, the Harmony Mountains to the north, and the Glendale Bench and Block Mesas to the east. The elevation where the Virgin River crosses the state line into Arizona is about 2,500 feet. Most Virgin River streamflow originates as snow, with runoff resulting in high flows from March through May. The greatest water-producing area is the headwaters of the North Fork of the Virgin River.

The Virgin River stream gage at Virgin, Utah, is located upstream from any major diversions. The long-term mean annual streamflow at this gage is 182 cubic feet per second (cfs). Annual streamflow is usually greater than 100 cfs and in high flow years can exceed 300 to 400 cfs. The flows at this gage show a distinct seasonal pattern, with peak flows in May. Monthly mean and annual mean flows do not show the variation that can occur in the Virgin River on a daily basis. Large fluctuations in Virgin River daily and weekly flows reflect the large percentage of the drainage basin that is composed of impervious area (exposed bedrock) and relatively short time of concentration during precipitation runoff events.

From January through August, flows decrease through St. George and increase again downstream from the urban area. There are several major inflows and diversions from the Virgin River in the St. George area, including:

- Diversion to Quail Creek Reservoir, Hurricane and LaVerkin;
- Diversion to St. George, Washington Fields;
- Inflow from Santa Clara River, Ash Creek, LaVerkin Creek, LaVerkin Spring; and
- Return flows from St. George wastewater treatment facility.

Historical canal company diversions dry-dammed the Virgin River immediately downstream of the current Quail Creek Diversion and at the Washington Fields Diversion. The WCWCD operates its system in accordance with the priority water rights of the three major historical diversions on the

Virgin River, so that the lesser of 86 cfs or the natural flow in the river reaches the Washington Fields Diversion.

Located approximately 15 miles northeast of St. George, Quail Creek Reservoir is formed by two dams on Quail Creek, a minor tributary to the Virgin River. The reservoir was constructed by the WCWCD and was completed in April 1985 to help meet regional culinary M&I water demands. Water for storage in Quail Creek Reservoir originates in the Virgin River, which is diverted at the Quail Creek Diversion Dam and is delivered to the reservoir in a pipeline. The diversion also supplies the towns of LaVerkin and Hurricane, the Hurricane Hydropower plant, and Sand Hollow Reservoir. The reservoir has a storage capacity of 40,000 acre-feet and a surface area of 620 acres.

Sand Hollow Reservoir is an off-stream reservoir located about 5 miles southwest of Hurricane. The reservoir was constructed by the WCWCD in 2002 and is used for culinary supply. Water to fill Sand Hollow Reservoir is conveyed from the Virgin River in the same pipeline that serves Quail Creek Reservoir. The reservoir has an active pool of about 30,000 acre-feet and a drought pool of 20,000 acre-feet. Sand Hollow Reservoir also serves as a groundwater recharge facility for the Navajo Sandstone Aquifer.

3.8.2 Environmental Consequences

3.8.2.1 No Action Alternative

Colorado River/Lake Powell

Under the No Action Alternative, the LPP would not be built and no other planned projects described in the No Action Alternative in Chapter 2 of this DEIS would affect the Colorado River. Therefore, there would be no effect to the Colorado River under this alternative.

Virgin River

Local planned projects would each develop more water from the Virgin River Basin. This would reduce the flow of the Virgin River by some unknown amount due to consumptive use of that developed water. The results of the VRDSM for the No Action Alternative are presented in the comparative analysis section below (3.8.2.3).

3.8.2.2 Southern and Highway Alternatives

Colorado River/Lake Powell Hydrology

The Southern and Highway Alternatives would affect the hydrology of Lake Powell, especially when the LPP is at full demand under drier conditions.

The effects of this alternative are discussed in Section 3.8.2.3, below (under Colorado River/Lake Powell), relative to the No Action Alternative, because the comparative difference between the No Action Alternative and the Southern and Highway Alternatives is the goal of this analysis.

Virgin River

The Southern and Highway Alternatives would affect the hydrology of the Virgin River by increasing return flows to lower reaches of the river. There would be no additional effects to hydrology in the Southern Alternative by amending the RMP.

The effects of this alternative are discussed in Section 3.8.2.3, below (under Virgin River heading), relative to the No Action Alternative, because the comparative difference between the No Action Alternative and Southern and Highway Alternatives is the goal of this analysis.

Cumulative Effects for Colorado River Simulation System and Virgin River Daily Simulation Model

The LPP would contribute to reduced storage values in Lake Powell induced by reasonably foreseeable projects modeled in this analysis. This contribution is within the variability affected by hydrology and is insignificant compared against both hydrologic variability and cumulative reasonably foreseeable projects.

The LPP would contribute to increased flows in the lower reaches of the Virgin River that were modeled in the VRDSM. This may offset other cumulative projects that reduce flows in those same stretches. This offset was not quantified within the VRDSM.

3.8.2.3 Comparative Analysis of Alternatives

Colorado River/Lake Powell

The modeling of the No Action Alternative compared to the Southern and Highway Alternative indicates differences in the water resource indicators analyzed. The maximum differences are seen in the long-term outlook under full demand and dry conditions.

For the No Action Alternative and Southern and Highway Alternatives, depletion and diversion information was compartmentalized into two categories: (1) reasonably foreseeable depletions that are defined as Upper Basin depletions with state legislation, a tribal resolution or federal Indian water settlement, a federal finding of no significant impact or ROD; and (2) depletions that cannot be defined as reasonably foreseeable. Depletions that cannot be defined as reasonably foreseeable remained constant at the 2020 depletion levels associated with the Basin Study Current projected demand scenario. Depletions assumed reasonably foreseeable are held constant at 2060 levels, and include the Central Utah Project, Animas-La Plata, Dolores Project, Navajo-Gallup, Ute Indian Compact, and Navajo Indian Irrigation Project. The two categories of demand data were held constant, with the LPP depletions increasing according to the schedule outlined in Attachment B of Appendix C-10, Hydrology, in order to accurately assess the interannual effects of an increasing depletion on the Colorado River system, while including reasonably foreseeable demands that are held constant at their full demand allotment to provide the maximum impact. Note that the 2020 depletions levels modeled are based on the Upper Basin 2012 Basin Study Current Projected depletion schedules in the CRSS (Reclamation 2012) and not the observed (or computed) depletions reported in the 2020 Consumptive Uses and Losses Report (Reclamation 2019), which was not available at the time of this analysis or the writing of this report and will later be prepared by Reclamation apart from this Proposed Project. Reclamation will incorporate updated information into the modeling analysis if it is available within the timeline for the Final EIS and ROD.

For each alternative, two future inflow hydrologies were modeled. One used data from the observed streamflow record (1906 to 2018). The other used hydrologic data derived from climate change emission traces to represent a range of possible future inflows under the assumption of climate change in the Colorado River Basin. These data and methods are discussed in further detail below.

DNF Inflow Results

The greatest differences in resource-specific conditions are seen in Lake Powell elevations with minimal differences in releases. The release differences are seen during wet years when slight elevation differences around equalization elevation triggers result in insignificant differences in releases. Flaming Gorge resource-specific conditions remain the same under both alternatives.

Figure 3.8-1 shows the differences in Lake Powell pool elevation in December between the Southern and Highway Alternatives and the No Action Alternative at the 10th, 50th, and 90th percentiles. In general, the pool elevation differences are larger later in the late stage of simulated years. Prior to the year 2028, there are no differences at any percentile level. Differences at the 50th percentile level during 2028 to 2060 range from 0.14 feet to 8.15 feet, again with Lake Powell's elevation lower in the Southern and Highway Alternatives and with the larger of these differences generally occurring after 2048. Between 2028 and 2060, the differences range between 0.2 feet and 14 feet at the 10th percentile; Lake Powell's elevation is lower in the Southern and Highway Alternatives. Differences at the 90th percentile level range from 0.03 to 0.6 feet.

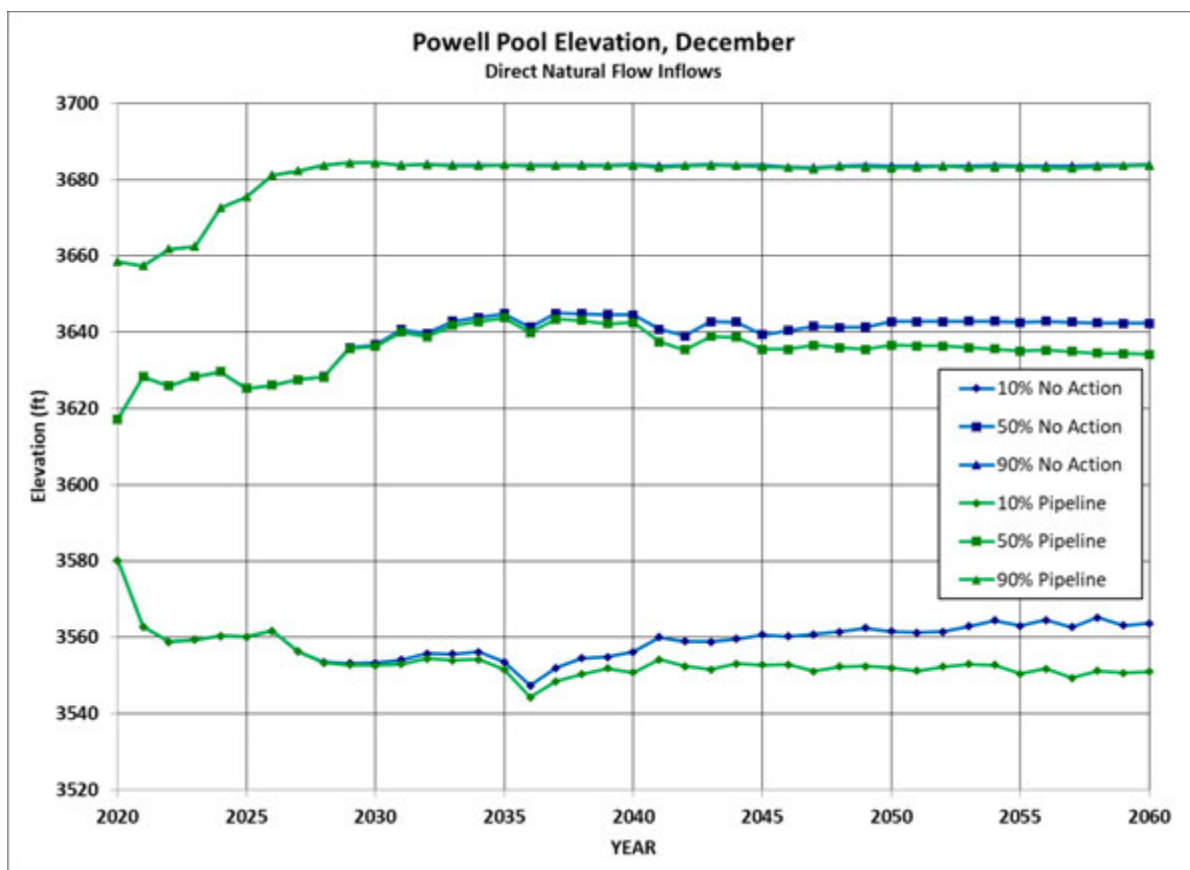


Figure 3.8-1 Lake Powell Pool Elevation, December. Direct Natural Flow Inflows, 86,000 acre-feet Lake Powell Pipeline Maximum Depletion.

Climate Change Inflow Results

The greatest differences in resource-specific conditions are seen in Lake Powell elevations with minimal differences in releases. The release differences are seen during wet years when slight elevation differences around equalization elevation triggers result in insignificant differences in

releases. Flaming Gorge resource-specific conditions remain the same under both alternatives. The effects on resources resulting from the Southern and Highway Alternatives are insignificant when compared against the No Action Alternative. The hydrologic variability within the climate change inflows is greater than the variability under the DNF hydrology, and this variability would exist regardless of both the Proposed Project and other reasonably foreseeable projects.

Figure 3.8-2 shows the differences in Lake Powell pool elevation in December between the Southern and Highway Alternatives and the No Action Alternative at the 10th, 50th, and 90th percentiles for climate change inflow hydrologies. The climate change inflow produces a wider variety and range of inflows, resulting in different future elevations of Lake Powell when compared with the DNF inflow hydrologies. Future Lake Powell elevations under the climate change inflows are generally lower at the 10th percentile when compared with the DNF inflows. However, overall, the differences between the Southern and Highway Alternatives and No Action Alternative are similar to those in the DNF simulations. Prior to the year 2028, there are no differences at any percentile level and in general, pool elevation differences are larger in the later modeled years. The greatest difference for Lake Powell elevation in the climate change inflows occurs in the 50th percentile (i.e., lowest elevations), with a maximum simulated difference of 9.17 feet lower in the Southern and Highway Alternatives as compared against 8.15 feet with DNFs.

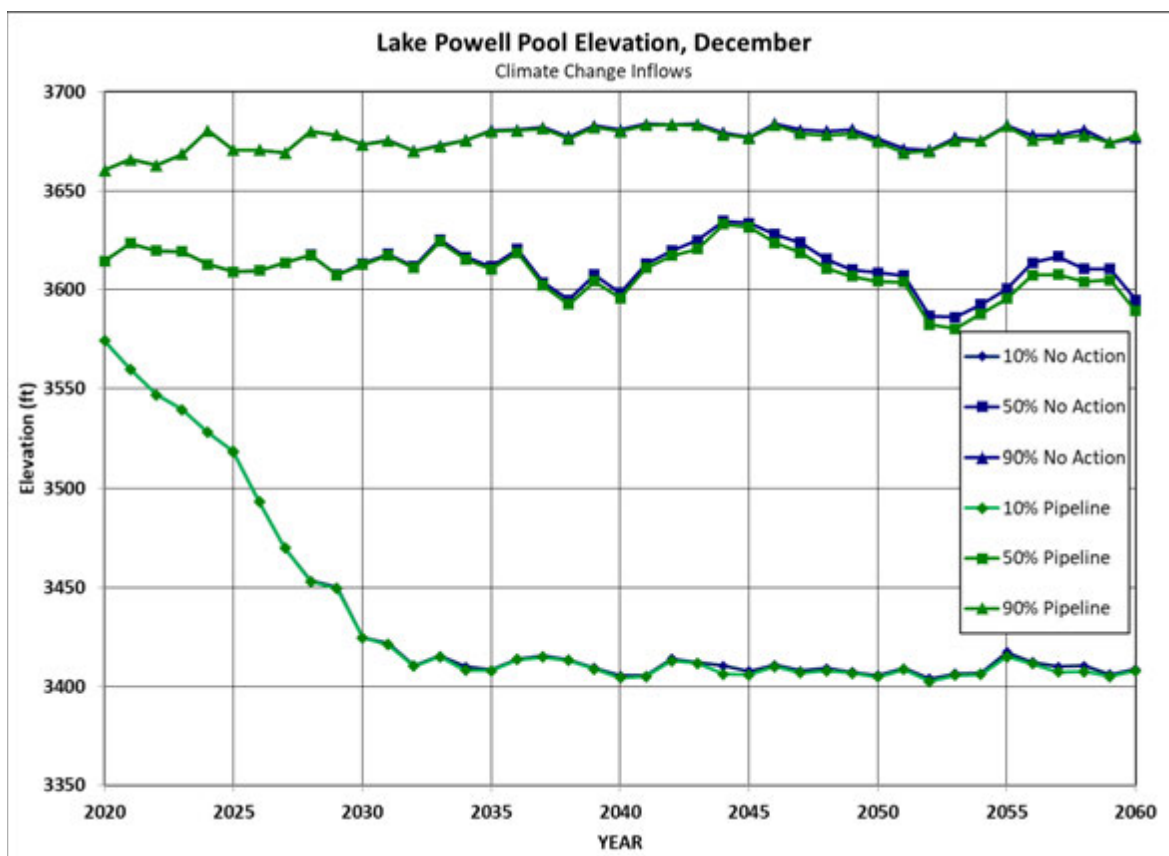


Figure 3.8-2 Lake Powell Pool Elevation, December. Climate Change Inflows, 86,000 acre-feet Lake Powell Pipeline Maximum Depletion.

Sensitivity Analysis

In order to further understand and analyze the results, Reclamation performed an additional sensitivity analysis to determine what the impacts of the No Action Alternative and Southern and Highway Alternatives would be under CRSS assumptions performed in a basin-wide planning context. These modeling assumptions were the same as the standard CRSS model runs that are used in a long-term basin-wide planning context wherein the projected 2012 Basin Study Current Projected Upper Basin depletions increase throughout the entire model run period (BLM 2012).

Figure 3.8-3 shows that the Lake Powell pool elevation in December is approximately 20 feet lower in the 50th percentile as compared against the Proposed Project's demand assumptions, and there is almost no difference in the 90th percentile. Reservoir conditions under drier hydrology in the 10th percentile decrease significantly as compared against the Proposed Project's demand assumptions, although these reservoir elevations are similar to the CRSS long-term conditions that are modeled in the 2012 Basin Study with similar assumptions regarding inflows, demands, and reverting from the Interim Guidelines and 2019 DCP after 2026 to previous operational strategies. Additionally, the long-term future fails to incorporate both the Interim Guidelines and the 2019 DCP operations that have been specifically implemented to assist during drought conditions. The Interim Guidelines are currently in review as required in Section XI.G.7.D. of the Interim Guidelines ROD. Reclamation is currently reviewing and evaluating the Interim Guidelines and will be undergoing a rigorous process to identify potential future operational strategies under various hydrologic conditions after the evaluation is complete. That process, as outlined in the Interim Guidelines ROD, is separate from this analysis, which analyzes the effects of depletion associated with the Proposed Project.

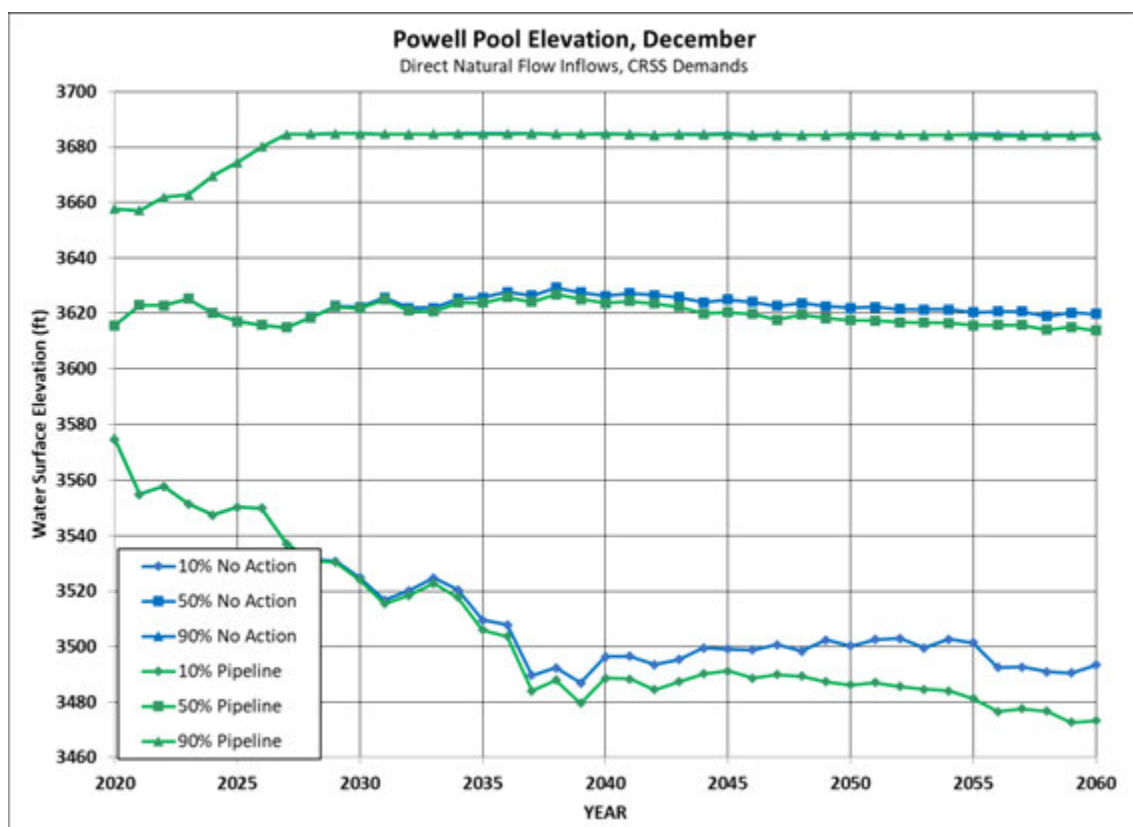


Figure 3.8-3 Lake Powell Pool Elevation, December. Direct Natural Flow Inflows, 86,000 acre-feet Lake Powell Pipeline Maximum Depletion.

VRDSM Model Results

The modeling comparing the No Action and Southern and Highway Alternatives indicates relatively small differences in the water resource indicators analyzed. The maximum differences are seen in the increased return flows in the lower portion of the Virgin River.

Monthly gage flow values are presented in Table 2.3-2 in Appendix C-10, Hydrology along with a comparison between the two scenarios and U.S. Geological Survey (USGS) gage error. Gage percentile plots are shown in Figures 2.3-20 through Figure 2.3-23, provided in Appendix C-10, Hydrology.

Differences in simulated streamflow along the Virgin River in the upper portions of the Washington County system near Quail Creek Reservoir were typically small, and within the degree of accuracy of the USGS stream gages (gage error ranged from 10 percent to 16 percent). Flow changes below gage error would not be measurable. Flow changes in drier months and years under the No Action Alternative were usually larger than at other times of the year because Quail Creek Reservoir storage was usually depleted in drier months and releases from the reservoir were less.

Flows under the Proposed Project scenario increased in the lower portions of the Virgin River near the state line because secondary demands in 2060 were not at a level to fully reuse all Virgin River and Proposed Project return flows from the St. George M&I demand. These changes in flows represent an upper bound of the effects that LPP supplies could have on the lower portions of the river. The effects would decrease beyond 2060 as secondary demands would continue to increase and use more return flows. Effects would also be less under drier, hotter climate change projections because there would be less reuse water available from Virgin River supplies and more of the Proposed Project return flows would be reused. The amount of return flows would depend on how the system is operated, the existing demand at any specific time, the ratio of culinary, secondary, and reuse water serving that demand, and climate change.

The No Action Alternative scenario did not meet St. George M&I demand and was short every year by approximately 54,000 acre-feet per year. The Proposed Project scenario had occasional shortages that averaged to approximately 2,000 acre-feet per year. Shortages are accounted for in the reliable yield planning for WCWCD and are not unexpected in the Proposed Project scenario; however, the VRDSM is not structured to simulate management optimization techniques, emergency groundwater storage supplies, or other approaches to handle such discrete events.

3.9 Water Quality

3.9.1 Affected Environment

This section describes the affected environment and effects analysis for water quality. Additional information is provided in Appendix C-11, Water Quality.

3.9.1.1 Regulatory Framework and Methodology

Various federal, state, and local regulations and policies apply to water quality within the region. The primary federal and state regulations are:

- The Clean Water Act (CWA) of 1977 (as amended);
- Spill Prevention, Control, and Countermeasure Regulation (40 CFR 112);
- Safe Drinking Water Act (42 USC §300[f] et seq.);
- State of Utah Water Quality Standards (Utah Administrative Code R317-2); and
- State of Arizona Water Quality Standards (Title 18: Environmental Quality, Chapter 11).

The geographic scope of the analysis of effects on water quality includes surface waters and shallow groundwater features within three distinct geographical areas: 1) The geographic area encompassed by Lake Powell immediately upstream from the Glen Canyon Dam in Coconino County, Arizona (eastern portion); 2) The Kanab Creek watershed (central portion); and 3) The Virgin River watershed (western portion). The affected environment also includes the immediate vicinity of the pipeline and appurtenances ROWs.

The methodology used to analyze potential effects to water quality is consistent with the methodology and assumptions used in the LPP Final Study Report 17 – Surface Water Quality (UBWR 2016a); however, the scope has been expanded to include potential effects to shallow groundwater aquifers. The methodology included review of beneficial use designations and water quality criteria, review of historical water quality data, assessment of environmental effects for construction and operation activities, and identification of mitigation measures.

3.9.1.2 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

The UBWR has identified EPMs that would be implemented as part of the construction, operation, and maintenance of the Proposed Project (UDWRe 2020). The EPMs are key construction practices related to water quality and are primarily intended to control stormwater runoff and erosion and prevent and respond to potential spills of hazardous materials. A full list of these EPMs is included in Appendix C-11, Water Quality. Additionally, the Proponent, as required by state law, would obtain National Pollutant Discharge Elimination System permits in Utah and Arizona.

3.9.1.3 Existing Conditions

Surface waters within 500 feet of the Proposed Project include ephemeral, intermittent, and perennial streams; Lake Powell; and Sand Hollow Reservoir (Table 3.9-1). Information and data on water quality conditions for waterbodies within the geographic study area are included in Appendix C-11, Water Quality. Shallow groundwater aquifers in the geographic scope are those that discharge directly into surface water features and may require dewatering during construction of the Proposed Project. The potential to encounter groundwater during construction activities along most of the Proposed Project alignments is low. The alignments are located in areas where groundwater is historically recorded at low water table elevations and with few productive water wells as identified in the LPP Final Study Report 5 – Groundwater Resources (UBWR 2016b).

Table 3.9-1 National Hydrography Dataset Features and Categories within 500 feet of the LPP Alternatives

Waterbody Name	NHD Hydrographic Category	Land Ownership
Southern Alternative		
Bitter Seeps Wash	Intermittent	BLM
Bitter Seeps Wash Tributary	Ephemeral	BLM, State
Buckskin Wash Tributary	Intermittent	BLM
Bullrush Wash Tributary	Ephemeral	BLM, Private, State
Cottonwood Wash	Intermittent	Private
Fort Pearce Wash Tributary	Ephemeral	BLM
Gould Wash Tributary	Ephemeral	BLM, Private
Johnson Wash	Perennial	Private
Johnson Wash	Intermittent	State, BLM
Johnson Wash Tributary	Ephemeral	BLM, Private, State
Kanab Creek	Intermittent	Tribe, BLM
Kanab Creek Tributary	Ephemeral	BLM, State, Tribe
Paria River	Intermittent	BLM, Private
Paria River Tributary	Intermittent	BLM
Pipe Valley Wash	Intermittent	Private, State, BLM
Sand Gulch Tributary	Intermittent	BLM, Private
Sandridge Wash	Intermittent	Private, State, BLM
Sandridge Wash Tributary	Ephemeral	Private, State, BLM
Seaman Wash	Intermittent	BLM
Short Creek	Intermittent	BLM, Private
Short Creek Tributary	Ephemeral	BLM, Private, State
Short Creek Wash Tributary	Ephemeral	BLM, Private
Wahweap Creek Tributary	Intermittent	State, BLM, NPS, Private
White Sage Wash	Intermittent	BLM
White Sage Wash Tributary	Ephemeral, Intermittent	BLM, Private

Table 3.9-1 NHD Features and Categories within 500 feet of the LPP Alternatives (continued)

Waterbody Name	NHD Hydrographic Category	Land Ownership
Highway Alternative		
Bitter Seeps Wash Tributary	Ephemeral	NPS, Tribe
Buckskin Wash Tributary	Intermittent	BLM
Bullrush Wash Tributary	Ephemeral	Private, State, Tribe
Cottonwood Creek	Intermittent	Tribe
Cottonwood Creek Tributary	Ephemeral	Tribe
Cottonwood Wash	Intermittent	Private
Fort Pearce Wash Tributary	Ephemeral	BLM
Gould Wash Tributary	Ephemeral	BLM, Private
Johnson Wash	Perennial	Private
Johnson Wash Tributary	Ephemeral	BLM, Private
Kanab Creek	Perennial	Private, State
Kanab Creek Tributary	Ephemeral	Private, State, Tribe
Lost Spring Wash	Intermittent	Private, State
Lost Spring Wash Tributary	Ephemeral	BLM, Private, State
Paria River	Intermittent	BLM, Private
Paria River Tributary	Intermittent	BLM
Pipe Valley Wash	Intermittent	Private, State
Sand Gulch Tributary	Intermittent	BLM, Private
Sand Wash	Intermittent	Tribe
Sand Wash Tributary	Ephemeral	Tribe
Sandy Canyon Wash	Intermittent	Tribe
Sandy Canyon Wash Tributary	Ephemeral	Tribe
Seaman Wash	Intermittent	BLM
Short Creek	Intermittent	BLM, Private
Short Creek Tributary	Ephemeral	BLM, Private, State
Short Creek Wash Tributary	Ephemeral	BLM, Private
Two Mile Wash Tributary	Ephemeral	Tribe
Twomile Wash	Perennial	Tribe
Wahweap Creek Tributary	Intermittent	BLM, NPS, Private, State
White Sage Wash Tributary	Ephemeral	BLM, Private

Source: UBWR 2020

Key:

BLM = Bureau of Land Management

NHD = National Hydrography Dataset

NPS = National Park Service

Tribe = Kaibab Band of Paiute Indians

Figures 3.9-1a and 3.9-1b display the NHD features crossed by both project alternatives.

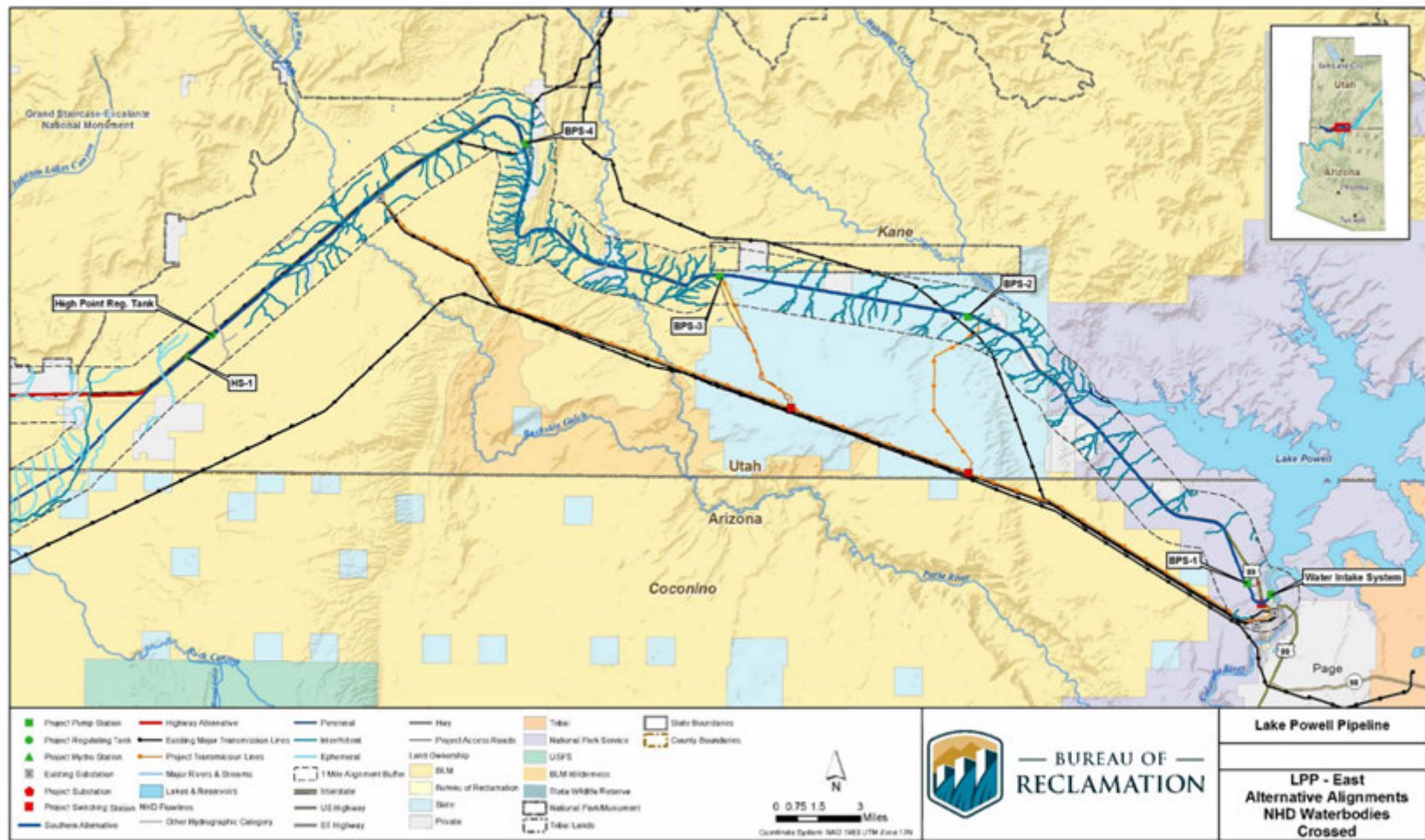


Figure 3.9-1a LPP East Alternative Alignments, NHD Features Crossed

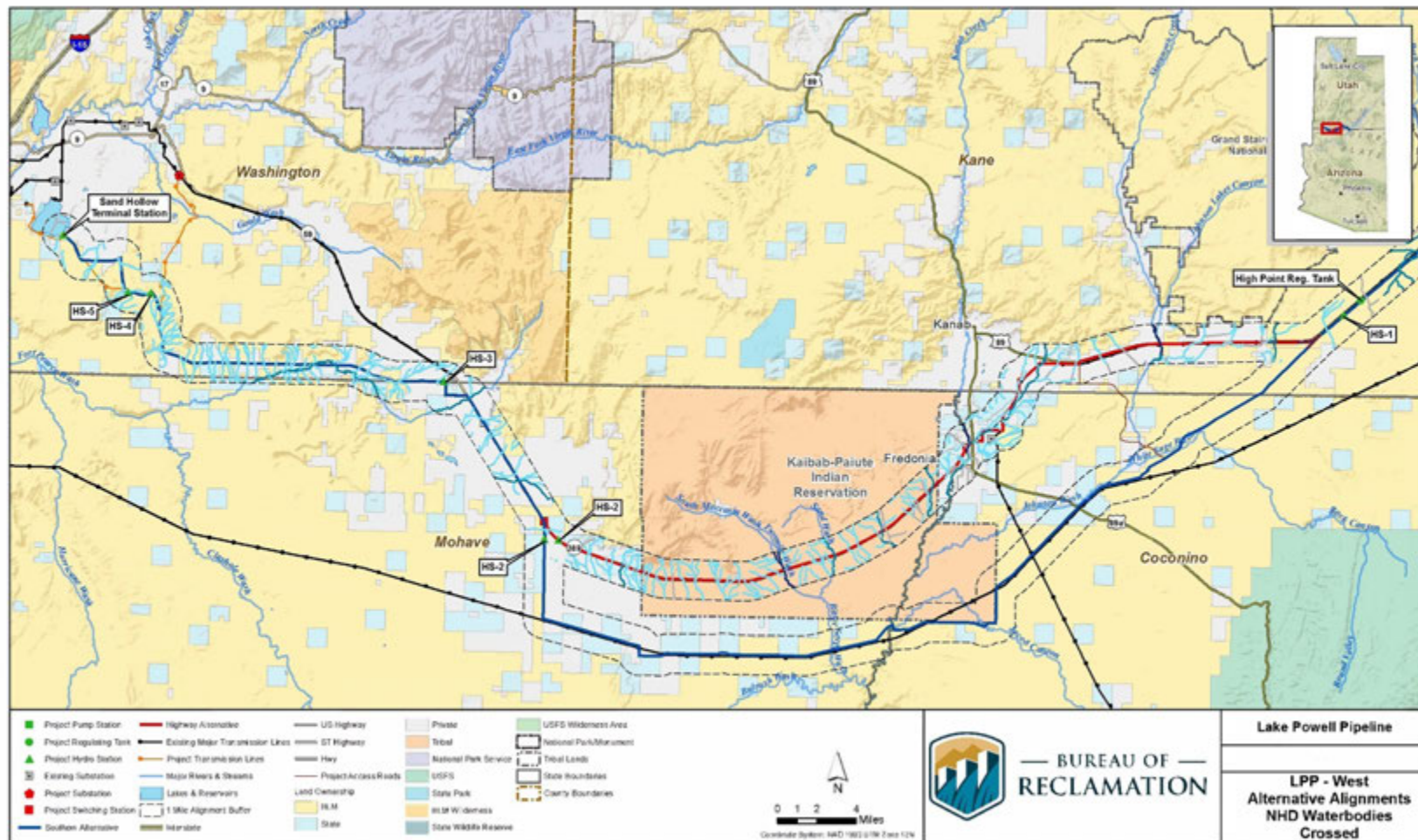


Figure 3.9-1b LPP West Alternative Alignments, NHD Features Crossed

Table 3.9-2 summarizes the locations of probable shallow groundwater that would be crossed by both LPP alternatives. Figures 3.9-2a and 3.9-2b display the locations of probable shallow groundwater that would be crossed by the Southern and Highway Alternatives.

Table 3.9-2 Probable Locations of Shallow Groundwater Crossed by Project Alternatives

Probable Groundwater Location	Probable Groundwater Area (acres)	Area of Disturbance (square feet)	Land Ownership
Southern Alternative			
Cottonwood Wash Crossing	710.32	49.92	Private, BLM
Paria River Crossing at Sand Gulch	201.02	17.37	BLM, Private
Pipe Valley Wash Southern Alternative Crossing	310.34	22.28	BLM, Private, State
Short Creek Crossings at Canaan Gap	1,320.83	80.1	BLM, Private, State
Short Creek Crossing at Colorado City	345.05	33.07	Private, State
Water Intake System	17.44	N/A	NPS, Reclamation
Highway Alternative			
Cottonwood Wash Crossing	710.32	49.92	Private, BLM
Kanab Creek Crossing at Fredonia	710.4	51.6	Private, State
Paria River Crossing at Sand Gulch	201.02	17.37	BLM, Private
Short Creek Crossings at Canaan Gap	1,320.83	80.1	BLM, Private, State
Short Creek Crossing at Colorado City	345.05	31.94	Private, State
Water Intake System	17.44	N/A	NPS, Reclamation

Source: UBWR 2020

Key:

BLM = Bureau of Land Management

N/A = not applicable

NPS = National Park Service

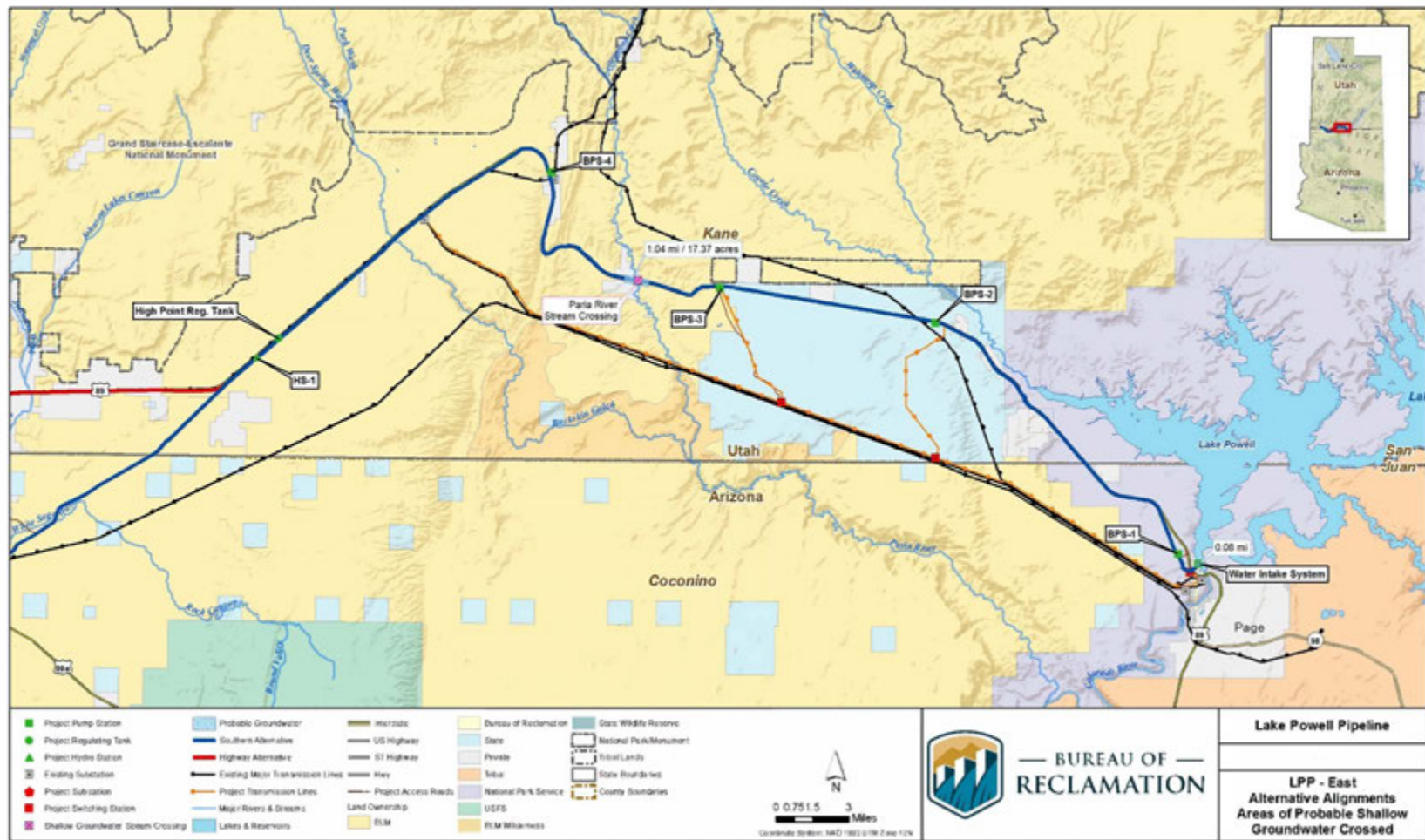


Figure 3.9-2a LPP East Alternative Alignments, Areas of Probable Shallow Groundwater Crossed

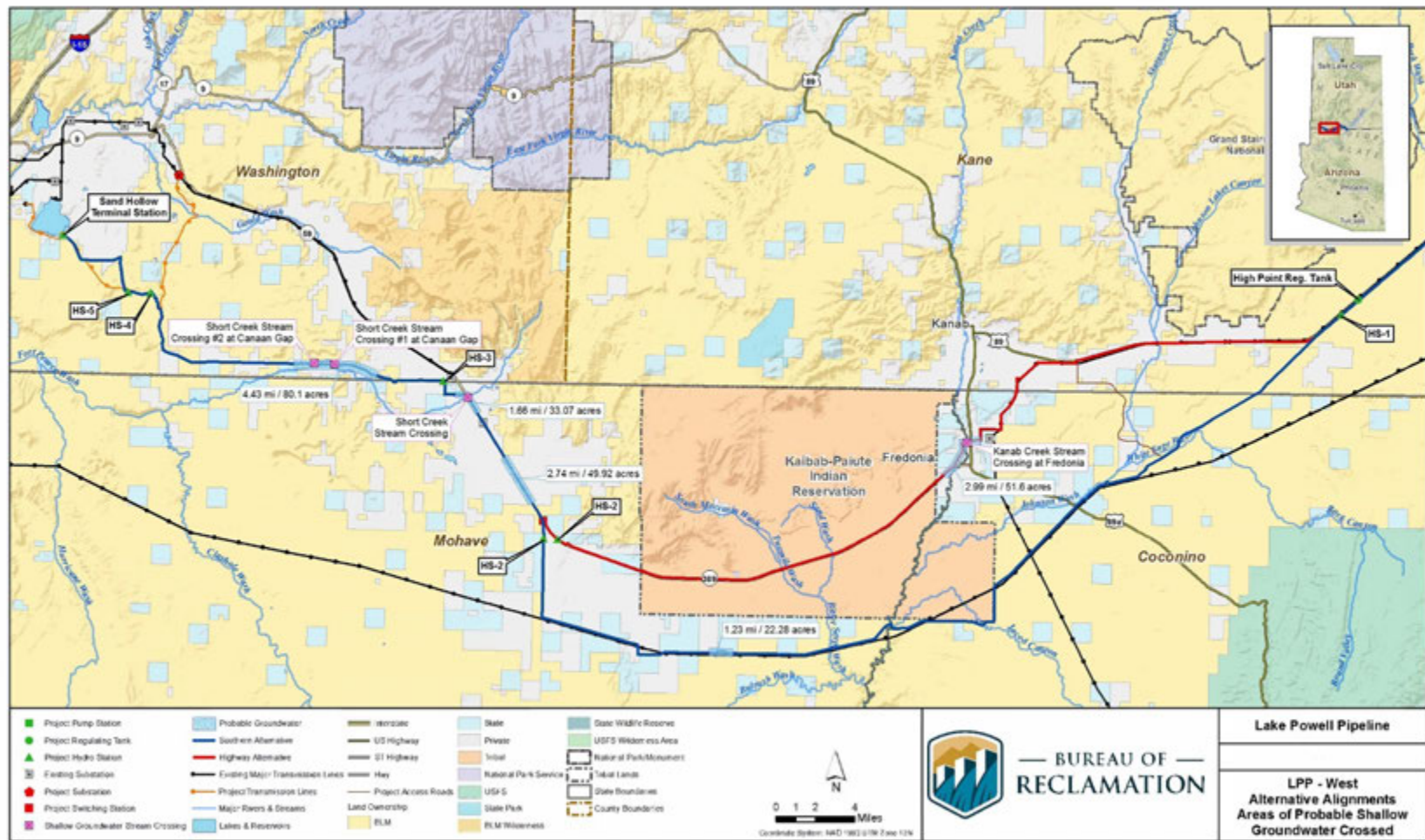


Figure 3.9-2b LPP East Alternative Alignments, Areas of Probable Shallow Groundwater Crossed

3.9.2 Environmental Consequences

3.9.2.1 Effects Assessment

Potential effects on surface water quality during construction and operation of the Proposed Project would result from clearing and grading for pipeline installation, the inline HSs, and the BPSs; the use of open-cut crossings for pipeline installation; changes to site drainage patterns; and maintenance activities such as pipeline flushing or draining. Potential effects on groundwater quality during construction of the Proposed Project would result from dewatering during construction activities.

The potential effects on surface water and shallow groundwater quality from the Proposed Project alternatives include:

- Increased erosion and sedimentation via runoff in areas of vegetation clearing, ground disturbance, and construction activity;
- Increased turbidity of shallow groundwater if dewatering or blasting is required;
- Destabilization of stream banks that require blasting;
- Runoff of chemicals onto surrounding soils (and/or waterbodies) from petroleum products or other chemicals (e.g., disinfectants) used or released on construction sites;
- Ground disturbance resulting from emergency repair activities, if the pipeline were to rupture during hydrostatic testing or normal operations;
- Temporary construction effects from vegetation removal and grading;
- Increased erosion and sedimentation from discharge of hydrostatic test water;
- Changes in total dissolved solids from the addition of large volumes of Lake Powell water to the Sand Hollow Reservoir; and
- Changes in water quality associated with volume changes in Lake Powell and downstream in the Lower Colorado River, as a result of water withdrawals from Lake Powell.

The geomorphology of waterways that would be traversed by the Proposed Project is evaluated to determine the likelihood of erosion and slope instability as a result of construction or operation and maintenance. Potential water quality effects from the inflow of Lake Powell water into Sand Hollow Reservoir are also assessed.

3.9.2.2 No Action Alternative

None of the LPP facilities would be constructed including the pipeline, transmission lines, and access roads. No effects would occur to the quality of surface water and shallow groundwater, including potential effects from alteration of existing drainage patterns or substantial erosion and siltation on or offsite during construction, operation, or maintenance of the LPP. No changes to Lake Powell or Sand Hollow Reservoir water quality would occur. Lake Powell water would not be conveyed to Washington County service areas. The WCWCD would implement foreseeable projects, including systems that would convey culinary and secondary water supply to the WCWCD service area. Effects to water quality due to these projects would vary in space and time. Most impacts would be short term and project-specific and would be minimized through implementation of standard industry practices by the Project Proponent.

3.9.2.3 Southern Alternative

Construction

Construction activities associated with the Proposed Project would pose the greatest hazard to surface water and shallow groundwater quality. Clearing of vegetation along the ROWs and grading the soil would temporarily lead to increased erosion and sedimentation in drainages in the vicinity of the Proposed Project. Improper staging of construction equipment or accumulation of project waste could result in surface runoff of petroleum or other contaminants into nearby waterways or drainages. Construction of open-cut crossings disturbs channel banks and sediment, which could increase turbidity in groundwater cells, which could then be discharged into nearby drainages. Each of these effects would be mitigated to the extent possible with the proper implementation of EPMs. However, even with the implementation of EPMs, water quality would likely be temporarily affected by construction activities. In addition, where the alternative crosses Kanab Creek in the ACEC, short- and possibly long-term effects are anticipated due to the steep canyon walls along the creek.

Construction of the pipeline intake at Lake Powell and the discharge at Sand Hollow Reservoir would not result in measurable effects to reservoir water quality because EPMs would be implemented at each stage of construction. Construction of the intake at Lake Powell would occur at a location near the Glen Canyon Dam that has previously been disturbed. Cuttings from the advancement of the vertical intake shafts that may fall into Lake Powell would be unlikely to affect water quality because of their relatively coarse grainsize. Construction of the Sand Hollow HS and tailrace would be conducted during a low-flow period with the implementation of applicable EPMs.

Operation

Operation and maintenance of the pipeline, water intake and discharge systems, pumping stations, and in-line HSs would not result in routine water discharges or other effects on water quality (see LPP Final Study Report 17 – Surface Water Quality [UBWR 2016a]). However, it would include annual water discharges that have the potential to affect natural surface water features in the vicinity. Additionally, water quality of nearby surface water features could be affected if a pipeline rupture were to occur.

The spread of invasive aquatic species would affect water quality in the affected environment. Quagga mussels (*Dreissena rostriformis bugensis*) are a major water quality concern and were discovered in Lake Powell in 2013, and the population has steadily grown since. Quagga mussels are destructive to ecosystems and water/wastewater systems. The mussels are prone to attaching to submerged objects and form dense clusters of organisms. They attach to pumps, pipes, M&I water supply systems, and other infrastructure. Quagga mussels are filter feeders that remove phytoplankton from the water column, which in turn reduces zooplankton, a food source for many aquatic species. The mussels also produce pseudofeces that accumulate in the water body and contain toxins that decrease pH levels.

Often, quagga mussel infestations are considered a water quality issue. The current mussel population is most prevalent in the Lake Powell forebay, from which water for the Proposed Project would be diverted. Quagga mussels are relatively tolerant of temperature changes, and they may survive in sandy or silty substrates and move with sediments via water currents. Quagga mussels may also exist in the water column as deep as 110 feet. Appendix C-12, Aquatic Invasive Species, contains a detailed analysis of the conditions and effects of quagga mussel transport from Lake Powell.

Mitigation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of water quality resources. No additional mitigation measures are proposed beyond the EPMs that would be implemented as part of the construction of the Proposed Project.

3.9.2.1 Highway Alternative

Construction

Effects on water quality resulting from implementation of the Highway Alternative would be similar to the effects of the Southern Alternative, with the exception of the differing location of the crossing of Kanab Creek at a point of perennial rather than intermittent flow and the shallower drainage at the crossing for this alternative. If Kanab Creek were to flow at the time of construction, sedimentation from construction would be more likely to be carried downstream. While the open-cut trenching technique would be used to lay pipeline at the crossing, the work would be performed when the stream is at low flow or dry.

Operation

The effects of operation and maintenance activities under the Highway Alternative would be the same as those described under the Southern Alternative.

Mitigation Measures

No additional mitigation measures are proposed beyond the EPMs that would be implemented as part of the construction of the Proposed Project.

3.9.2.2 Comparative Analysis of Alternatives

Tables 3.9-3, 3.9-4, and 3.9-5 summarize the effects to surface water and shallow groundwater quality from each alternative, by landowning entity and project alternative. These tables are not a comprehensive summary of the effects to each landowning entity or to specific waterbodies because total counts of features do not account for differences in morphology at stream crossings or other location-specific characteristics. Refer to the appropriate sections above for more detailed analysis of the effects on specific NHD features or shallow groundwater aquifers.

The effects to water quality in Lake Powell and Sand Hollow Reservoir are the same for the Southern and Highway Alternatives because the intake and discharge locations do not differ between alternatives.

Table 3.9-3 Summary of NHD Feature Crossings and Blasting Locations by Landowner

NHD Feature Type	BLM	NPS	Tribe	State	Private
NHD Features Crossing the Alternatives^{(a),(b)}					
Southern Alternative					
Perennial	0	0	0	0	0
Intermittent	52	14	1	18	19
Ephemeral	89	0	9	35	36
Highway Alternative					
Perennial	0	0	1	0	2
Intermittent	48	14	3	17	22
Ephemeral	45	2	27	29	48
NHD Feature Crossings Requiring Blasting^(a)					
Southern Alternative					
Perennial	0	0	0	0	0
Intermittent	5	1	1	2	3
Ephemeral	5	0	1	1	3
Highway Alternative					
Perennial	0	0	0	0	0
Intermittent	4	1	0	1	2
Ephemeral	4	0	0	1	3

Source: UBWR 2020

Note:

(a) Multiple landowners may be associated with each NHD feature segment, so there is overlap in the summed values. Additionally, the alternative may cross the feature multiple times. Refer to Tables 2.2-1 through 2.2-4 in Appendix C-11, Water Quality, for complete listings of NHD features and landownership.

(b) Crossing is defined as an NHD feature with 0 feet of distance to the alternative alignment, as calculated by geospatial data analysis.

Key:

BLM = Bureau of Land Management

NHD = National Hydrography Dataset

NPS = National Park Service

Tribe = Kaibab Band of Paiute Indians

Table 3.9-4 Total Temporary Effects of NHD Waterbody Crossings by Land Manager/Owner

Agency ^(a)	Southern Alternative acres)	Highway Alternative (acres)
BLM	3.6	3.0
NPS	0.9	0.9
Reclamation	0.0	0.0
Tribe	0.0	0.4
State	1.4	1.0
Private	1.5	2.1

Source: UBWR 2020

Note:

(a) Aside from a small number of perennial stream crossings associated with each alternative, most waterbodies are ephemeral or intermittent.

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

Table 3.9-5 Summary of Shallow Groundwater Occurrence and Disturbance by Landowning Entity

Land Ownership	Cumulative Total Probable Groundwater Area (acres)	Cumulative Area of Disturbance (square feet)
Southern Alternative		
BLM	2,542.1	169.67
NPS	17.44	N/A
Reclamation	17.44	N/A
Tribe	--	--
State	1,976.22	135.45
Private	2,887.56	202.74
Highway Alternative		
BLM	710.32	49.92
NPS	17.44	N/A
Reclamation	17.44	N/A
Tribe	--	--
State	2,376.28	163.64
Private	3,086.60	213.56

Source: UBWR 2020

Note:

(a) Multiple landowners may be associated with each area of shallow groundwater, so there is overlap between totaled areas. Refer to 1.4-2 for complete listings of shallow groundwater occurrences.

Key:

BLM = Bureau of Land Management

N/A = not applicable

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

3.10 Aquatic Invasive Species

3.10.1 Affected Environment

The control and active monitoring of aquatic invasive species (AIS) that could be conveyed by the LPP from Lake Powell to other drainages in Utah and Arizona must be carefully monitored, controlled, and carefully managed. While there can be any number of plant and animal species that may be considered invasive and potentially of concern, the well-publicized organism and primary concern for the Proposed Project is the quagga mussel (*Dreissena rostriformis bugensis*). Quagga mussels have significant operational and environmental impacts in the lower Colorado River drainage and continue to be a serious problem. The quagga mussel is a fresh-water invasive mollusk native to the Dnieper River drainage in the Ukraine. It was introduced to North America via ships' ballast water discharge while sailing through the Great Lakes and has spread invasively throughout the country, primarily by recreational boaters. The elaborate array of water conveyance systems throughout the west creates a means of introduction to areas free of infestation. As quagga mussels continue to spread, water conveyance systems are impacted by biofouling while ecosystems are degraded.

3.10.1.1 Regulatory Framework and Methodology

The Proposed Project water would be completely contained within the pipeline or facilities within Utah and Arizona. Therefore, only Utah and Arizona state regulations were provided in addition to guidelines from federal agencies. A National Pollutant Discharge Elimination System permit would be required for O&M discharges. Chemical treatment for AIS control would be included in the application for that permit.

State Regulations

- Utah Code 23-14-1, 23-14-18, and 23-14-19 and Rules R657-3, R657-13, and R657-16;
- Utah Code 23-27-301 and 23-27-401 and Rule R657-60;
- Utah's State Wildlife Action Plan of 2015 is a comprehensive management plan designed to conserve native species populations and habitats in Utah and prevent the need for additional federal listings; and
- Arizona's State Wildlife Action Plan of 2012 provides a 10-year vision for achievement, subject to adaptive management and improvement along the way under the watchful eye of the Federal Energy Regulatory Commission and its partners, for shared success in wildlife conservation and management.

Federal Regulations

- Hazard Analysis Critical Control Point –NPS E.O. 13112 and 13751.
- Lacey Act (16 USC §§ 3371–3378). Under injurious species provisions, it is illegal to import, export, or ship the listed species in the Lacey Act to other states. Quagga mussels are listed under Title 18 of the Lacey Act.
- The NPS Organic Act of 1916, (54 USC 100101 et seq.) as amended, establishes the NPS as an agency under the direction of the Secretary of the Interior with the stated purpose of promoting use of the national park lands while protecting them from impairment.
- The NPS (2006) Management Policies sets the framework and provides direction for all management decisions relating to national park lands.
- The NPS Director's Order 12 (DO-12 and Handbook; 66 FR 7507) describes the NEPA process and describes the responsibility of the NPS regarding participation in or coordination of NEPA procedures for actions occurring on NPS-managed lands.
- E.O. 13112 of February 3, 1999 - Invasive Species - calls upon executive departments and agencies to take steps to prevent the introduction and spread of invasive species, and to support efforts to eradicate and control invasive species. E.O. 13112 also created a coordinating body to oversee implementation of the order, encourage proactive planning and action, develop recommendations for international cooperation, and take other steps to improve the Federal response to invasive species.
- E.O. 13751 of December 8, 2016 - Safeguarding the Nation from the Impacts of Invasive Species amends E.O. 13112 and directs actions to continue coordinated federal prevention and control efforts related to invasive species. This order maintains the National Invasive Species Council (Council) and the Invasive Species Advisory Committee; expands the membership of the Council; clarifies the operations of the Council; incorporates considerations of human and environmental health, climate change, technological innovation, and other emerging priorities into federal efforts to address invasive species; and strengthens coordinated, cost-efficient federal actions.

- E.O. 13112 and E.O. 13751 require federal agencies to refrain from authorizing, funding, or implementing actions that are likely to cause or promote the introduction, establishment, or spread of invasive species in the United States unless, pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions. The framework for choosing the action alternatives will require that the Record of Decision will include a determination that meets both E.O. requirements.

AIS can be a large number of species but the quagga mussel (*Dreissena rostriformis bugensis*) is a primary concern for the Proposed Project. By implementing the EPMs, the potential for transporting other AIS species is eliminated. Therefore, the following discussion will be primarily focused on preventing the spread of quagga mussels from Lake Powell to Proposed Project facilities in Washington County.

The scope of AIS concerns for the Proposed Project extend from the Lake Powell intakes to the outlet at Sand Hollow Reservoir. Since the water originates at the infested Lake Powell and project water would be self-contained in the pipeline (except for periodic releases into BLM approved locations for testing; i.e., dry washes), the affected area is the Lake Powell intake, Sand Hollow Reservoir, and Quail Creek Reservoir, due to the hydraulic connection of the two reservoirs via a pipeline. It is too speculative to expect a rupture or leak in the LPP that would result in potentially contaminating other water sources that the Proposed Project crosses. Therefore, the primary area of focus is to eliminate the potential for the pipeline and especially Sand Hollow to become infested with quagga mussels.

3.10.1.2 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development (see Appendix E, Plan of Development) are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

The POD includes EPMs for the AIS resource, which include:

Current designs to prevent quagga mussels in LPP supplies currently call for coatings, screens, and chemical treatment at the intake and BPSs. The best available technology will be evaluated during final design and will be implemented to prevent quagga mussels. Applicable technology could include self-cleaning screens and ultraviolet treatment. Preventive measure could be installed at all pump stations and hydrostations (UDWRe 2020; see Appendix E, Plan of Development).

Since coatings, screening, ultraviolet (UV) treatment, and chemical treatment of the pipeline are included as EPMs in the POD, these measures are discussed in detail in Section 1.3 in Appendix C-12, Aquatic Invasive Species. In summary, the intake system would be coated in a silicone-based

coating to reduce the settlement of quagga mussels. The LPP water would be screened using self-cleaning 0.0012-inch filters and then treated with hydro-optic UV units to provide a redundant primary control system. A secondary control system, if needed, would be chemical treatment using chlorine (sodium hypochlorite) at the Lake Powell pumping station, which would be neutralized with sodium bisulfite before it is discharged into Sand Hollow Reservoir.

3.10.1.3 Existing Conditions

The interbasin transfer of Proposed Project water from Lake Powell to Sand Hollow Reservoir through the proposed LPP could result in transfer of undesirable and invasive aquatic organisms from the upper Colorado River Basin to the Virgin River Basin. All of the Proposed Project water conveyed through the pipeline would flow into Sand Hollow Reservoir for the specific purpose of providing M&I raw water supply for treatment in a water treatment facility and distribution as culinary water.

Currently, the greatest threat to Sand Hollow and Quail Creek reservoirs is recreational boats spreading AIS. Utah Division of Wildlife Resources (2019) classifies Sand Hollow Reservoir as high risk due to the number of boaters traveling there from other nearby quagga mussel-infested waterbodies such as Lake Powell and Lake Mead. In 2018 and 2019, the only Utah reservoir that required more decontaminations than Sand Hollow Reservoir was Lake Powell.

3.10.2 Environmental Consequences

3.10.2.1 No Action Alternative

The No Action Alternative would be the same as the existing conditions outlined in Section 1.4 of Appendix C-12, Aquatic Invasive Species. Sand Hollow Reservoir would remain at high risk for quagga mussel infestation due to the number of recreational boaters traveling to it and Quail Creek Reservoir from nearby infested waterbodies. Additionally, none of the projects planned by the District, that would occur if the LPP was not built, would increase risk of infestation of quagga mussels to surrounding waterbodies.

3.10.2.2 Southern Alternative

The Southern Alternative would increase the overall potential for spreading quagga mussels to Sand Hollow and Quail Creek Reservoirs because water delivered through the pipeline could contain the mussel in its many life stages. Implementing the EPMs will minimize that risk to the greatest extent given the practicality of treatments to this specific Proposed Project while using the best available information to inform both the EPMs and mitigation measures. While these individual measures do not completely alleviate the potential effects from quagga mussels, a combination of all measures would reduce the potential for infestation and minimize the potential for spreading quagga mussels to waterbodies outside of the Project Area. If all preventive measures (filtration, UV treatment, chemical application) fail and quagga mussels are released into Sand Hollow, their successful establishment would be inevitable. Without treatment, the infestation would have impacts on the aquatic resources within Sand Hollow Reservoir and Quail Creek Reservoir since they are connected via a pipeline.

There is limited potential for environmental effects on the established fishery from implementing the eradication treatment (potassium chloride) for Sand Hollow and Quail Creek Reservoirs (Section 3.10.1.2, above). While this fishery is entirely non-native fish, those effects are discussed in Section 3.14, Sensitive Species - Fish and Wildlife. Sand Hollow Reservoir is a high use recreation area

valued for boating, fishing, and swimming. If treatment for quagga mussels is required in Sand Hollow Reservoir, the fish may incur limited mortality, although not expected using anticipated dosages (Densmore et al. 2018). Potassium chloride has been shown to have significantly lower toxicity in fish than it does in mussels (Waller et al. 1993; Fisher 1994; Sykes 2009; Sykes et al. 2011; Crank and Barnes 2017), supporting its use as an environmentally benign treatment. If the quagga mussel monitoring did not detect the infestation before it spread to Quail Creek Reservoir, similar impacts on the fishery would be expected because both would be treated simultaneously at similar concentrations. Since both reservoirs contain a similar fish assemblage, similar effects would be expected.

After accounting for these measures in analyzing the environmental consequences, the Proposed Project poses a lower risk to spreading quagga mussels into Sand Hollow Reservoir than the risk that recreational boaters pose.

Mitigation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of AIS resources.

Should Sand Hollow Reservoir become infested with quagga mussels, despite all the prevention and control measures outlined in Section 1.3 of Appendix C-12, Aquatic Invasive Species, there are measures that would be implemented to manage the infestation and control any transfer to the Virgin River (see Section 2.2.2 in Appendix C-12, Aquatic Invasive Species).

Monitoring at pump stations and Sand Hollow Reservoir would be conducted on a weekly basis and would inform what steps may be required to prevent quagga mussels from becoming established in Sand Hollow and Quail Creek Reservoirs. If Sand Hollow Reservoir were to become infested, it would be necessary to shut down the transfer of water between Sand Hollow Reservoir and Quail Creek Reservoir and Quail Creek Reservoir's outlet to the Virgin River. Should Quail Creek Reservoir become infested, treatment would be applied at its two outlet structures, main dam, and south dam. At the same time, any discharges from the reservoir would be shut off. To date, potassium chloride has provided the only documented case of successful open-water treatment and eradication of a dreissenid mussel population from an entire waterbody. For this reason, among others discussed in Section 2.2.2 in Appendix C-12, Aquatic Invasive Species, potassium chloride is the recommended open-water treatment of Sand Hollow and Quail Creek reservoirs if they become infested (Reclamation 2015).

3.10.2.3 Highway Alternative

Potential effects from AIS for the Highway Alternative would be very similar as described in Section 2.2 of Appendix C-12, Aquatic Invasive Species, for the Southern Alternative.

Mitigation Measures

The Mitigation Measures would be the same as those described in Section 2.2.2 in Appendix C-12, Aquatic Invasive Species, for the Southern Alternative.

3.10.2.4 Comparative Analysis of Alternatives

The No Action Alternative includes the threat of recreational boats spreading AIS into Sand Hollow and Quail Creek reservoirs. UDWR (2019) classifies Sand Hollow Reservoir as high risk due to the number of boaters traveling there from other nearby infested waterbodies such as Lake Powell and Lake Mead. Both action alternatives have the potential for adverse effects on the environment by contributing to additional risks of quagga mussel infestation to a watershed that currently has no established populations.

A few minor differences occur between the Highway and Southern Alternatives regarding AIS. These differences would only occur if the primary quagga control method did not provide complete protection and chemical treatment was required. For the Highway Alternative, the pipeline length would be reduced by approximately 7 miles, which would reduce the duration of chemical exposure to approximately 94.5 minutes at an average water velocity of 6.5 feet per second. The minimum required chlorine exposure duration to result in 100% mortality of dreissenid mussels would still be achieved, which is discussed in detail in Section 1.3 in Appendix C-12, Aquatic Invasive Species.

With the recommended environmental protection and mitigation measures, the Proposed Project poses a lower risk to spreading quagga mussels into Sand Hollow Reservoir than the risk that recreational boaters pose. In 2018 and 2019, the only Utah reservoir that required more decontaminations than Sand Hollow Reservoir was Lake Powell (UDWR 2019).

3.11 Vegetation Communities

3.11.1 Affected Environment

This section focuses on general plant, or vegetation, community types that would be affected by the Proposed Project. Threatened or endangered plants protected under the ESA are discussed under Section 3.15, Threatened and Endangered Species, and in Appendix C-18, Threatened and Endangered Species. Special Status Plants (including noxious/invasive weeds) not protected under the ESA are discussed in Section 3.13, Special Status Plants and Appendix C-15, Special Status Plants.

3.11.1.1 Regulatory Framework and Methodology

The effects of the LPP alternatives are described as temporary (up to one year during construction and restoration), short term (one to five years), and long term (more than five years).

The BLM would need to grant multiple ROWs allowing the Proposed Project's construction and O&M on lands they manage in Utah and Arizona. These ROW permits would require that avoidance, minimization, and restoration activities be applied to affected vegetation communities, in conformance with management decisions in four resource management plans: Kanab-Escalante Planning Area Resource Management Plan (approved February 2020), Kanab Field Office Resource Management Plan (approved October 2008), the RMP (approved February 2008), and St. George Field Office Resource Management Plan (approved March 1999). The NPS would also require similar measures where the Proposed Project encroaches onto GCNRA, as would the Tribe for the Highway Alternative, where the BIA would grant a ROW.

Vegetation mapping of the Project Area was based on detailed, extensive field surveys, which collected data using transects that identified and mapped the plant species and vegetation community type distribution within the survey area. This effort was then aided by aerial interpretation using 9-inch resolution, 3-band color digital imagery. This approach resulted in comprehensive data collection and an analysis effort that can contribute to an accurate land impact assessment and the resulting development of on-site management actions and restoration practices.

The Project Area is defined as the alternative alignments of the LPP ROWs, other facilities associated with the Proposed Project, electrical transmission lines, BPSs, and construction staging areas. The effects analysis addresses effects directly associated with construction and O&M activities of the Proposed Project.

Note: The data set for the vegetation surveys comes from the original study performed by the UBWR, LPP Final Study Report 15 – Vegetation Communities (UBWR 2016). However, the analysis in this appendix and Section 3.11, Vegetation Communities, is original to this NEPA effort.

3.11.1.2 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

The Project Proponent's EPMs identified in Appendix B of the POD (UDWRe 2020; provided herein as Appendix E, Plan of Development) were considered when assessing initial and residual effects on vegetation communities. See Appendix C-13, Vegetation Communities for a full list of proposed EPMs specific to vegetation communities.

3.11.1.3 Existing Conditions

The Project Area comprises two ecological regions: Colorado Plateau and Mojave Desert (see Figure 3.11-1). Tables 3.11-1 and 3.11-2 show the effects, in acres, on the two regions, by owners/managers. The majority of the Project Area is classified as Colorado Plateau, which extends from Lake Powell west to the Hurricane Cliffs. Within the Colorado Plateau Region of the Project Area there are 15 different vegetation communities. The Mojave Desert Region includes the portion of the Project Area that is below (to the west of) the Hurricane Cliffs, including Sand Hollow Reservoir. Within the Mojave Desert Region of the Project Area there are 10 different vegetation communities. There are also a variety of other vegetated and unvegetated land use types within the Project Area that are neither natural nor seminatural plant communities. They include agricultural lands, developed lands with various predominant land uses, invasive upland vegetation where the original plant community is no longer extant, ruderal vegetation, and non-vegetated lands. A discussion on each of these vegetation communities and land use types can be found in Appendix C-13, Vegetation Communities.

Table 3.11-1 Vegetation Community Area Affected by Land Owner/Manager–Southern Alternative

Entity	Colorado Plateau Ecological Region	Mojave Desert Ecological Region	Other	Subtotal
Permanent Disturbance Area (Acres)				
BLM	39.3	26.9	1.9	68.1
NPS	19.9	0.0	0.3	20.2
Reclamation	27.0	0.0	0.0	27.0
State	7.8	3.5	0.0	11.4
Private	33.0	7.1	1.4	41.5
<i>Subtotal</i>	127.0	37.5	3.7	168.3
Temporary Disturbance Area (Acres)				
BLM	1,955.2	94.4	9.3	2,058.8
NPS	259.7	0.0	0.0	259.7
Reclamation	9.1	0.0	0.0	9.1
State	835.8	27.0	0.0	862.9
Private	791.2	200.1	50.6	1,041.9
<i>Subtotal</i>	3,851.1	321.5	59.9	4,232.5
Total	3,978.1	359.1	63.6	4,400.8

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

Table 3.11-2 Vegetation Community Area Affected by Land Owner/Manager – Highway Alternative

Entity	Colorado Plateau Ecological Region	Mojave Desert Ecological Region	Other	Subtotal
Permanent Disturbance Area (Acres)				
BLM	39.3	26.9	1.9	68.1
NPS	19.9	0.0	0.3	20.2
Reclamation	27.0	0.0	0.0	27.0
Tribe	0.0	0.0	0.0	0.0
State	7.6	3.5	0.0	11.1
Private	35.6	7.1	1.4	44.1
<i>Subtotal</i>	129.3	37.5	3.7	170.6
Temporary Disturbance Area (Acres)				
BLM	1,344.0	94.4	9.3	1,447.6
NPS	259.7	0.0	0.0	259.7
Reclamation	9.1	0.0	0.0	9.1
Tribe	239.3	0.0	0.0	239.3
State	751.6	27.0	0.0	778.6
Private	905.9	200.1	50.6	1,156.6
<i>Subtotal</i>	3,509.6	321.5	59.9	3,891.0
Total	3,639.0	359.1	63.6	4,061.6

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

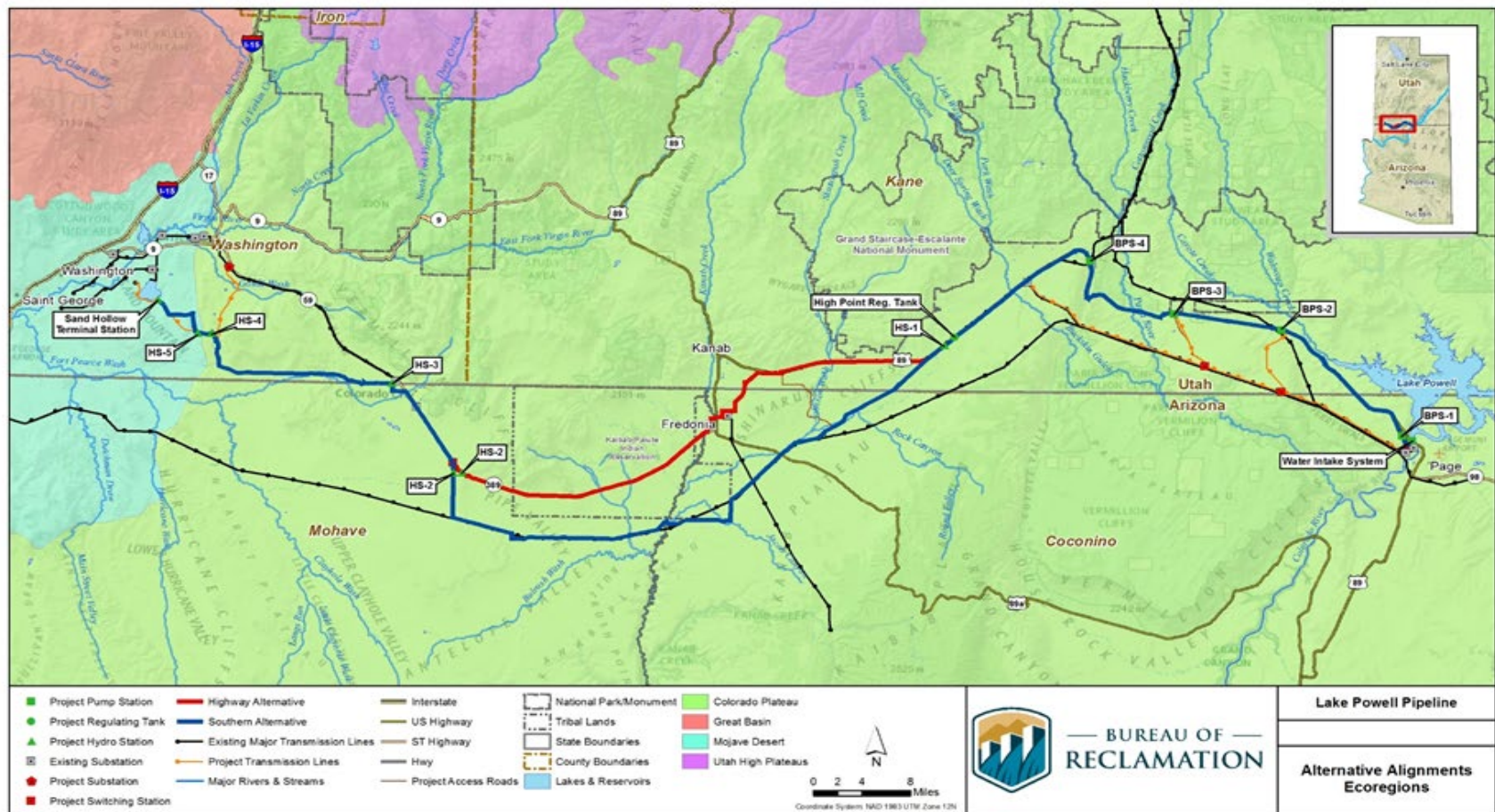


Figure 3.11-1 Ecological Regions Occurring along the Proposed Project Alignment Routes.

3.11.2 Environmental Consequences

3.11.2.1 No Action Alternative

The No Action Alternative would not result in permanent or temporary effects to vegetation communities from the Proposed Project. However, under this alternative, projects already planned by the Proponent would continue to occur. Disturbance, due to these projects, would vary in space and time. Most impacts would be short-term and project-specific, including localized disturbance of vegetation. Most effects to vegetation resources would be minimized through implementation of standard industry practices by the Proponent.

3.11.2.2 Southern Alternative

Proposed Project construction would require clearing vegetation from nearly all areas where earthwork occurs, including material and equipment staging areas. More specifically, vegetation clearing and grubbing activities would occur within the pipeline construction corridor and other areas where pump stations, hydrostation ROWs, electrical transmission line tower bases, substations, switch stations, and staging areas are proposed. All construction-related activities have potential to permanently change the structure and composition of existing vegetation communities. Construction would have short-term effects on vegetation communities. While complete removal would occur in these areas, there are many acres of comparable vegetation in the area(s) surrounding the pipeline corridor. Once construction activities are completed and the Proposed Project enters the O&M phase, much of the Project Area would be restored.

Regarding permanent and temporary effects, where physical structures, such as power generating stations, electrical substations, and permanent access roads, would be installed above ground, vegetation would be permanently affected. Conversely, where vegetation is cleared and grubbed for constructability purposes, and no above ground structures would be installed, effects would be temporary in nature. Most portions of the ROWs would be reclaimed/restored such that the vegetation communities would return to a condition equal to or exceeding that which occurred prior to disturbance. However, for long-term maintenance and safety accessibility, some vegetation (e.g., trees that could affect infrastructure) would be managed in a manner that could be considered permanent effect. More details describing these activities are provided below.

Following construction, O&M activities would only minimally disturb reestablished vegetation communities in most areas. However, in areas where these activities are more than “routine” (e.g., the pipeline had to be replaced in sections), reestablished vegetation would likely be disturbed again, but those disturbance activities would be at a scale far smaller than the initial Proposed Project construction and would occur infrequently.

Mitigation Measures

Minor changes to the EPMS should be implemented to meet agency-specific goals and objectives for management of vegetation resources.

Providing additional substantive measures as mitigation beyond what is proposed above in Section 3.11.1.2 would not be required for this resource, as the EPMS should minimize effects to vegetation communities to the greatest extent practicable.

However, minor changes to the EPMs should be implemented in order to meet agency-specific goals and objectives for management of vegetation resources. These recommended changes to EPMs (which are highlighted) include the following:

- The detailed Restoration Plan to be prepared and submitted to the BLM for approval prior to the start of construction should include details on species of plants and/or seed mixture to be used, time of planting, and also time of seeding (EPM B.1.1).
- Revegetation efforts must establish not only a stable biological ground cover equal to or exceeding that which occurred prior to disturbance, but also must establish the mix (or composition) of native vegetation species identified in the Restoration Plan, as agreed to with the BLM or NPS (EPM B.1.1 and B.1.62).
- Restoration will be considered successful when a stable biological ground cover and mix of native vegetation species (i.e., composition) equal to or exceeding that which occurred prior to disturbance is established (EPM B.1.1 and B.1.62).
- Prior to commencing any plant salvage operations in special designation areas, a collection permit (not a free use permit, as identified in the EPM B.1.69), flora transportation tags, or any other required permits will be obtained to transport salvaged plants as part of restoration activities (EPM B.1.62).
- Transplanting will not occur during periods of high temperature or other unfavorable environmental conditions. EPM B.1.68 and B.1.72 states this would occur “as feasible,” which should not be included because transplanting in these conditions would result in almost certain failure.
- The Project Proponent or its certified licensed contractor will submit a request for a Pesticide Use Proposal to the BLM and other applicable agencies prior to the planned application of any herbicide and a Pesticide Application Record will be submitted to the BLM (EPM B.1.81 and B.2.12).
- No herbicide mixing or rinsing of containers or application equipment will occur within 100 feet of water sources (i.e., lakes, streams, livestock reservoirs, or springs) (EPM B.1.81).

Additional mitigation measures for effects to vegetation communities could occur indirectly as part of federal and state regulatory processes that protect other resources associated with some vegetation community types. For example, if the USFWS requires mitigation measures for protecting species listed for protection under the ESA, such measures would likely require additional protection for those species’ habitats. By extension, some vegetation community types that provide habitat for those species would benefit from specific mitigation requirements.

3.11.2.3 Highway Alternative

Effects to vegetation for the Highway Alternative would be similar to the Southern Alternative in that vegetation communities would be affected as a consequence of construction and O&M activities. The Highway Alternative would produce permanent and temporary effects to vegetation communities because of construction and O&M activities. Temporary effects would result from clearing vegetation where work activities would occur but are not needed for long-term operation, such as maintenance of the pipeline and associated infrastructure (e.g., construction-related access roads and staging areas), which are subsequently reclaimed. Permanent effects would result from areas where impervious surfaces (e.g., concrete pads) would be installed. To a degree, permanent effects would result in areas within the pipeline and electrical transmission line corridors where vegetation would be managed through removal or restrictions on height (e.g., under transmission wires or directly over the pipeline and permanent access roads).

Mitigation Measures

Mitigation measures for the Highway Alternative would be the same as those proposed for the Southern Alternative.

3.11.2.4 Comparative Analysis of Alternatives

The Proposed Project would have unavoidable adverse effects on vegetation resources.

Construction activities associated with the proposed alternatives would temporarily disturb 4,232.5 acres of vegetation community types from the Southern Alternative and 3,891 acres from the Highway Alternative. The Southern Alternative would permanently affect 168.3 acres of vegetation, while the Highway Alternative would permanently affect 170.6 acres (see Tables 3.11-1 and 3.11-2, above). Construction activities would have short-term effects on vegetation communities; once construction activities are completed and the Proposed Project enters the O&M phase, much of the Project Area would be reclaimed, reducing long-term effects.

The Project Proponent's proposed measure to develop a detailed restoration plan and implement revegetation activities as described in Section 3.11.1.2, above, would reduce effects on vegetation. Proposed methods for segregation and stockpiling topsoil would ensure existing seed banks. The Project Proponent's proposed salvage of shrubs and cacti could also enhance restoration success, although transplanting desert vegetation can be difficult and have low rates of success. Salvaged plant use would restore vegetation structure, providing shade and more suitable microhabitats for germination of seeds. Consideration of the spatial relationships between individual plants during salvage and transplant could influence ultimate survivorship. It would be particularly important not to transplant during periods of high temperature or other unfavorable environmental conditions, as clarified above in the Mitigation Measures portion of Section 3.11.2.2, to ensure the highest chance of success. If the Project Proponent's includes measures in the restoration plan to use salvaged trees and shrubs to shade smaller plants (especially those removed from similar shaded habitats), considers these spatial relationships during replanting, and transplants only during favorable environmental conditions, restoration efforts could be more successful and reduce long-term adverse effects on vegetation.

With implementation of revegetation activities, long-term effects of construction on vegetation within disturbed areas would be reduced but would be unavoidable. Due to slow growing rates and disruptions in soil structure, revegetation efforts are likely to require several years or more to be successful, depending on the vegetation community and composition of the seed mixture—grassland areas would recover much more quickly than shrubland/wooded areas.

Restoration of desert vegetation is often a slow process, so extended monitoring efforts, as proposed, are justified and necessary to ensure the restoration is successful. The Project Proponent's proposed methods for collecting baseline data in the ROWs and in adjacent reference areas is also well suited to monitoring revegetation success. Comparing treated sites with reference sites during a specific season ensures that success criteria are not dependent on climatic conditions but compares vegetation in treated areas with non-treated areas under the same weather conditions. Therefore, it is prudent to monitor reference sites and restoration areas at the same time. These methods would provide necessary data to measure restoration success. The Project Proponent's proposed restoration monitoring would occur for a minimum of five years, or until the restoration fulfills the requirements of the approved restoration plan and the Project Proponent receives written release from the BLM/NPS. Since successful restoration may be achieved in some areas more quickly than

other areas, written approval would identify the area(s) released (see EPM B.2.10 in the POD, provided as Appendix E, Plan of Development).

Due to slow growth rates of vegetation in the Project Area, particularly in the Mojave Desert ecoregion, construction activities would likely produce long-term effects. The overall effects of the Southern Alternative and the Highway Alternative would be similar, although the Southern Alternative would temporarily affect approximately 159 more acres and permanently affect approximately 184 more acres than the Highway Alternative (see Tables 3.11-1 and 3.11-2, above).

Following construction, O&M activities would occasionally produce additional disturbance to vegetation if clearing or digging is needed to repair project facilities. Restoration for these activities would follow the same avoidance and minimization measures to facilitate the achievement of restoration success criteria.

3.12 Wetland and Riparian

3.12.1 Affected Environment

Wetlands are areas that meet the criteria for soils, hydrology, and vegetation as defined in the 1987 U.S. Army Corps of Engineers (USACE) Wetland Delineation Manual (USACE 1987). These are areas that are inundated or saturated by surface or groundwater at a duration and frequency sufficient to support vegetation typically adapted for saturated soil conditions. Wetland areas typically comprise marshes, shallow swamps, lakeshores, wet meadows, and riparian areas, and are often along or adjacent to perennial or intermittent water bodies. Water salinity levels can range from no salinity to levels associated with estuaries.

Riparian areas are vegetated zones that form a transition between permanently saturated and upland areas and typically exhibit vegetation and physical characteristics associated with permanent sources of surface or subsurface water. These areas may or may not meet all three USACE criteria for wetlands, and, within an individual system, may contain jurisdictional and non-jurisdictional areas and still be considered riparian. The Proposed Project alternative alignments would cross numerous riparian areas along, adjacent to, or contiguous with perennial and intermittent rivers or water bodies. Although they comprise a small percentage of the overall Project Area, riparian areas are among the most productive and important ecosystems, having a greater diversity of flora and fauna than adjacent uplands. Riparian systems filter and purify water, reduce sediment loads, enhance soil stability, provide microclimatic moderation when contrasted with extremes in adjacent areas, and can contribute to groundwater recharge and stream base flow.

3.12.1.1 Regulatory Framework and Methodology

Waters of the United States are protected by the federal government through Section 404 of the CWA, which is administered by the USACE with oversight by the U.S. Environmental Protection Agency (EPA). The CWA applies to dredge or fill material placed in Waters of the United States, which Title 40 CFR 230.3 defines as all waters which are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters which are subject to the ebb and flow of the tide, all interstate waters including interstate wetlands and all other waters such as interstate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes or natural ponds.

The BLM has responsibility for the majority of the lands through which the Proposed Project would cross. These lands sustain a variety and abundance of resources that are prized for their recreation, wildlife, cultural, and historic values, as well as their economic values, and for such uses as livestock production and mineral extraction. Riparian-wetland areas, though they comprise only a small amount of the total land base, are the most productive and highly prized resources found on BLM-managed lands. FLPMA directs the BLM to manage public lands in a manner that will provide for multiple use and at the same time protect natural resources for generations to come. In addition to FLPMA, numerous laws, regulations, policies, executive orders, and memorandums of understanding direct the BLM to manage its riparian-wetland areas for the benefit of the nation and its economy.

The wetland and riparian analyses included evaluating a variety of existing data and information, including the following: wetland, soils, and hydrologic maps showing locations of intermittent, ephemeral, and permanent waterways; aerial photography imagery; USGS stream gauge data; BLM data; and vegetation mapping, including identification of riparian areas. Field data was also collected that included evaluation of vegetation, soils, and hydrology at stream crossings and washes. Scour chains and crest gauges were installed in washes and streams at selected locations to collect additional hydrological data. Effects were measured by calculating the area where construction would affect the resource and estimating potential changes in wetland/riparian area function or value.

3.12.1.2 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

The Project Proponent's EPMs identified in Appendix B of the POD were considered when assessing initial and residual effects on vegetation communities (see Appendix E, Plan of Development). However, as the list is exhaustive for this section, please see Appendix C-14, Wetland and Riparian for the full list of proposed EPMs specific to this resource.

3.12.1.3 Existing Conditions

No features met the three-parameter criteria for wetland determination; therefore, there were no wetlands identified in the Project Area.

Riparian areas are vegetated zones that form a transition between permanently saturated and upland areas and typically exhibit vegetation and physical characteristics associated with permanent sources of surface or subsurface water. These areas may or may not meet all three USACE criteria for wetlands, and, within an individual system, may contain jurisdictional and non-jurisdictional areas and still be considered riparian. The Proposed Project alternatives would cross numerous riparian areas along, adjacent to, or contiguous with perennial and intermittent rivers or water bodies. Although they comprise a small percentage of the overall Project Area, riparian areas are among the most productive and important ecosystems, having a greater diversity of flora and fauna than

adjacent uplands. Riparian systems filter and purify water, reduce sediment loads, enhance soil stability, provide microclimatic moderation when contrasted with extremes in adjacent areas, and can contribute to groundwater recharge and stream base flow.

The riparian assessment identified 12 perennial and intermittent streams/washes with potential to support riparian vegetation along the LPP alignment alternatives. Riparian areas are functioning properly when adequate vegetation, landform, or large woody debris is present to dissipate stream energy associated with high waterflows, reducing erosion and improving water quality; filter sediment, capture bedload, and aid floodplain development; improve floodwater retention and groundwater recharge; develop root masses that stabilize streambanks against cutting action; develop diverse ponding and channel characteristics to provide the habitat and the water depth, duration, and temperature necessary for fish production, waterfowl breeding, and other uses; and support greater biodiversity.

The ACEC was designated in part to protect riparian areas that occur along, adjacent to, or contiguous with Kanab Creek and its tributaries. The Southern Alternative would directly affect riparian areas within this special designation area. The Kanab Creek riparian area at the Southern Alternative crossing is an intermittent stream with continuous seasonal flow. The dominant plant species in the Kanab Creek riparian zone are cottonwood (*Populus* spp.), willow (*Salix* spp.), seep willow (*Baccharis salicifolia*), arrowweed (*Pluchea sericea*), ash (*Fraxinus* spp.), cattail (*Typha* spp.), rush (*Juncus* spp.), and sedge (*Carex* spp.), as well as a variety of grasses and forbs. However, in Kanab Creek and associated side canyons, native vegetation is being displaced by invasive species such as tamarisk (*Tamarix* spp.). Tamarisk is now a dominant riparian shrubby tree in the Colorado River basin below 6,000 feet. Kanab Creek also hosts populations of Russian olive (*Elaeagnus angustifolia*), tree of heaven (*Ailanthus altissima*), and pampus grass (*Cortaderia* spp.) (BLM 2015).

See Appendix C-14, Wetland and Riparian, for a detailed discussion on the existing condition of all wetland/riparian areas in the Project Area.

3.12.2 Environmental Consequences

The effects of the LPP alternatives on wetland and riparian areas are described as temporary (up to one year during construction and restoration), short-term (one to five years), and long-term (more than five years). Potential effects of the LPP may be adverse (negative) or beneficial (positive) to this resource. In addition, effects may be direct or indirect. Direct effects alter wetland and riparian areas, while indirect effects may alter environmental factors that are important to riparian plant growth and the functioning condition of these areas. Effects to wetlands, riparian areas, and jurisdictional waters were determined using the data and methods described in Section 1.2 of Appendix C-14, Wetland and Riparian Areas, and above. Table 3.12-1 presents riparian area acreage affected by alternative of the Proposed Project.

Table 3.12-1 Riparian Area Acres Affected by Alternative

Riparian System Name	Riparian Area Acreage	
	Southern Alternative	Highway Alternative
Wash West of Blue Pool Wash	0.63	0.63
Paria River	1.14	1.14
Johnson Wash	0.12	0.12
Kanab Creek at Fredonia	N/A	0.09
Cottonwood Creek	N/A	0.03
Two Mile Wash	N/A	0.06
White Sage Wash	0.27	N/A
Kanab Creek at Jacob Canyon	0.18	N/A
Bitter Seeps Wash	0.03	N/A
Short Creek, Colorado City	0.27	0.27
Short Creek, East Canaan Gap	0.21	0.21
Short Creek, West Canaan Gap	0.12	0.12
Total	2.97	2.67

Key:

N/A = Not applicable as this riparian area is not crossed by this alternative.

3.12.2.1 No Action Alternative

Under the No Action Alternative, no construction would occur, and there would be no direct or indirect effects on wetlands, riparian areas, and jurisdictional waters. Under this alternative, no amendment to the RMP would be required.

However, under this alternative, projects already planned by the Proponent would continue to occur. Disturbance, due to these projects, would vary in space and time. Most impacts would be short-term and project-specific, including localized impacts to wetlands and riparian areas prior to reestablishment of vegetation. Most effects to wetlands and riparian areas would be minimized through implementation of standard industry practices by the Proponent and through potential mitigation required by a 404 permit.

3.12.2.2 Southern Alternative

The Southern Alternative would produce permanent and temporary unavoidable adverse effects on riparian areas and jurisdictional waters because of construction and O&M activities. Unavoidable effects would include short-term loss of riparian vegetation where the pipeline crosses the resource and short-term loss of some system functions as a result of clearing riparian vegetation in areas where work activities would occur, but are not needed for long-term operation and maintenance of the pipeline and associated infrastructure and are subsequently reclaimed. Permanent effects would result from areas within the ROWs where vegetation would be managed through removal or restrictions on height (e.g., under transmission wires and directly over the pipeline). Proposed EPMs should be effective in reducing both temporary and permanent effects, and these effects would not be significant. Approximately 2.97 acres of riparian area would be affected from this alternative.

The only riparian area that is classified as perennial at the proposed crossing by the Southern Alternative is associated with the Paria River; this area is known to support suitable habitat for federally listed fish species in downstream reaches. Constructing the pipeline through hydrologic features, such as streams, would typically involve trenching during dry or low water seasons to completely avoid or minimize effects. Vegetation removal would be required and is considered unavoidable for any pipeline crossing. However, implementing the proposed EPMs should restore the riparian area and its functional level in the long-term, except where vegetation that could affect infrastructure (such as trees growing into powerlines or deep roots interfering with the buried pipeline) would be managed for long-term project maintenance and safety accessibility vegetation, which would be considered a permanent effect.

Construction activities associated with the Proposed Project could also pose a hazard to hydrological function at riparian area crossings, in particular the Kanab Creek crossing. Clearing of vegetation along the LPP corridor and grading the soil to prepare for installation of the pipeline would temporarily lead to increased erosion and sedimentation in drainages in the vicinity of the Proposed Project. Improper staging of construction equipment or accumulation of project waste could result in surface runoff of petroleum or other contaminants into nearby waterways or drainages. Construction of open cut crossings disturbs channel banks and the canyon walls in Kanab Creek, which would likely increase sediment loading downstream. Blasting of shallow bedrock could temporarily increase turbidity in groundwater cells, which could then be discharged into nearby drainages. Each of these effects would be mitigated to the extent possible with the proper implementation of EPMs. However, even with the implementation of EPMs, hydrologic function of the Kanab Creek riparian area would likely be affected. Effects from constructing the pipeline across the deep canyon at the Kanab Creek crossing for this alternative would likely be difficult to mitigate, and the potential exists for substantial erosion and siltation into the creek during construction. In addition, reclamation would be difficult due to the steepness of the canyon, resulting in the potential for long-term erosion and siltation into Kanab Creek which could affect hydrologic function of the riparian area. Monitoring revegetation to meet success criteria of the Proposed Project restoration plan would be required annually for several years, using such data to make corrections where the restoration may not be trending toward meeting those success criteria.

It is anticipated that 9.05 acres of jurisdictional waters would be affected by the Proposed Project (Southern Alternative). Effects on jurisdictional waters would be temporary, with no permanent loss of function or values occurring. Temporary effects would not affect areas of open water, except where pipeline crossings occur through perennial streams (e.g., the Paria River and La Verkin Creek). Effects may include vegetation loss, soil and hydrologic processes disturbance, sedimentation, and water quality effects. These would be minimized by the implementation of EPMs.

Resource Management Plan Amendment

RMPA Sub-alternative 1

Under RMPA Sub-alternative 1, no changes to the size of the ACEC are proposed. This sub-alternative proposes an amendment to Decision No. MA-LR-06 so that new land use authorizations could be allowed in the ACEC even when another reasonable alternative exists. Any new land use authorization approved would have the potential for adverse effects to ACEC values but would also include mitigation for any effects to sensitive resources. While the proposed amendment to MA-LR-06 would require mitigation for effects from new land use authorizations such as the Proposed Project, disturbance to the Kanab Creek and Bitter Seeps Wash riparian areas would still occur, and riparian resources would be lost in at least the short term due to pipeline installation until restoration activities described in the EPMs are successful.

RMPA Sub-alternative 2

Potential effects under this sub-alternative would result in similar effects as RMPA Sub-alternative 1. However, the size of the ACEC would be reduced by 905 acres, with no specific provisions for mitigation from new land use authorizations (including the Proposed Project) in the area excluded from the ACEC. Construction and O&M of the LPP would result in direct effects to riparian vegetation, as well as indirect effects to riparian resources from sedimentation and erosion as vegetation is removed. EPMs would mitigate effects to the extent possible.

RMPA Sub-alternative 3

Effects to riparian resources under this sub-alternative would be similar to those described for RMPA Sub-alternative 1. In addition, the portion of the ACEC overlapped by the utility corridor would no longer be an avoidance area for new land use authorizations, which could increase the likelihood of land use authorizations within the corridor with associated effects to resources. However, this sub-alternative would result in a net decrease of 175.5 acres within the ACEC that is overlapped by the utility corridor (no change in the size of the ACEC would occur). Thus, these lands would no longer be identified as an area where new ROWs are encouraged, potentially decreasing the likelihood of effects to riparian resources from potential new land use authorizations.

Mitigation Measures

Minor changes to the EPMs should be implemented in order to meet agency-specific goals and objectives for management of wetlands and riparian resources. These recommended changes to EPMs are listed in Appendix C-14, Wetland and Riparian.

In addition to the EPMs and the Proposed POD, the construction methods for the Southern Alternative would ultimately be determined in coordination between UBWR and the applicable jurisdictional agency during final design stages in order to reduce effects to riparian areas and jurisdictional waters.

3.12.2.3 Highway Alternative

The Highway Alternative would produce permanent and temporary unavoidable adverse effects on riparian areas and jurisdictional waters because of construction and O&M activities. Unavoidable adverse effects would include short-term loss of riparian vegetation where the pipeline crosses the resource and short-term loss of some system functions as a result of clearing riparian vegetation where work activities would occur, but are not needed for long-term O&M of the pipeline and associated infrastructure, and are subsequently reclaimed. Permanent effects would result from areas where impervious surface (e.g., concrete pads) would be installed. As with the Southern Alternative, permanent effects would result from areas within the ROWs where vegetation would be managed through removal or restrictions on height (e.g., under transmission wires and directly over the pipeline). Proposed EPMs should be effective in reducing these effects, and none are predicted to be significant. A total of 2.67 acres of riparian area would be affected from the Highway Alternative; an estimated 8.73 acres of jurisdictional waters would be affected from the Highway Alternative.

Mitigation Measures

The same minor changes to the EPMs listed for the Southern Alternative should also be implemented for the Highway Alternative.

3.12.2.4 Comparative Analysis of Alternatives

Construction activities associated with the Proposed Project could pose a hazard to hydrological function at riparian area crossings, in particular the Kanab Creek crossing. While Kanab Creek would be crossed under both alternatives, the crossing under the Highway Alternative is in an area where the drainage is very shallow, narrow, and contains little riparian vegetation; this is in contrast to the Southern Alternative Kanab Creek crossing, which is much deeper, wider, and contains well established riparian vegetation that also provides habitat for the endangered southwestern willow flycatcher. The potential for effects (both direct and indirect) is reduced for the Highway Alternative as compared to the Southern Alternative.

In terms of effects to jurisdictional waters, there is little difference between the two alternatives. Under the Southern Alternative, 2.97 acres of riparian area and 9.05 acres of jurisdictional waters would be affected. Under the Highway Alternative, 2.67 acres of riparian area and 8.73 acres of jurisdictional waters would be affected.

3.13 Special Status Plants

3.13.1 Affected Environment

Special status plant species are plant species identified by the BLM as Sensitive Species and for the NPS these are as species in need of protection through conservation measures. The Tribe provided a list of Plants of Cultural Concern, which have significant importance to the Tribe (Stoffle 2020). Noxious weed and invasive plant species are any plant designated by a federal, state, or county government as injurious to public health, agriculture, recreation, wildlife, or property. More specifically, invasive plant species are not native to an area in which they become established, altering a vegetation community. Plant species protected by the USFWS under the ESA are analyzed in Appendix C-18, Threatened and Endangered Species.

3.13.1.1 Regulatory Framework and Methodology

Special status plant species include the BLM designated sensitive species, NPS species of concern, and Tribal designated species of cultural concern. Plants identified by the Tribe include only those species of importance and interest to their culture, so some of those species may be abundant within the Proposed Project ROWs. Each of these entities/agencies has responsibility for management of special status plant species and their habitat on lands that they manage. In particular, actions authorized by the BLM and NPS must not contribute to the listing of these species. Listed below are laws and policies applicable to BLM and NPS management of special status species.

- BLM Special Status Species Management Policy Manual 6840 (BLM 2008a) provides management direction and guidance for the conservation of special status species and their habitats. Under this policy, special status species include animal and plant species listed as threatened or endangered, proposed for listing, or candidates for listing under the provisions of the ESA; those listed as sensitive species by a state; and those listed by a BLM state director as sensitive. However, for the Proposed Project, only state-identified and BLM state director-identified species are applicable. Plant species listed for protection under the ESA are addressed in Appendix C-18, Threatened and Endangered Species. BLM Resource Management Plans provide overall direction for management of resources on lands the agency administers, including special status plants. Those RMPs will be used to manage potential effects to special status plant species as conformance with the RMPs are required by the BLM. Such management measures would be in addition to measures identified in this report as proposed by the Project Proponent and any mitigation requirements.
- NPS Organic Act, passed in 1916 (16 USC 1), established the NPS as an agency under the direction of the Secretary of the Interior with the stated purpose of promoting use of national park lands while protecting them from impairment. Specifically, the Act declares that the NPS has a dual mission, both to conserve park resources and provide for their use and enjoyment “in such a manner and by such means as will leave them unimpaired” for future generations (16 USC 1).
- NPS Management Policies 2006 sets the framework and provides direction for all management decisions relating to national park lands. This document states the NPS “will use all available authorities to protect lands and resources within units of the national park system.” NPS personnel are required to be knowledgeable about and adhere to laws, regulations, and policies pertinent to NPS management included in this document.
- NPS Director’s Order 12 (DO-12 and Handbook; 66 FR 7507) describes the NEPA process and describes the responsibility of the NPS regarding participation in or coordination of NEPA procedures for actions occurring on NPS-managed land. This order outlines the NPS’s requirement of affirmatively stating whether impairment (as defined by the Organic Act and the 2006 Management Policies document) to park resources would result from a proposed action and provides guidelines for assessing intensity of effects.

The State of Arizona operates a program regulating activities that could affect native plant species. This program is administered by the state Department of Agriculture, Environmental Services Division (Arizona Administrative Code Title 3, Chapter 3, Article 11). Such species are known as highly safeguarded native plants that are organized into four categories identified as Appendices A through D in the Arizona Administrative Code. Activities that remove and/or salvage highly safeguarded native plants may require a permit(s) from the Environmental Services Division. The State of Utah does not regulate native plant species removal or salvage.

Noxious Weeds and Invasive Plant Species

Restoration treatments are an integral part of control and management of future invasions of invasive species, and to prevent further harm to sensitive plants and animals from disrupted local ecosystem function. Executive Order 13112 Section 2(a)2 charges federal agencies to “provide for restoration of native species and habitat conditions in ecosystems that have been invaded.”

Following this requirement, weed species must be managed during pre-construction, construction and post-construction periods to assure that further invasions are prevented or limited to the greatest extent practicable. In other words, by requiring protection measures for special status plant species, by extension, weed plant species must be controlled simultaneously.

- The Carlson-Foley Act (43 USC 1241) directs federal land-management agencies to destroy noxious weeds growing on land under their jurisdiction and provides a legal framework for reimbursement of expenses to state or local agencies for weed control on federal land.
- Federal Noxious Weed Act of 1974 (Public Law 93-629) (76 USC 2801 et seq.) directs the management of undesirable plants on federal lands, including prohibiting the transport of noxious weeds into the United States and between states. This legislation also outlines how noxious weed infestations are to be quarantined and controlled on federal lands. BLM resource management plans provide overall direction for management of resources on lands the agency administers, including noxious weeds and invasive species. The BLM maintains data on the locations, approximate quantities, and management of noxious weed populations. Applicable resource management plan management direction for the Proposed Project where it occurs on BLM-managed lands include the resource management plan decisions regarding noxious weed/invasive species for the Arizona Strip Field Office, St. George Field Office, Kanab Escalante Planning Area, and Kanab Field Office.
- BLM Manual 1740-1 – Integrated Vegetation Management (2008b) and BLM Manual 1740-2 – Renewable Resource Improvement and Treatment Guidelines and Procedures (1987) outline policies, objectives, and standards focused primarily on planning, analyzing, constructing, maintaining, replacing, or modifying renewable resource improvements and treatments such as for forestry, invasive species, and range management.
- NPS Organic Act of 1916, (54 USC 100101 et seq.) as amended, established the NPS as an agency under the direction of the Secretary of the Interior with the stated purpose of promoting use of national park lands while protecting them from impairment. Specifically, the Act declares that the NPS has a dual mission, both to conserve park resources and provide for their use and enjoyment “in such a manner and by such means as will leave them unimpaired” for future generations (16 USC 1).
- NPS Management Policies 2006 sets the framework and provides direction for all management decisions relating to national park lands. This document states the NPS “will use all available authorities to protect lands and resources within units of the national park system” (2006). NPS personnel are required to be knowledgeable about and adhere to laws, regulations, and policies pertinent to NPS management included in this document.
- NPS Director’s Order 12 (DO-12 and Handbook; 66 FR 7507) describes the NEPA process and describes the responsibility of the NPS regarding participation in or coordination of NEPA procedures for actions occurring on NPS-managed land. This order outlines the NPS’s requirement of affirmatively stating whether impairment (as defined by the Organic Act and the 2006 Management Policies document) to park resources would result from a proposed action and provides guidelines for assessing intensity of effects.

- The states of Arizona (AAC Title 3, Chapter 4) and Utah (Utah Noxious Weed Act, Utah Administrative Code R68-9) operate programs to manage and control the spread of noxious and invasive plant species. Arizona regulates through two state agencies, the Department of Agriculture and the Department of Forestry and Fire Management, in cooperation with the U.S. Department of Agriculture (USDA). Utah regulates its program through the State Department of Agriculture and Food. Both states operate their programs in two main ways: (1) providing a list of noxious weeds and invasive plant species that require regulation; and (2) permit individuals and companies that treat such species with herbicides (i.e., applicator license).

Short-term effects are defined as lasting five years or less, and long-term effects are effects lasting longer than five years. Analysis considerations for noxious weeds and invasive species include the extent of land potentially disturbed by the Proposed Project's construction and O&M activities and the extent of noxious weed-infested land potentially disturbed by the Proposed Project. Invasive species and noxious weeds are a threat to native vegetation communities and wildlife species and their habitats. Effects on invasive species are beneficial if their prevalence is decreased or, at worst, maintained, and adverse if their prevalence increases due to a project.

Much of the data collected and partially analyzed for this resource assessment was provided by the Project Proponent, which conducted comprehensive surveys and collected other data to produce supporting documents (UBWR 2016a, 2016b). The area of analysis is defined as the Proposed Project's alternative alignments construction ROW areas; other facilities associated with the pipeline include hydrostations (i.e., power generating stations); electrical transmission lines; booster pump stations and construction staging areas. The plant species survey was conducted simultaneously as a comprehensive effort to record vegetation community data as well. Survey corridors were established based on the pipeline or electrical transmission center line, extending 150 feet on either side for a 300-foot-wide total width; or for areas with greater potential for special plant resources, 300 feet on either side of the center line for a 600-foot-wide total width. Generally, the 300-foot-wide corridors occurred between Lake Powell and the Cockscomb, and west of the Hurricane Cliffs extending northward to the Proposed Project terminus near Sand Hollow Reservoir. All other linear elements had a 600-foot-wide survey corridor.

However, since this data was initially collected, the Project Proponent has further refined the proposed construction area, therefore, data analyzed in this document is based on the known construction footprint rather than the initial survey widths. This approach provides a more accurate understanding of LPP effects, whereas basing those effects on a 300- and 600-foot pipeline corridor width would substantially overestimate those effects, producing inaccurate results and analysis.

A preliminary survey of areas likely to support special status plants was conducted in 2008. In 2009, the survey area represented the entire Proposed Project alternative alignments and surveys were conducted for special status plants, noxious weeds, and vegetation communities. Additionally, surveying was conducted in 2010 to address route refinement (see LPP Final Study Report 15 – Vegetation Communities UBWR [2016b]).

Furthermore, the proposed Dixie Springs Electric Transmission line corridor, which occurs at the western terminus of both proposed route alternatives, was rerouted to the west side of Sand Hollow Reservoir in March 2020. Because this is a late reroute, there was no time to perform plant species surveys due to time constraints, and, moreover, winter plant surveys would not produce a comprehensive result based on plants being dormant. Plant surveys will be conducted prior to construction (see Section 2.2.1, above).

3.13.1.2 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

Refer to Appendix B of the POD for EPMs (UDWRe 2020; provided herein as Appendix E, Plan of Development). The following EPMs may reduce adverse effects on special status plants species including those listed in B.5. (Biological Resources), particularly B.5.8 through B.5.13. EPMs that would reduce the potential for spread of invasive species/noxious weeds include B.1.76 through B.1.82. EPMs for other resources may provide additional benefits such as those identified for Stormwater and Erosion Control, Restoration, Noxious Weeds, Water Resources, and Air Quality.

3.13.1.3 Existing Conditions

Before surveys were completed, many different species of special status plants were identified as potentially occurring in the Project Area (Table 3.13-1; Appendix C-13, Special Status Plants) Of the species potentially occurring in the area, only six special status species were documented during field surveys. These included smooth catseye (*Cryptantha semiglabra*), Kanab's barrel cactus (*Echinocactus polycephalus* var. *xeranthemoides*), Cutler's spurred lupine (*Lupinus caudatus* var. *cutleri*), Kane breadroot (*Pediomelum epipsilum*), nipple phacelia (*Phacelia mammillariensis*), and Atwood's pretty phacelia (*Phacelia pulchella* var. *atwoodii*). Special status plant species also include 138 species identified as culturally important to the Tribe.

Noxious weed surveys were completed for the Proposed Project in 2010 as presented in the LPP Final Study Report 12 – Special Status Plant Species and Noxious Weeds (UBWR 2016a). The survey for noxious and invasive weeds confirmed the presence of 16 taxa including red brome (*Bromus rubens*), cheatgrass (*Bromus tectorum*), red stem fillaree (*Erodium cicutarium*), Russian thistle (*Salsola tragus*), tamarisk (*Tamarix species*), poison milkweed (*Asclepias subverticillata*), field bindweed (*Convolvulus arvensis*), Russian olive (*Elaeagnus angustifolia*), halogeton (*Halogeton glomeratus*), Scotch thistle (*Onopordum acanthium*), common purslane (*Portulaca oleracea*), puncturevine (*Tribulus terrestris*), jointed goatgrass (*Aegilops cylindrica*), African or Saharan mustard (*Brassica tournefortii*), Johnsongrass (*Sorghum halepense*), and Siberian elm (*Ulmus pumila*).

Table 3.13-1 Total Special Status Plant Species Potentially Occurring in the Proposed Alternatives

BLM	NPS	Tribe		
		Southern ^(a)	Highway ^(a)	APE ^(a)
25	16	44	61	138

Notes:

(a) This value represents a minimum number of species identified by the Tribe as potentially occurring. The area of potential effect represents a geographic area substantially larger than the alternatives Project Areas combined.

Key:

APE = area of potential effect

BLM = Bureau of Land Management

NPS = National Park Service

Tribe = Kaibab Band of Paiute Indians

3.13.2 Environmental Consequences

3.13.2.1 No Action Alternative

Under the No Action Alternative, no construction would occur; therefore, there would be no direct or indirect effects on special status plant species and there would be no additional potential for the spread of noxious weeds and invasive plant species. Current resource conditions would continue under the No Action Alternative; however, unrelated planned projects under current and future authorizations and land uses may affect special status plants and may contribute to presence of noxious weeds and invasive species within the ROWs.

3.13.2.2 Southern Alternative

The construction and O&M of the Southern Alternative would result in both direct and indirect effects on special status plants due to construction of Proposed Project features and actions, such as vegetation clearing, soil excavation, and stock piling of soil materials. The disturbance associated with construction and O&M activities can lead to invasive species and noxious weed invasion, persistence, and spread.

Five special status plants (BLM Sensitive and NPS; Table 3.13-2) were documented during the 2009/2010 survey effort along the Southern Alternative. Construction of permanent features including access roads are likely to involve actions such as vegetation clearing, soil excavation, piling of soil materials, increased vehicle, equipment, and human traffic, which could result in losses of individual plants and degradation of habitat. Effects may include increased erosion, dust deposition, and spread of invasive species and noxious weeds. Indirect effects as a result of soil disturbance and vegetation removal increases the potential for colonization of invasive species and noxious weeds, which could affect special status plants and their habitats through competition and increased fire regimes (as can be seen with cheatgrass). Drift of herbicides associated with treatment of noxious weeds within the ROWs may inadvertently cause mortality to special status plants. Increased access on new and existing access roads could result in dust deposition, which could inhibit photosynthesis, reproductive ability, and various metabolic processes for individual plants. Increased access in the ROWs could also increase potential for illegal collection of commercially desirable special status plants.

Table 3.13-2 Special Status Plant Species Observed Along Southern Alternative

Southern Alternative	Number of Plants Found in Lake Powell Pipeline Project Right-of-Way	
	BLM	NPS
Kanab barrel cactus (<i>Echinocactus polycephalus</i> var. <i>xeranthemoides</i>)	9	-
Cutler's spurred lupine (<i>Lupinus caudatus</i> var. <i>cutleri</i>)	53	-
Kane breadroot (<i>Pediomelum epipsilum</i>)	5,339	-
Nipple phacelia (<i>Phacelia mammalariensis</i>)	1	1,687
Atwood's pretty phacelia (<i>Phacelia pulchella</i> var. <i>atwoodii</i>)	1,351	-

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Invasive species and noxious weed occurrences and concentrations were similar along both the Southern Alternative and Highway Alternative (see LPP Final Study Report 15 – Vegetation Communities [UBWR 2016b]). In general, concentrated areas of these species would be identified preconstruction so control measures can be specifically targeted. Beyond that, EPMs require that efforts be made to prevent spread and introduction of these species in areas where they are not substantially established. This is an important consideration for a linear project as construction activities can readily spread these species over considerable distances. To address this substantial concern, the Project Proponent is proposing EPMs that include an Integrated Weed Management Plan be prepared and submitted to state and federal agencies. EPMs would also require heavy equipment be inspected prior to entering the construction ROW. Additionally, these measures would include frequent off-site equipment cleaning to minimize spreading these species and use of certified weed-free materials. Collectively, these measures would represent a practicable way to manage the spread of noxious weeds and invasive plant species.

Although the Southern Alternative would avoid the KIR, effects on these plant species are considered. As with the BLM and NPS special status plant species, the Tribe's species are expected to be affected in the same manner. This includes construction activity effects as well as the proposed EPMs for reestablishing plant species and vegetation communities during the post-construction ROW restoration period. Furthermore, some of these species are expected to receive additional protection measures via the State of Arizona native plant species rules. Therefore, although these species would be affected through construction-related activities associated with the Southern Alternative, they would be reestablished to the same extent as other special status plant species. The Southern Alternative may affect 44 plants that are culturally important to the Tribe.

Overall, the proposed EPMs provide effective and practical methods to avoid, minimize, or reduce construction effects. Construction and O&M associated with the Southern Alternative and application of the EPMs would not result in more than minor direct and indirect effects on special status plants and would not be expected to affect the only known populations of any of these species.

The Proposed Project as it relates to the effects of climate change would have no direct effect on special status plants, noxious weeds and invasive plant species. Conversely, a potential indirect adverse effect could occur during the ROW restoration period. The Project Proponent has proposed, through an EPM, that “vegetation may be watered;” however, successful restoration would likely require seed broadcasting, replanting of salvaged plants, and a reliable water source. Relying solely on natural precipitation and stormwater runoff would reduce the probability of success. These effects would be exacerbated if climate change resulted in less precipitation.

Mitigation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of special status plant resources.

- The Project Proponent has proposed comprehensive EPMs that would address vegetation community restoration and specific measures to address special status plants, noxious weeds and invasive plant species, throughout the Proposed LPP, where no impervious surfaces or open water storage would be installed. Although such measures would assist restoration, they may not be enough to achieve success. Reclamation requires additional mitigation measures to assist with restoration success. These measures are presented below:
 1. Identify areas where watering may not be practicable to address potential alternative measures.
 2. Aside from topsoil segregation and replacement, the Project Proponent has indicated that excess soil material will be redistributed across the affected cleared Proposed LPP ROW areas post-construction to a depth estimated at increasing the ROW grade by 6.4 inches. The Project Proponent shall ensure that excess soil material is not placed on the topsoil where redistributed.

In addition, the Project Proponent’s EPMs proposed special status plant surveys where these species have been identified during the previous survey effort; however, limiting surveys could result in special status plants outside of those areas going undetected. The following measures are proposed:

1. Pre-project habitat assessments will be completed across 100% of the Proposed Project disturbance area within potential special status plant habitat prior to any ground disturbing activities to determine if suitable habitat is present. Special status plant surveys will be conducted within suitable habitat to determine occupancy in accordance with agency approved methods, protocols, and reporting requirements.
2. Agency and Tribe plant lists may change over time. The Project Proponent shall coordinate with BLM, NPS, and the Tribe to acquire a current list of these species before initiating surveys described above.

3.13.2.3 Highway Alternative

Effects on special status plants, noxious weeds and invasive plant species resulting from the proposed Highway Alternative would be similar to those of the Southern Alternative. Therefore, the analysis in Section 3.13.2.2, above, is applicable to the Highway Alternative.

Along the Highway Alternative, the 2009/2010 survey effort documented three special status plants, including Cutler's spurred lupine, Kane breadroot, and nipple phacelia (see Table 3.13-3). There are 61 plants that are culturally important to the Tribe that have been identified along the Highway Alternative that may be affected by construction and O&M (see Supplement #1 in Appendix D, Analysis and Perspective of the Tribes).

Table 3.13-3 Special Status Plant Species Observed Along Highway Alternative

Highway Alternative	Number of Plants Found in Proposed Project Right-of-Way		
	BLM	NPS	KIR
Cutler's spurred lupine (<i>Lupinus candatus</i> var. <i>cutleri</i>)	53	-	-
Kane breadroot (<i>Pediomelum epipsilum</i>)	5,302	-	30
Nipple phacelia (<i>Phacelia mammalariensis</i>)	1	1,687	-

Key:

BLM = Bureau of Land Management

KIR = Kaibab Indian Reservation

NPS = National Park Service

Mitigation Measures

Mitigation measures identified for the Southern Alternative would also apply to the Highway Alternative.

3.13.2.4 Comparative Analysis of Alternatives

Due to the scale and complexity of the Proposed Project, differentiating potential effects from the Southern and Highway Alternatives is difficult. However, one exception needs to be considered. The Highway Alternative has the potential to affect more plant species that are of cultural concern to the Tribe than the Southern Alternative. For plant species occurring on the KIR, there may be additional protections requested by the Tribe that would apply to the reservation. Based on surveys for special status plants and invasive species/noxious weeds, and excluding plants of cultural concern, effects between the two action alternatives would be similar.

3.14 Sensitive Species – Fish and Wildlife

3.14.1 Affected Environment

This section provides a summary of the sensitive wildlife species that may occur or could be affected with implementation of the Highway Alternative, Southern Alternative, and No Action Alternative. Sensitive species in this section include those that are listed as sensitive by the BLM, species of greatest conservation need identified in Arizona and Utah wildlife action plans, and those identified as rare species in the Glen Canyon National Recreation Area. Species listed under ESA are analyzed in Section 3.15, Threatened and Endangered Species and Appendix C-18, Threatened and Endangered Species, and the effects on general fish and wildlife are analyzed in C-16, General Fish and Wildlife. A discussion of cumulative effects is provided in Appendix C-25, Cumulative Effects.

3.14.1.1 Regulatory Framework and Methodology

Detailed information is provided in Appendix C-17, Sensitive Species – Fish and Wildlife Species. Sensitive species discussed in this section include those species that are listed as sensitive by the BLM in Arizona and Utah, species of greatest conservation need identified in Arizona and Utah wildlife action plans, and GCNRA rare species. Sensitive species are managed consistent with BLM resource management plans, BLM Special Status Species Management Policy Manual 6840, NPS Organic Act of 1916, (54 USC 100101 et seq.) as amended, NPS Management Policies 2006, NPS Director’s Order 12, and State Wildlife Action Plans. Federal regulations protecting various species of avian species include the Migratory Bird Treaty Act of 1918 as amended and the Bald and Golden Eagle Protection Act. The geographic scope of data collected for sensitive fish and wildlife included information within a 6-mile-wide corridor of both action alternatives (i.e., 3 miles on either side of a reference centerline). The Project Proponent completed a variety of Study Reports for the Proposed Project. In addition to these resources, agency personnel were coordinated with to identify specific species’ ranges, known locations, relevant literature, agency publications, and online databases.

The methodology used to assess potential effects to sensitive species was: (1) identifying the types of potential effects on sensitive species that could result from construction and O&M of the proposed pipeline and associated facilities, as well as effects associated with a water delivery contract downstream of Flaming Gorge Reservoir downstream in the Green and Colorado Rivers and return flows associated with municipal and agriculture use in the Virgin River; (2) assessing the level and extent of initial effects on sensitive species at the individual or population level; (3) identifying appropriate mitigation measures and; (4) disclosing the level of potential residual effects on sensitive species. Table 3.14-1 lists potential effects identified for analysis on sensitive species during scoping or in coordination with agency personnel.

Table 3.14-1 Sensitive Species Effects Identified for Analysis

Type of Effect	Analysis Consideration (Construction, Operation, and Maintenance)
Injury and mortality: direct injury or mortality and loss of individuals; indirect mortality as a result of disturbance, contaminants, and increased predation; injury/mortality as a result of electrocutions/collisions; increased predation	<p>Construction activities: destruction of dens or nests and mortality due to vehicles collisions, crushing of individuals, increased stress from presence of construction activities, introduction of contaminants or invasive species, increased predators as a result of construction waste, increased predators as a result of ROW disturbance</p> <p>Operation and maintenance activities: flight collisions and electrocutions with transmission lines, predators perching on transmission lines, increased pressure on prey populations, noise and human activity</p>
Habitat loss/fragmentation/degradation: extent of habitat potentially affected by the Proposed Project	<p>Construction activities: vegetation removal, dust generation, acres of permanent and temporary disturbance, invasive species/noxious weeds</p> <p>Operation and maintenance activities: ground-disturbing activities</p>

Table 3.14-1 Sensitive Species Effects Identified for Analysis (continued)

Type of Effect	Analysis Consideration (Construction, Operation, and Maintenance)
Reproductive effects/function/health/ resilience: displacement of wildlife from noise and human activity during construction, introduction of non-native species and predation, changes to predator populations that may affect prey populations	Construction activities: blasting, vegetation removal and worker activities, disturbance from vehicles and equipment, herbicide use for invasive/noxious species Operation and maintenance activities: noise and human activity, increased predation from predators perching on transmission lines, predators using pipeline ROW as a corridor, herbicide use for invasive/noxious species
Corridors and barriers:	Construction activities: trenches Operation and maintenance activities: facilities/fences that may cause barriers to sensitive species movements
Aquatic invasive species/non-native fish:	Operation and maintenance activities: potential transportation of aquatic invasive species and non-native fishes to the Virgin River system

Key:

ROW = right-of-way

3.14.1.2 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

Refer to EPM B.5, Biological Resources, in Appendix B of the POD for EPMs that may minimize adverse effects, which include B.5.1 through B.5.7, B.5.57 through B.5.70, B.5.77, B.5.78, and B.5.85 (UDWRe 2020; provided herein as Appendix E, Plan of Development).

3.14.1.3 Existing Conditions

Sensitive species are usually rare within at least a portion of their range. There are 42 sensitive species that are known to occur or have potential to occur within the analysis area. Refer to Appendix C-17, Sensitive Species – Fish and Wildlife for a detailed account of each species, which is summarized in Table 3.14-2.

Table 3.14-2 Summary of Sensitive Species Habitat Within the Analysis Area

Common Name (Scientific Name)	Status	Habitat
Monarch butterfly (<i>Danaus plexippus plexippus</i>)	BLM-AZ BLM-UT	The monarch butterfly is currently under status review by the USFWS. A petition was submitted in 2014 to list the species under ESA. Monarchs are found throughout the United States where milkweeds (<i>Asclepias</i> spp.) occur. Threats identified in the petition to list the species from the Center for Biological Diversity include loss and degradation of habitat and loss of milkweed resulting from herbicide application, conversion of grasslands to cropland, loss to development and aggressive roadside management, loss of winter habitats from logging, forest disease, and climate change (https://ecos.fws.gov/docs/petitions/92210//730.pdf). In the analysis area, monarchs are likely to be found where milkweed species are present including Welsh's milkweed, which is a federally threatened species, and poison milkweed, a noxious weed that may occur near the analysis area.
Western bumblebee (<i>Bombus occidentalis</i>)	BLM-UT	The western bumblebee was common and widespread throughout the western United States; however, it has undergone declines throughout its range. Threats include pests and disease, habitat destruction or alteration, pesticide use, invasive species, and climate change (https://xerces.org/endangered-species/species-profiles/at-risk-bumblebees/western-bumble-bee). In the analysis area, western bumblebees are likely to be rarely encountered in areas where there are flowering plants and crops.
Bluehead sucker (<i>Catostomus discobolus</i>)	BLM-AZ BLM-UT AZ-SGCN UT-SGCN CA	The range of the bluehead sucker extends beyond the Colorado River Basin to the Upper Snake (Idaho), Weber (Wyoming), and Bear (Utah) Rivers and is managed under a range-wide conservation agreement (UDWR 2006). The bluehead sucker occurs in small or mid-sized tributaries. It was historically widely distributed in the mainstem of the Colorado River above the mouth of the Grand Canyon in mainstem and tributaries and has declined from 45 to 60% of its historical range (Bezzarides and Bestengen 2002). Threats include water diversions and barriers to movement, invasion of non-native fish, and concerns with hybridizing. Within the analysis area, it has been found in tributaries to the Lower Colorado River Basin, including Paria River and Kanab Creek, and within the Upper Colorado River Basin in the mainstem and tributaries to Green and Colorado Rivers up from Lake Powell. For detailed information and maps, refer to the 2002 Status Review (Bezzarides and Bestengen 2002) and conservation agreements (AZGFD 2006, UDNR 2006).

Table 3.14-2 Summary of Sensitive Species Habitat Within the Analysis Area (continued)

Common Name (Scientific Name)	Status	Habitat
Desert sucker (<i>Catostomus clarki</i>)	BLM-AZ BLM-UT AZ-SGCN UT-SGCN	The desert sucker is endemic to the Colorado River Basin, preferring riffles, rapids, and flowing streams with gravelly bottoms. The desert sucker occurs in the Lower Colorado River Basin, below the Grand Canyon, particularly in the Bill Williams, Salt, Gila, and San Francisco River drainages and in the Virgin River drainage, which includes the pluvial White River and Meadow Valley Wash (AZGFD 2002a). Threats include water development, dewatering and depletions, and predation by non-native fish (UDWR 2017). Within the analysis area, desert sucker occurs in the Virgin River drainage.
Flannelmouth sucker (<i>Catostomus latipinnis</i>)	BLM-AZ BLM-UT AZ-SGCN UT-SGCN	The flannelmouth sucker is endemic to the Colorado River Basin and is managed under a range-wide conservation agreement (UDWR 2006). It is commonly found in most medium to large, lower elevation rivers of the Upper Colorado River drainage and in lesser numbers in similar habitats in the lower Colorado River drainage. Within the analysis area, flannelmouth sucker occurs in the Colorado River from Lake Powell upstream into Colorado, in the main channel of the Colorado River below Glen Canyon Dam, and in the Virgin River, Paria River, and Kanab Creek (Bezzarides and Bestengen 2002). The Paria River is an important spawning stream for the flannelmouth sucker (UDWR 2006, AZGFD 2002b) and it uses the river only seasonally for spawning and early rearing. Spawning has been documented in the Paria River upstream of its confluence with the Colorado River in the Grand Canyon National Park (AZGFD 2002b). Juvenile flannelmouth suckers may remain in the Paria River until flooding flushes them into the Colorado River. Detailed information on flannelmouth sucker occurrence in Kanab Creek is not available.
Speckled dace (<i>Rhinichthys osculus</i>)	BLM-AZ AZ-SGCN	Speckled dace are native to all major western drainages from the Columbia and Colorado Rivers south to Sonora, Mexico. In Arizona, speckled dace are found in the Colorado, Bill Williams, and Gila River drainages, preferring rocky riffles, runs and pools at headwaters, creeks and small to medium rivers. Threats are similar to the other species including dewatering and diversion and non-native species. Speckled dace are widely distributed in Arizona and Utah (AZGFD 2002c). In the analysis area, speckled dace has been documented in the lower Paria River, which is an important spawning stream for the species and the Virgin River and its tributaries.

Table 3.14-2 Summary of Sensitive Species Habitat Within the Analysis Area (continued)

Common Name (Scientific Name)	Status	Habitat
Roundtail chub (<i>Gila robusta</i>)	BLM-AZ BLM-UT AZ-SGCN UT-SGCN CA	In 2003, a distinct population segment (DPS) of roundtail chub in the Lower Colorado River Basin was petitioned to be listed and in 2015 it was proposed to be listed as threatened (80 FR 60753); however, USFWS reopened the comment period on the proposed rule citing significant new information on the taxonomic status (81 FR 75801). The proposed rule to list the Lower Colorado River Basin roundtail chub as threatened was withdrawn stating the roundtail chub DPS is not a discrete taxonomic entity and does not meet the definition of a species under ESA (82 FR 16981). Roundtail chub is managed under a conservation agreement and strategy (UDWR 2006). Roundtail chub were historically common throughout the Colorado River Basin in mainstem and tributary streams (Bezzlerides and Bestengen 2002). In the Lower Colorado River basin, extant populations exist in the Upper Gila, Bill Williams, Verde, and Little Colorado drainages. In the Upper Colorado River Basin, the species occupies about 45% of their historic range (Bezzlerides and Bestengen 2002) in the Colorado and Green Rivers and major tributaries (UDWR 2006). In the analysis area, roundtail chub is expected in the mainstem of the upper Colorado River and mainstem and larger tributaries.
Arizona toad (<i>Anaxyrus microscaphus</i>)	BLM-AZ BLM-UT AZ-SGCN UT-SGCN	The Arizona toad is currently undergoing a status review by the USFWS. The Arizona toad inhabits streams, washes, irrigated crop lands, reservoirs, and uplands adjacent to water. Habitat includes desert, grassland, and agriculture. It breeds in shallow water after rains during spring and summer months. Suitable habitat for Arizona toad occurs within the analysis area. It has been documented in the Virgin River drainage and near Colorado City within the analysis area in Utah and is likely to occur in similar habitats in Arizona though it has not been documented.
Northern leopard frog (<i>Rana pipiens</i>)	BLM-AZ AZ-SGCN UT-SGCN	Northern leopard frog breeds in a variety of aquatic habitats that include slow-moving or still water along streams and rivers, wetlands, permanent or temporary pools, beaver ponds, and human-constructed habitats such as earthen stock tanks and borrow pits. Emergent vegetation, such as sedges and rushes, are important features for breeding areas, and tadpoles are most often found in backwaters and still pools. There is suitable habitat for northern leopard frog in the analysis area and the species has been documented within the analysis area in Arizona.

Table 3.14-2 Summary of Sensitive Species Habitat Within the Analysis Area (continued)

Common Name (Scientific Name)	Status	Habitat
Common chuckwalla (<i>Sauromalus ater</i>)	BLM-UT NPS	Predominantly found near cliffs, boulders, or rocky slopes where they use rocks as basking sites and rock crevices for shelter. They can be found in rocky desert, lava flows, hillsides, and outcrops. Creosote bush occurs throughout most of its range. The analysis area is within the range for the species and has been documented within the analysis area in Utah.
Desert night lizard (<i>Xantusia vigilis</i>)	BLM-UT UT-SGCN	Found in arid and semiarid rocky terrain. In Utah, there are two subspecies. The common night lizard (<i>Xantusia vigilis vigilis</i>) is found on the Beaver Dam Slope in Washington County, and the Utah night lizard (<i>X.v. utabensis</i>) is found in Garfield and San Juan Counties (UDWR 2017). The analysis area is within the range for the common night lizard; however, there are no known occurrences.
Gila monster (<i>Heloderma suspectum</i>)	BLM-UT AZ-SGCN UT-SGCN	Preferred habitats include large rocky shelves, sandy areas, and creosote bush–sagebrush areas, less frequently found in desert-grassland, and is rare in oak woodland to 5,000 feet elevation. It is most common in undulating rocky foothills, bajadas and canyons. The analysis area is within the range for the species, and they have been documented within the analysis area in Utah near Warner Valley and Kanab.
Glossy snake (<i>Arizona elegans</i>)	NPS	Inhabits barren to sparse desert shrub, sagebrush flats, grasslands, and sandhills in sandy or loam soils with some rocks present. The analysis area is within the northernmost portion of the range for the species. There is one documented occurrence within the analysis area in Ferry Swale Allotment near Page, Arizona.
Zebra-tailed lizard (<i>Callisaurus draconoides</i>)	BLM-UT	Associated with open areas with little vegetation, washes, and desert pavement and hardpan (UDWR 2017). Distribution in Utah is southern and western Washington County, including Beaver Dam Slope, St. George, Warner Valley, Leeds, Hurricane, Virgin, and Springdale (UDWR 2017). The analysis area is within the range for the species and it has been documented within the analysis area in Utah in the Warner Valley, St. George, and Hurricane areas.
American peregrine falcon (<i>Falco peregrinus anatum</i>)	BLM-AZ AZ-SGCN UT-SGCN	Optimum habitat is associated with steep, sheer cliffs overlooking woodlands, riparian areas, agriculture areas, or other habitats that support avian prey populations. Multiple occurrences are recorded for northern Coconino and Mohave Counties. Potential nesting habitat includes cliff habitat near the Colorado River below Glen Canyon Dam at Hurricane Cliffs; however, no recorded sightings of peregrine falcon have been documented in the area of potential effect at the Hurricane Cliffs. An active eyrie has been identified north of the Proposed Project in an area known as Flag Point in Kane County, approximately 15 miles east of Kanab (LPP Final Study Report 13 – Special Status Wildlife Species [UBWR 2016]).

Table 3.14-2 Summary of Sensitive Species Habitat Within the Analysis Area (continued)

Common Name (Scientific Name)	Status	Habitat
Bald eagle (<i>Haliaeetus leucocephalus</i>)	BLM-AZ BLM-UT AZ-SGCN UT-SGCN USFWS- BGEPA	Uses areas with high water-to-land edge and areas with unimpeded views, including both horizontal and vertical aspects. Areas selected for use as wintering habitat will have an adequate food supply and have open water, such as river rapids, impoundments, dam spillways, lakes, and estuaries. Analysis area is within the non-breeding range; therefore, occurrence would be associated with winter from November to April. Important bald eagle habitat includes Lake Powell, Leeds Creek, Quail Creek, Quail Creek Reservoir, the Santa Clara and Virgin Rivers, and the Hurricane City sewer lagoons (LPP Final Study Report 13 – Special Status Wildlife Species [UBWR 2016]). The analysis area includes suitable winter foraging area; however, there are no known winter roosts.
Brewer's sparrow (<i>Spizella breweri</i>)	NPS AZ-SGCN	Nests in shrub-steppe and high desert scrub habitats.
Burrowing owl (<i>Athene cunicularia</i>)	BLM-AZ BLM-UT AZ-SGCN UT-SGCN	Occurs in open grassland and prairies, but it also uses other open situations, such as golf courses, cemeteries, and airports. The nest is in a mammal burrow, usually that of a prairie dog, ground squirrel, or badger; if a mammal burrow is not available, the owls will sometimes excavate their own nest burrow. The analysis area includes suitable habitat and burrowing owls have been documented near East Clark Bench and Pipe Valley.
Ferruginous Hawk (<i>Buteo regalis</i>)	BLM-AZ BLM-UT AZ-SGCN UT-SGCN	Inhabits grasslands, shrub steppes, and semidesert grasslands. Nesting habitat ranges from cliffs, trees, utility structures, and farm buildings to haystacks and relatively level ground. The species has been documented near West Clark Bench.
Golden Eagle (<i>Aquila chrysaetos</i>)	BLM-AZ BLM-UT AZ-SGCN UT-SGCN USFWS- BGEPA	Nests on cliffs near open country and in high desert scrub. Nests also occur in trees and on transmission towers. Golden eagles have been documented near Shinarump Cliffs.
Green-tailed Towhee (<i>Pipilo chlorurus</i>)	NPS	Occurs in dense, shrubby habitat with scattered trees (pinyon pine-juniper) or cactus. Nest in shrubs.
Lewis's woodpecker (<i>Melanerpes lewis</i>)	BLM-UT AZ-SGCN UT-SGCN	Major breeding habitat for Lewis's woodpecker consists of open, park-like ponderosa pine forests. Lewis's woodpecker is attracted to burned-over Douglas-fir, mixed conifer, pinyon-juniper, riparian, and oak woodlands, but is also found in the fringes of pine and juniper stands, and deciduous forests, especially riparian cottonwoods.

Table 3.14-2 Summary of Sensitive Species Habitat Within the Analysis Area (continued)

Common Name (Scientific Name)	Status	Habitat
Long-billed Curlew (<i>Numenius americanus</i>)	BLM-UT	Long-billed curlew nesting habitat includes several elements; short grass, a bare-ground component, shade, and vertebrate prey.
Northern Goshawk (<i>Accipiter gentilis</i>)	BLM-AZ BLM-UT AZ-SGCN	Prefers mature mountain forest and riparian zone habitats. Nests are constructed in trees in mature forests. In Arizona, goshawks nest most commonly in ponderosa pine forests along the Mogollon Rim, on Mt. Trumbull, on the Kaibab Plateau, and in Arizona pine and ponderosa pine forests in the southeastern mountains. They have been documented near Sand Gulch and Telegraph Flat.
Pinyon Jay (<i>Gymnorhinus cyanocephalus</i>)	BLM-AZ AZ-SGCN	Pinyon jay habitat preferences include mosaics of large tracts of pinyon-juniper woodlands especially those areas that contain large, mature, seed-producing pinyon pines, and relatively open structure with mixed shrubs (especially sage-brush) and grasses. Nests in pinyon-juniper and conifer habitats. Colonial nesters, with 25 or more pairs nesting in one woodland stand. Most nests are placed in ponderosa pine, pinyon pine or junipers at heights ranging from 3 to 115 feet. Pinyon-juniper woodlands are extensive in the analysis area. The presence of fledglings in large flocks of up to 40 birds seen in the Project Area indicate that successful breeding occurs.
Sage thrasher (<i>Oreoscoptes montanus</i>)	NPS	Inhabits sagebrush communities in low deserts.
Sagebrush sparrow (<i>Amphispiza belli</i>)	NPS	Nests in shrublands, grasslands, and desert habitats, often on the ground.
Short-eared owl (<i>Asio flammeus</i>)	BLM-UT	Usually found in grasslands, shrublands, and other open habitats; it nests on the ground, usually under a bush or clump of grass. Nesting may occur from March through August, with multiple broods possible.
Allen's big-eared bat (<i>Idionycteris phyllotis</i>)	BLM-AZ BLM-UT AZ-SGCN UT-SGCN NPS	Sensitive bats are likely to occur in rocky areas, riparian habitats, woodlands, and scrublands. Roost sites for many species include caves, mines, buildings, rock crevices, large snags, and under exfoliating bark. There are known occurrences for several of the bat species within the analysis area, including the Arizona myotis, Allen's big-eared bat, western small-footed myotis, fringed myotis, long-legged myotis, and Yuma myotis. In Utah, Townsend's big-eared bat has been documented in the analysis area along with a historical record of occurrence for Allen's big-eared bat.
Arizona myotis (<i>Myotis occultus</i>)	BLM-AZ AZ-SGCN	
Big free-tailed bat (<i>Nyctinomops macrotis</i>)	BLM-UT UT-SGCN NPS	

Table 3.14-2 Summary of Sensitive Species Habitat Within the Analysis Area (continued)

Common Name (Scientific Name)	Status	Habitat
Fringed myotis (<i>Myotis thysanodes</i>)	BLM-UT UT-SGCN NPS	
Greater western mastiff bat (<i>Eumops perotis californicus</i>)	BLM-AZ AZ-SGCN NPS	
Spotted bat (<i>Euderma maculatum</i>)	BLM-AZ BLM-UT AZ-SGCN UT-SGCN NPS	
Townsend's big-eared bat (<i>Corynorhinus townsendii</i>)	BLM-AZ BLM-UT AZ-SGCN UT-SGCN NPS	
Western red bat (<i>Lasiurus blossevillei</i>)	BLM-UT AZ-SGCN UT-SGCN NPS	
Western small-footed myotis (<i>Myotis ciliolabrum</i>)	NPS	
Yuma myotis (<i>Myotis yumanensis</i>)	NPS	
Long-legged myotis (<i>Myotis volans</i>)	NPS	
Houserock Valley chisel-toothed kangaroo rat (<i>Dipodomys microps leucotis</i>)	BLM-AZ AZ-SGCN NPS	Habitat for the Houserock Valley chisel-toothed kangaroo rat consists of scattered juniper in sandy areas and desert shrub habitats with sandy to rocky soils with little vegetation. The analysis area is within the predicted range model for Houserock Valley chisel-toothed kangaroo rat. There are no documented occurrences within the analysis area for this species and primary habitats where the species has been documented are located south of the analysis area in Houserock Valley.

Table 3.14-2 Summary of Sensitive Species Habitat Within the Analysis Area (continued)

Common Name (Scientific Name)	Status	Habitat
Kit fox (<i>Vulpes macrotis</i>)	BLM-UT AZ-SGCN UT-SGCN NPS	Kit fox habitat is salt desert shrub habitats with sparsely vegetated flat areas. They tend to select den sites in barren areas with silty, clay soil that are higher than the surrounding terrain that allow for digging. Kit fox have preferences for and ties to specific den sites and may use a range of different dens throughout a season. Kit fox have been documented within the analysis area.
Silky pocketmouse (<i>Perognathus flavus</i>)	NPS AZ-SGCN	Silky pocket mouse (<i>Perognathus flavus</i>) is one of the smallest pocket mice endemic to southern North America preferring valley bottoms with often sandy or loamy soils in arid and semiarid grassland, sandy, and rocky habitats. It is known to occur in the Glen Canyon National Recreation Area.

Key:

BLM-AZ = Arizona BLM Sensitive Species

BLM-UT = Utah BLM Sensitive Wildlife Species

AZ-SGCN = Arizona Species of Greatest Conservation Need

UT-SGCN = Utah Species of Greatest Conservation Need

CA = Conservation Agreement

NPS = Glen Canyon NRA

USFWS-BGEPA = USFWS Bald and Golden Eagle Protection Act

3.14.2 Environmental Consequences

The analysis assumes that all EPMs identified in Appendix B of the POD would be fully implemented to avoid, minimize, or mitigate effects (see Appendix E, Plan of Development). Short-term effects to species would not extend beyond one full year for any given sensitive species; whereas, long-term effects would extend beyond one full year and may affect more than one reproduction cycle, which could begin to have effects at the population level. For habitat, the same parameters were used as those described for vegetation communities. Short-term effects to habitat are defined as the five-year period for restoration implying that vegetation community restoration success criteria should be achieved within five years. Long-term effects to habitat would extend beyond a five-year period.

3.14.2.1 No Action Alternative

Under the No Action Alternative, the LPP would not be built; there would be no request for the LPP water exchange contract, an easement, or ROWs for the Proposed Project, and no RMPA would be required. The sensitive species analysis area would exist under current and future authorizations and land uses; therefore, effects to sensitive species and their habitats would not occur.

However, under this alternative, projects already planned by the Proponent would continue to occur. Disturbance, due to these projects, would vary in space and time. Most impacts would be short-term and project-specific, including localized effects to sensitive species and to their habitat. Most effects to sensitive species would be minimized through implementation of standard industry practices by the Proponent.

3.14.2.2 Effects Common to Both the Highway Alternative and Southern Alternative

The Proposed Project would affect vegetation communities within the Colorado Plateau and Mojave Desert ecoregions that provide suitable habitat for sensitive species under both the Highway Alternative and Southern Alternatives (hereinafter, “action alternatives”). Direct and indirect effects are not expected to result in population-level changes to sensitive species resulting in a need for federal listing under ESA. Proposed Project effects are described in detail for construction and O&M activities associated with the proposed pipeline and infrastructure as well as the LPP water exchange contract and potential return flows in Appendix C-17, Sensitive Species - Fish and Wildlife.

Injury and Mortality. Construction, and O&M activities would include localized displacement and direct mortality of some individuals along the ROWs in association with ground-disturbing activities. The use of herbicides, during O&M, to control noxious and invasive species within the ROW could affect sensitive species from contact with or ingestion of treated materials. Effects may include death, damage to vital organs, decreased body condition, and effects to young, depending on exposure and amount. Direct effects to birds during operation include risk of mortality and injury from in-flight collision and electrocution with transmission lines, which would be minimized with incorporation of Avian Power Line Interaction Committee (APLIC) guidelines. EPMs would minimize effects that could lead toward injury and mortality. Construction effects would be short term and localized to the ROWs. Effects of operating the transmission lines may be long-term and moderate but would also be localized to the ROWs. Operating transmission lines in accordance with

APLIC guidelines would reduce collision and electrocution risk and would likely not have population-level effects.

Habitat Loss, Fragmentation, and Degradation. Direct effects to sensitive species could occur from habitat disturbance as a result of cutting, clearing, and removal of vegetation, which would reduce the amount of cover, nesting, and foraging habitat available to sensitive species directly within the ROWs. Ground-disturbing activities would be done outside of sensitive seasons (e.g., nesting and natal periods), which would minimize effects during critical life stages. Seeding specifications on federal lands would result in revegetation of plant species per federal recommendations aiding in the restoration of sensitive species habitats. Most habitats within the ROWs are expected to return to preconstruction conditions following restoration within five years. Noxious and invasive species could degrade habitat values and reduce wildlife diversity within the ROW; however, the ROWs would be monitored and treated. Dust generated from construction and use of unpaved access roads may affect photosynthesis, respiration, and transpiration in plants valuable to sensitive species; however, dust generation would be minimized with EPMs. Construction at stream crossings would alter channel hydrology and disturb existing aquatic habitat, including disturbing streambed substrate, mobilizing sediment, increasing potential for erosion and sedimentation, turbidity, and increasing potential for hazardous material spill in streams. Approximately 1.14 acres at Paria River would be affected under both action alternatives. The Southern Alternative would disturb 0.18 acres of riparian habitat at Kanab Creek at Jacob Canyon, and the Highway Alternative would disturb 0.09 acres of riparian habitat at Kanab Creek at Fredonia.

Corridors and Barriers. Pipeline trenching during construction may cause temporary barriers to sensitive species moving through an area that are unable to cross the trench during construction; however, this situation would be short term and localized within the ROWs. The pipeline would be completely buried and would not pose an impediment to sensitive species movements. Security fencing at facilities would restrict access to larger terrestrial wildlife within the footprint of the facility and perimeter fence; however, the fencing would not impede wildlife movements because most species would be able to navigate around it.

Reproduction, Noise Displacement, Introduction of Non-native Species, Predator/Prey Populations. Noise could have a short-term effect during clearing and grading of the ROWs, during construction and blasting, cleanup, restoration activities, and during O&M activities. Refer to Appendix C-3, Noise and Vibration, for more detailed discussion on noise and vibration effects. Noise-related effects may generate reaction responses (e.g., alert postures, fleeing, reduced feeding) and effects during breeding and nesting seasons/rearing of young. Effects of noise-related construction activities would be localized, dissipating as activities leave an area. Operational noise would be localized and would be no greater than 45 dBA outside the perimeter of each facility or 50 feet from the building, whichever is closer to the noise source.

The LPP water exchange contract would contribute toward meeting the requirements established in the Upper Colorado River Implementation Program within the upper reaches of the Green and Colorado Rivers, which would also maintain appropriate flows for other sensitive fish species within these reaches. Operations would have negligible effects to sensitive fish in the Colorado River downstream of Glen Canyon Dam due to minimal changes in water temperatures and lower dissolved oxygen and the distance of sensitive fish populations downstream of the dam (See Appendix C-11, Water Quality). Diversion of Lake Powell water could increase return flows to the

Virgin River (e.g., increased sewer return flows or increased surface water runoff from irrigation), which may offset effects of drought or high water use. Effects to sensitive fish within the Virgin River system associated with introduction of quagga mussels would be minimized through EPMs, as described in Section 3.10, Aquatic Invasive Species, and Appendix C-12, Aquatic Invasive Species.

Transmission lines and other aboveground facilities may provide opportunity for raptors, including golden eagles and ravens, to perch and prey on small, terrestrial sensitive species such as kit fox pups, small mammals, and reptiles. This could have long-term, local effects on sensitive species in proximity to the ROWs.

3.14.2.3 Southern Alternative

The Southern Alternative would have similar direct and indirect effects to sensitive species as those described under Section 3.14.2.2, above. Habitats would be permanently lost within the direct footprints of facilities. The Southern Alternative would result in temporary and permanent disturbances of 3,705 acres within the Colorado Plateau and 265.8 acres within the Mojave Desert ecological regions. The Southern Alternative would disturb an additional 644.2 acres of developed and otherwise disturbed vegetation communities, which are less valuable habitats for sensitive species due to their disturbed condition. Temporary and permanent disturbance within riparian habitats include 2.97 acres.

Construction and maintenance activities at stream crossings may have greater effects because these habitats are limited and are of high value to sensitive species. With application of EPMs, effects to individuals present during construction would occur; however, these effects would be short term and are not expected to have range-wide effects to populations. Riparian habitats would recover more quickly in comparison to upland habitats; however, riparian habitats would extend over more than one season for successful restoration. Effectiveness of EPMs is expected to be high, except at Kanab Creek (see Section 3.12, Wetland and Riparian), minimizing direct and indirect effects to riparian and upland habitats. Effects to habitat in some areas may be more long term because of restoration rates of some components of habitat (e.g., pinyon pine-juniper and blackbrush) and the potential for invasive, non-native species within the ROWs.

Mitigation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of sensitive fish and wildlife species resources. In addition to EPMs, the following mitigation measures would further reduce effects to sensitive species:

General

- EPMs, as outlined in the POD, are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts (see Appendix E, Plan of Development). EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

Residual Effects – Implementing this measure would further reduce the effects of the Proposed Project and would provide applicability of the EPMs to other lands besides just federal agency–managed lands, which would provide additional assurances that effects to sensitive species would be avoided and minimized as appropriate or in coordination with jurisdictional agency or landowner.

Sensitive Fish

- The Dewatering Plan at perennial stream crossings would identify timing of construction activities and if appropriate, promote construction at these crossings during the dry season (September through October or possibly later, depending on conditions) to minimize effects on sensitive aquatic resources. The Dewatering Plan would address the presence of fish at perennial stream crossings and define protocols for fish removal from stream channels prior to dewatering activities, diverting water into a diversion channel prior to the start of construction, and the subsequent restoration of stream flows and replacement of fish to the original stream channel upon completion of construction at the stream crossing.

Residual Effects – Implementing this mitigation measure would further reduce effects associated with construction at perennial stream crossings by timing those activities during construction when crossings are more likely to be dry or have reduced water flows, which would reduce effects to sensitive fish and amphibians.

Sensitive Birds

- The Bird Conservation Strategy would outline application of APLIC guidelines to reduce avian collision and electrocution associated with the transmission lines.
- Avoid installing travelers during the nesting season prior to conductor pulling activities.
- Contact state and federal agencies to obtain the most current information on nesting raptors within 1 mile of the ROW. Where state and/or federal agencies determine inadequate raptor nesting data exists, preconstruction (the year before construction is to occur) raptor surveys would be completed in accordance with agency protocols (i.e., aerial and pedestrian surveys) within a 1-mile buffer of the ROW during the breeding/nesting season (January 15 through May 1). Nests would be monitored during construction and, if nests are determined to be active during construction, then appropriate seasonal and spatial buffers would apply in accordance with BLM resource management plans. Details would be lined out in the Bird Conservation Strategy.

Residual Effects – Implementing mitigation measures for sensitive birds would provide additional assurances that effects to these species are further reduced. Identifying in the Bird Conservation Strategy the specifics such as location, type, etc. of measures that would be deployed for the proposed LPP as defined through APLIC guidelines to reduce avian collisions and electrocutions would provide additional assurances that adequate measures are being taken in the design of the transmission lines to reduce collision and electrocution risks. Installing travelers outside of the migratory bird nesting season would further reduce effects to sensitive birds which may nest in travelers if set in place during the nesting season as they provide additional substrate for nesting activities and are known to be used by migratory birds during this time. Raptor nest surveys for the project are old and were completed outside of the raptor nesting season, and species was not able to be determined in many cases where nests were identified; therefore, additional coordination to ensure use of best available raptor nest information is used and supplemented with additional raptor nest surveys to be completed during the raptor breeding/nesting season would ensure identification

of these sensitive areas and application of seasonal and spatial restrictions during construction of the Proposed Project.

General All Sensitive Species

- Monitor the ROWs ahead of trenching equipment and trenches themselves for small or less-mobile animals and haze them from the ROW. If hazing is unsuccessful, a qualified wildlife biologist would capture and relocate animals to a safe distance from the construction corridor.
- Cover or backfill trenches or barriers and place approved working lights along open trenches at the completion of each day. Open no more than 1,000 feet of trench at any one location or segment. Construct all open trenches with escape ramps to allow trapped wildlife to exit the trenches.
- Personnel will look for wildlife under vehicles and construction equipment that has been sitting for extended periods of time and/or overnight and contact the biological monitor(s) if an animal needs to be moved.

Residual Effects – Implementing these measures would provide additional protections for sensitive species. Monitoring the ROWs ahead of trenching would allow for identification of individuals that need to be hazed or removed from the area prior to trenching activities. Opening no more than 1,000 feet of trench at any one location or segment would also ensure that open trenches are not causing barriers to wildlife movements within the ROWs and would allow for monitors to effectively monitor the area(s) of open trench to ensure sensitive species that may become entrapped are readily identified, located, and removed in a timely manner. Checking for sensitive species under vehicles and construction equipment that has been sitting for extended periods would allow for the identification of any species that may have sought protection, shelter, or shade to be identified and hazed prior to moving the vehicle/equipment, which would further reduce effects to sensitive species.

3.14.2.4 Highway Alternative

The Highway Alternative would have similar direct and indirect effects to sensitive species as those described under Section 3.14.2.2, above. Short-term effects associated with the Highway Alternative are not expected to result in population level changes to sensitive species resulting in a need for federal listing under ESA because direct effects would be localized to the ROWs and portions would be co-located with the existing highway; therefore, effects would be minor. Effects to habitat in some areas may be more long-term because of restoration rates of some components of habitat (e.g., pinyon pine-juniper and blackbrush) potential for invasive, non-native species within the ROWs, which would result in some moderate effects to sensitive species habitat within the ROWs.

The Highway Alternative would result in temporary and permanent disturbances of 3,421.3 acres (283.7 acres less than the Southern Alternative) within the Colorado Plateau and 265.8 acres (which is the same as the Southern Alternative) within the Mojave Desert ecological regions. The Highway Alternative would disturb an additional 421 acres of developed and otherwise disturbed vegetation communities, which are less likely to provide valuable habitat for sensitive species due to their disturbed condition. The Highway Alternative would disturb 2.67 acres of riparian habitat. The Highway Alternative would disturb 1.14 acres at the Paria River crossing and 0.09 acres at Kanab Creek at Fredonia.

Mitigation Measures

The mitigation measures proposed for the Highway Alternative are the same as those proposed for the Southern Alternative since resource concerns are the same.

3.14.2.5 Comparative Analysis of Alternatives

The Southern Alternative and Highway Alternative may affect individual sensitive species or their habitat, but are not likely to cause a trend toward federal listing or to reduce viability for any population or species. Effects of ground-disturbing actions would be localized and associated with the ROWs. Operation effects of transmission lines would be long term in regard to collision and electrocution risk. Transmission lines would also provide perching substrate to a variety of predatory and opportunistic birds, such as raptors and ravens, which may increase predation on sensitive species. Habitat recovery is expected to meet recovery standards for vegetation; however, some areas may take longer to recover (e.g., pinyon-juniper woodlands and blackbrush). Implementation of EPMs would minimize potential effects to sensitive species and provide opportunity for restoration of habitats. Effects to sensitive species would be similar for both action alternatives.

3.15 Threatened and Endangered Species

3.15.1 Affected Environment

3.15.1.1 Regulatory Framework and Methodology

- This section describes ESA-listed species (plants and animals) within the Proposed Project analysis area. Detailed information is provided in Appendix C-18, Threatened and Endangered Species.
- The BLM establishes goals and objectives for resources and allowable uses on the lands they manage. BLM resource management plans must be prepared in accordance with FLPMA and regulations at 43 CFR 1600. The Proposed Project includes land administered by Kanab Field Office, Arizona Strip Field Office, and St. George Field Office. The current land-use plans (and plan amendments) are as follows:
 - Kanab Field Office Resource Management Plan (2008)
 - Kanab-Escalante Planning Area Resource Management Plan (2020)
 - Arizona Strip Field Office Resource Management Plan (referred to herein as “the RMP”) (2008)
 - St. George Field Resource Management Plan (1999)
- The ESA, as amended (16 USC 1531 et seq.), protects and recovers imperiled species and the ecosystems on which they depend. The ESA requires federal agencies, in consultation with the USFWS, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. The ESA also prohibits the take of any listed species.
- The BLM Special Status Species Management Policy Manual 6840 provides management direction and guidance for the conservation of special status species and their habitats. Under this policy, special status species include animal and plant species listed as threatened or endangered, proposed for listing, or candidates for listing under the provisions of the ESA; those listed as sensitive species by a state; and those listed by a BLM State Director as sensitive. The objective of this policy is to ensure actions requiring authorization or approval

by the BLM are consistent with the conservation needs of special status species and do not contribute to the need to list any special status species under provisions of the ESA.

- The NPS Organic Act of 1916, (54 USC 100101 et seq.) as amended, establishes the NPS as an agency under the direction of the Secretary of the Interior with the stated purpose of promoting use of the national park lands while protecting them from impairment.
- NPS Management Policies 2006 sets the framework and provides direction for all management decisions relating to national park lands.
- NPS Director's Order 12 (DO-12 and Handbook; 66 FR 7507) describes the NEPA process and describes the responsibility of the NPS regarding participation in or coordination of NEPA procedures for actions occurring on NPS land.
- The Utah State Wildlife Action Plan of 2015 (Utah Wildlife Action Plan Joint Team 2015) is a comprehensive management plan designed to conserve native species populations and habitats in Utah and prevent the need for additional federal listings.
- Arizona's State Wildlife Action Plan of 2012 (AZGFD 2012) provides a 10-year vision for achievement, subject to adaptive management and improvement along the way under the watchful eye of the Arizona Game and Fish Commission and its partners for shared success in wildlife conservation and management.

ESA-listed species that may occur in the analysis area were identified and reviewed from the USFWS (Information for Planning and Conservation [IPaC] website and state-level lists), BLM (state level), UDWR, and Arizona Game and Fish. Distribution and occurrence data were reviewed from BLM, USFWS, and Utah and Arizona. In addition to these data, agency personnel and online databases (e.g., USFWS Environmental Conservation Online System, Heritage Data Request Application, Arizona Environmental Online Review Tool, and HabiMap) were consulted to identify specific species' ranges, suitable habitat, and occurrence in the analysis area. Official species lists were obtained on March 18, 2020.

For the purposes of adequately identifying potential for ESA species and their habitats and to evaluate Proposed Project-related effects on ESA-listed species, detailed information was collected within a 6-mile-wide corridor of the Proposed Project and defined as the analysis area (i.e., 3 miles on either side of a reference centerline) for each alternative. Effects to ESA species and designated critical habitat were also assessed based on the LPP water exchange contract from Flaming Gorge Reservoir down the Green and Colorado Rivers to Lake Powell and return flows from municipal and agriculture water use associated with LPP in the Virgin River from the confluence of Ash and La Verkin Creeks downstream to the confluence with Beaver Dam Wash in Arizona. Entering into the LPP water exchange contract would contribute to meeting the ESA Upper Colorado River Recovery Implementation Program requirements in Reaches 1 and 2 of the Green River and assist in the recovery of the four Colorado River endangered fish species.

ESA-listed species, associated critical habitat, and suitable habitat known or likely to occur within the analysis area are described in detail in Appendix C-18, Threatened and Endangered Species, based on known occurrences, mapped critical habitat, Proposed Project-specific surveys, professional judgment, and knowledge and experience of agency specialists.

Table 3.15-1 describes the ESA-listed species effects identified for this analysis.

Table 3.15-1 ESA Species Effects Identified for Analysis

Type of Effect	Analysis Considerations (Construction, Operation, and Maintenance)
<ul style="list-style-type: none"> • Direct loss of individuals and/or habitat due to vegetation removal, soil disturbance, stream crossings • Decreased habitat connectivity resulting in reduced pollinator movement and gene flow between populations • Increased soil erosion and alteration to runoff patterns in habitat • Reduced attractiveness of disturbed areas to pollinator species • Herbicide drift from adjacent treated areas • Increased dust • Increased invasive species and noxious weeds • Increased access potentially resulting in illegal collection of individuals, habitat degradation, and disturbance • Increased predation pressure by raptors or corvids • Modification/loss of habitat • Disruption of breeding and nesting activities or other important seasonal activities • Potential changes to hydrology and aquatic habitat at perennial, intermittent, and ephemeral stream crossings • Potential effects of water withdrawal from Lake Powell (entrainment and impingement) • Introduction and dispersal of invasive aquatic species • Potential effects on Green River and Colorado River and their 100-year floodplain • Potential effects on the Virgin River and its 100-year floodplain 	<ul style="list-style-type: none"> • Determining the number of known element occurrences and occupied habitat areas within the action area for each alternative route • Qualitative analysis of direct threats to individuals due to Proposed Project activities and potential increased collection pressure due to increased public access to habitat • Extent of ESA species habitat and designated critical habitat potentially disturbed by the Proposed Project • Proximity of the Proposed Project to known breeding/nesting habitat/other important seasonal habitat

3.15.1.2 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the POD are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

For a full list and description of EPMs identified in Appendix B of the POD for biological resources (see Appendix E, Plan of Development), refer to Section 1.3 of Appendix C-18, Threatened and Endangered Species. EPMs that may effectively reduce potential for adverse effects on sensitive species include: B.5.1, B.5.2, B.5.7, B.5.8 through B.5.13, B.5.14 through B.5.36, B.5.65 through B.5.66, B.5.69, B.5.71 through B.5.76, and B.5.85. In addition to EPMs, the Section 7 consultation process resulted in additional conservation measures for ESA-listed species identified in Section 1.3 of Appendix C-18.

EPMs for other resources may provide additional benefits to ESA-listed species such as those identified for stormwater and erosion control, restoration, noxious weeds, water resources, and air quality.

3.15.1.3 Existing Conditions

Refer to Appendix C-18, Threatened and Endangered Species, for detailed accounts of each species' status, recovery efforts, distribution and presence within the analysis area, life history and ecology, and presence of critical habitat. Table 1.4-1 in Appendix C-18 lists all ESA-listed species considered. ESA-listed species and habitat known or with potential to occur within the analysis area include: California condor, Mexican spotted owl, southwestern willow flycatcher, western yellow-billed cuckoo, Mojave Desert tortoise, Colorado pikeminnow, razorback sucker, bonytail, humpback chub, Virgin River chub, woundfin, dwarf bear-poppy, Shiwits milk-vetch, Jones cycladenia, Siler pincushion cactus, Ute ladies'-tresses orchid, and Welsh's milkweed. These species are summarized in Table 3.15-2.

Table 3.15-2 ESA Species and Critical Habitat Summary

Species	Status	Alternative		Summary
		Southern	Highway	
California condor (<i>Gymnogyps californianus</i>)	Experimental Nonessential Threatened-NPS lands	X	X	There is no known roosting or nesting habitat within the analysis area. Condors forage long distances in grasslands, oak savannas, mountain plateaus, ridges, and canyons and are expected to forage and fly over the Proposed Project. California condor presence would be similar along both action alternatives. The potential for condor presence is high due to proximity of the alternatives to the release location on the Vermillion Cliffs, condor use of the area, and long foraging distances, which increase likelihood that condors could be encountered across all land jurisdictions.

Table 3.15-2 ESA Species and Critical Habitat Summary (continued)

Species	Status	Alternative		Summary
		Southern	Highway	
Mexican spotted owl (<i>Strix occidentalis lucida</i>)	Threatened	X	X	Designated critical habitat occurs outside of the analysis area. There are no documented occurrences of Mexican spotted owl breeding or nesting within the analysis area. Potential recovery habitat within the analysis area may include riparian habitats such as Paria River and Kanab Creek, which may be used for foraging and dispersal.
Southwestern willow flycatcher (<i>Empidonax traillii eximius</i>)	Endangered Designated Critical Habitat	X	X	Designated critical habitat occurs along the Virgin River and Paria River crossing. Southwestern willow flycatcher suitable habitat exists at Short Creek at Canaan Gap (BLM-managed land and private), Short Creek at Colorado City (private), Two-mile Wash (KIR), Kanab Creek (BLM), Cottonwood Wash (KIR), Kanab Creek at Fredonia (private), Paria River (private), and Bitterseeps Wash (BLM-managed lands). The Paria River is occupied habitat.
Western yellow-billed cuckoo (<i>Coccyzus americanus</i>)	Threatened Proposed Critical Habitat	X	X	The Paria River crossing (private lands) is the only area identified as suitable. No cuckoos were documented during surveys in 2010.
Mojave Desert tortoise (<i>Gopherus agassizii</i>)	Threatened Designated Critical Habitat	X	X	Designated critical habitat is within the analysis area but 0.4 miles north of the LPP. Potential for effects to Mojave Desert tortoise and habitat occur on the westernmost portion of the Project Area in Washington County, Utah, on BLM-managed land, SITLA, and private lands.
Colorado pikeminnow (<i>Ptychocheilus lucius</i>)	Endangered Designated Critical Habitat	X	X	The infrastructure associated with the LPP is located outside of the range for this species; however, because a component of the Proposed Project includes an LPP water exchange contract with Reclamation from Flaming Gorge Reservoir downstream to Lake Powell, effects to the species are considered.
Razorback sucker (<i>Xyrauchen texanus</i>)	Endangered Designated Critical Habitat	X	X	

Table 3.15-2 ESA Species and Critical Habitat Summary (continued)

Species	Status	Alternative		Summary
		Southern	Highway	
Bonytail (<i>Gila elegans</i>)	Endangered Designated Critical Habitat	X	X	
Humpback chub (<i>Gila cypha</i>)	Endangered Designated Critical Habitat	X	X	
Virgin River chub (<i>Gila seminude</i>)	Endangered Designated Critical Habitat	X	X	Critical habitat for Virgin River chub was designated as the mainstem Virgin River and its 100-year floodplain extending from the confluence of LaVerkin Creek to Halfway Wash, Nevada. Although the Proposed Project would not be located in the Virgin River, this critical habitat reach could be affected by return flows from Proposed Project water delivery to the St. George area.
Woundfin (<i>Plagopterus argentissimus</i>)	Endangered Designated Critical Habitat	X	X	
Dwarf bear- poppy (<i>Arctomecon humilis</i>)	Endangered	X	X	Suitable habitat, as provided by the USFWS, exists within the analysis area near Short Creek at Canaan Gap along the proposed pipeline route and near The Divide along the proposed 138-kV transmission line route in Washington County and occurs on BLM-managed land, SITLA, and private land. The species was not encountered during surveys.
Shivwits milk-vetch (<i>Astragalus ampullarioides</i>)	Endangered	X	X	The USFWS provided suitable habitat for this species, which occurs near Canaan Gap in Washington County, Utah on BLM-managed lands and private lands. The species was not encountered during surveys.
Jones cycladenia (<i>Cycladenia humilis</i> var. <i>jonesii</i>)	Threatened	X		The potential for occurrence of Jones cycladenia is highest on the Southern Alternative where suitable habitat was documented near Cedar Ridge on private lands.

Table 3.15-2 ESA Species and Critical Habitat Summary (continued)

Species	Status	Alternative		Summary
		Southern	Highway	
Siler pincushion cactus (<i>Pediocactus sileri</i>)	Threatened	X	X	The USFWS provided suitable habitat for this species, which is located throughout the analysis area on BLM-managed land, KIR, SITLA, and private lands. The species was encountered predominantly southwest of Fredonia (13 individuals on SITLA and private lands) and within the KIR (2,925 individuals); with two additional sites from White Sage Wash to Seaman Wash (one individual on BLM-managed lands) and from west of Short Creek at Canaan Gap (seven individuals on BLM-managed lands and private lands).
Ute ladies'-tresses orchid (<i>Spiranthes diluvialis</i>)	Threatened	X	X	The infrastructure associated with the LPP is located outside of the range for this species; however, because a component of the Proposed Project includes the LPP Water Exchange Contract with Reclamation from Flaming Gorge Reservoir downstream to Lake Powell, effects to the species are considered.
Welsh's milkweed (<i>Asclepias welshii</i>)	Threatened	X	X	USFWS provided suitable habitat for Welsh's milkweed, which is predominantly near Flat Top west of Page, Arizona, on state lands and some on BLM-managed land in proximity to the proposed transmission lines. Welsh's milkweed was not encountered during surveys. In addition to Proposed Project-specific surveys, the nearest record of occurrence is more than 3 miles from the analysis area.

Key:

BLM = Bureau of Land Management

KIR = Kaibab Indian Reservation

LPP = Lake Powell Pipeline

SITLA = Utah School and Institutional Trust Lands Administration

USFWS = U.S. Fish and Wildlife Service

3.15.2 Environmental Consequences

The analysis area encompasses ESA-listed species, suitable and designated critical habitat that could be directly affected (e.g., from ground disturbance and presence of workers/equipment) by the action alternatives or that could be indirectly affected (e.g., from noise, dust). The analysis summary assumes that all EPMs identified in Appendix B of the POD would be fully implemented to avoid, minimize, or mitigate effects (see Appendix E, Plan of Development). In addition to EPMs, Section 7 consultation measures would further minimize effects. Short-term effects would not extend beyond one full year for any given ESA-listed species; long-term effects would extend beyond one full year and may affect more than one reproduction cycle, which could begin to have effects at the population level.

3.15.2.1 No Action Alternative

Under the No Action Alternative, the LPP would not be built; there would be no request for the LPP water exchange contract, an easement, or ROWs for the Proposed Project; and no RMPA would be required. The ESA-listed species analysis area would exist under current and future authorizations and land uses. Existing conservation programs would not result in disturbance to ESA-listed species habitat identified within the Proposed Project ROW; however, conservation programs may affect water within the Virgin River system.

However, under this alternative, projects already planned by the Proponent would continue to occur. Disturbance, due to these projects, would vary in space and time. Most impacts would be short-term and project-specific, including direct effects to ESA-listed species and their habitat. Most effects to ESA-listed species would be minimized through implementation of standard industry practices by the Proponent.

Under this alternative, no amendment to the RMP would occur, so current management of the resources for which the ACEC was designated (including habitat for the endangered southwestern willow flycatcher) as prescribed in the RMP would continue. This alternative would therefore not result in effects to threatened and endangered species, including southwestern willow flycatchers.

3.15.2.2 Effects Common to All Action Alternatives

The action alternatives would affect vegetation communities within the Colorado Plateau and Mojave Desert ecoregions that provide suitable habitat for ESA species. Direct and indirect effects are described in detail for construction, operation, and maintenance activities associated with the proposed pipeline and infrastructure as well as the LPP water exchange contract and potential return flows in Appendix C-18, Threatened and Endangered Species. Direct effects of construction, operation, and maintenance of the Proposed Project would be localized to the ROW. Indirect effects would extend beyond the ROW and include noise, fugitive dust, and fragmentation of habitat. Implementation of the EPMs would be highly effective at minimizing effects to ESA species and habitats. In addition to EPMs, the Section 7 consultation would include additional conservation measures that would apply as identified in Section 1.3 of Appendix C-18, Threatened and Endangered Species, which would further minimize effects to ESA-listed species.

Indirect and Direct Species-Specific Effects: California Condor, Mexican Spotted Owl, Southwestern Willow Flycatcher, and Western Yellow-billed Cuckoo

California Condor

There would be no effect to designated critical habitat for California condor because it does not occur within the analysis area. There would be no effect to condor nesting habitat because known nesting sites are located on NPS-managed lands and Vermillion Cliffs National Monument well outside of the analysis area; however, the UBWR would consult with state and federal agencies prior to construction-related activities to ensure no California condors are known to nest in proximity to the Proposed Project. The primary issue associated with Proposed Project construction is the potential to draw condors into the construction area because they forage great distances. Condors foraging near the Proposed Project ROW drawn to a construction site could be affected by the Proposed Project's activities, disturbance associated with noise and construction personnel and equipment, and increased potential for vehicular collisions with foraging birds landing within the construction areas or on access roads. Condors that are attracted to construction sites could become habituated to human garbage. Maintaining a clean worksite free of trash and debris would reduce the potential for condors to be attracted to work areas.

Direct effects from operation of the Proposed Project would be limited to the transmission component, which includes potential for electrocution and collision resulting in injury or death if condors were to encounter a transmission line. Due to their size and soaring habitats, condors have low maneuverability, which contributes to the risk of collision and electrocution. The wingspan of a condor could exceed typical separation distances of electrical conductors and other energized equipment especially on smaller voltage transmission lines. The potential for electrocutions and collisions warrants consideration of adequate spacing of transmission equipment to improve line visibility and space conductors to minimize the risk (APLIC 2006, 2012).

California condors have a low reproductive rate, which makes populations vulnerable to the slightest losses. Construction and operation effects of the pipeline and ancillary facilities would be minimized based on implementation of the EPMs and Section 7 consultation conservation measures. Effects to habitat would be associated with foraging activities; there would be no effect to nesting or roosting habitats, and effects to foraging habitats would occur. There would be 2,965 acres of permanent ROW and 1,429 acres of additional temporary construction area that would be affected by the Southern Alternative and 2,768 acres of permanent ROW and 1,339 acres of additional temporary construction area that would be affected by the Highway Alternative, which may affect foraging habitat for California condors. Construction-related effects would be short-term and would dissipate immediately following completion of the Proposed Project. There are operational uncertainties associated with the potential for a condor to collide with a transmission line, tower, conductor, or guard wire. Collisions and electrocutions would be expected to be rare because captive-released condors go through power pole aversion training; however, the potential is still recognized as a threat. Evaluating the possibility of collisions and electrocutions is speculative and it is not possible to fully determine if these effects would occur where the transmission lines would be constructed. The potential threat of collision and electrocution would be long-term for the life of the ROW for the transmission lines; however, implementation of the APLIC guidelines (APLIC 2006, 2012) would reduce the threat. Effects associated with maintenance activities would be similar to those expected during construction; however, they would be less intense and more focused.

Mexican Spotted Owl

There would be no effect to designated critical habitat. Suitable nesting and roosting habitat are located outside of the analysis area; however, foraging and dispersal habitat may occur. Based on distance to nearest known nesting areas, Mexican spotted owls are not expected to nest within the analysis area; therefore, there would be no effect to nesting habitat. The habitat values most likely to be affected by the Proposed Project are foraging and dispersal habitat. The Paria River and Kanab Creek may be used as dispersal corridors for transient Mexican spotted owls travelling and dispersing to suitable habitats on NPS-managed lands at Zion National Park and Grand Canyon National Park. The number of owls using riparian corridors and dispersing is likely to be low since most juveniles remain close to natal sites. The duration of the construction in the corridors would be brief and due to overlap with suitable and potential southwestern willow flycatcher habitat, construction would not occur April 1 through August 15. Some overlap may occur with construction activities and juvenile dispersal since juveniles disperse in September and October (USFWS 2012). It is believed that most juvenile northern spotted owls occupy territories near their natal territories. The Recovery Plan (USFWS 2012) acknowledged that juvenile Mexican spotted owls use a wide variety of habitats during dispersal, which vary greatly from typical breeding habitat. These factors combined make it highly unlikely that an owl would be using the riparian corridors at the time of construction minimizing the potential for effects to foraging or dispersing owls.

Based on vegetation mapping, there is low potential for recovery habitats to occur within the analysis area. Owl foraging habitat includes a wide variety of forest conditions, canyon bottoms, cliff faces, tops of canyon rims, and riparian areas and may occur within the analysis area. Some effects to foraging habitats associated with pinyon-juniper woodlands would be expected on both the Southern Alternative and Highway Alternative. There would be 124.4 acres (temporary) and 429.3 acres (permanent) disturbance within pinyon-juniper woodlands on the Southern Alternative and 128 acres (temporary) and 434.1 acres (permanent) disturbance on the Highway Alternative.

It is not known to what extent collisions and/or electrocutions affect Mexican spotted owl populations, but fatalities from these causes are not likely a substantial influence on owl persistence (USFWS 2012). The transmission lines are in low value habitat and more than 10 miles from the nearest known nesting habitat. Foraging habitats in proximity to the transmission lines are open desert shrub habitats with some pinyon-juniper woodland but for the most part are relatively open canopy habitats. It is highly unlikely that foraging owls would collide with transmission lines because they are expected to fly well below tree canopy when hunting, putting them well below the risk of collision with a transmission line.

Overall, effects of the Proposed Project would result in short-term direct and indirect effects to Mexican spotted owls and associated foraging and dispersing habitats. Noise and disturbance related effects would be short-term, dissipating immediately following completion of the Proposed Project. Operational effects would be minimal, and noise-generating infrastructure does not occur within nesting or roosting habitats.

Southwestern Willow Flycatcher and Western Yellow-billed Cuckoo

The proposed pipeline alternatives and associated infrastructure would have no effect on proposed critical habitat for western yellow-billed cuckoo. The Proposed Project would disturb 1.14 acres of designated critical habitat for southwestern willow flycatcher, which is expected to affect biological and physical attributes of designated critical habitat such as food, cover or shelter, and riparian habitat characteristics that support breeding populations (e.g., vegetation height, size and shape of

habitat patches, tree canopy structure, and vegetation density). The Paria River was also identified as suitable habitat for western yellow-billed cuckoo. Refer to Table 3.15-3 for acres of disturbance within designated critical habitat and suitable habitat for southwestern willow flycatcher and western yellow-billed cuckoo along the Southern and Highway Alternatives.

Table 3.15-3 Disturbance to Riparian Habitat

Riparian Area	Southern Alternative	Highway Alternative
Paria River ^(a)	1.14 acres	1.14 acres
Kanab Creek	0.18 acres	N/A
Kanab Creek at Fredonia	N/A	0.09 acres
Short Creek at Colorado City	0.27 acres	0.27 acres
Short Creek at Canaan Gap	0.21 acres	0.21 acres
Two Mile Wash	N/A	0.06 acres
Cottonwood Creek	N/A	0.03
Total	1.8	1.8

Note:

(a) The Paria River is designated critical habitat for southwestern willow flycatcher and suitable habitat for western yellow-billed cuckoo.

Key:

N/A = not applicable

Direct effects to southwestern willow flycatcher and western yellow-billed cuckoo would include disturbance and disruption of breeding, nesting, and brood-rearing and the direct loss, degradation, and fragmentation of limited riparian habitat suitable for the species. Disturbance and disruption during breeding, nesting, and brood-rearing resulting from increased human presence, construction equipment, and noise could result in reduced fitness, survival, nest abandonment, increased predation, and decreased nestling and egg survival. Alteration of riparian habitat including clearing of vegetation over 5 feet in height could result in fragmentation of designated critical habitat and suitable habitat. Direct effects to the species would be limited if construction activities avoid the primary breeding and nesting season. Any activities or clearing of vegetation during this season could result in direct disturbance to nesting birds, nest abandonment, and injury or mortality to eggs and young birds leading to reduced reproductive success; however, EPMs and Section 7 consultation conservation measures would minimize this threat. Direct effects to designated critical habitat for flycatcher and suitable habitat for both flycatchers and cuckoos associated with the Proposed Project would occur and restoration of the habitat components for these species would be long term.

One proposed transmission line is approximately 3.6 miles south of the southernmost portion of designated critical habitat for flycatchers on the Paria River. Habitat where the transmission line crosses the Paria River is unsuitable for flycatchers and cuckoos; however, riparian corridors that do not meet the requirements for breeding or nesting habitat may still be used as migration and movement routes; therefore, there is risk of collision with transmission lines that bisect migration and movement corridors. The risk of mortality and injury to southwestern willow flycatcher and western yellow-billed cuckoo from in-flight collision with transmission lines may occur; however, due to availability of higher quality nesting habitats outside of the Project Area, low numbers of these species that may be using this corridor, and rarity of such occurrences. There would be no effect based on electrocution risk associated with flycatcher and cuckoo because of the clearance and spacing between conductors.

Indirect effects could include invasive plant introduction which could reduce the quality of these habitats for nesting and brood-rearing habitat. Invasive riparian vegetation such as tamarisk is prevalent throughout riparian habitats within the Project Area; therefore, removal of native riparian vegetation presents an opportunity for tamarisk to establish or replace native vegetation such as willow and potential for modification of designated critical habitat for flycatchers in the Paria River and for both species within other suitable riparian habitats. It is anticipated that the Proposed Project would result in effects to the riparian communities, and habitats would be expected to improve following restoration efforts.

Riparian habitats within the analysis area are dynamic; therefore, suitable habitat documented 10 years ago may have changed; pre-construction surveys would provide more up-to-date information on habitat suitability and species presence. Construction effects of the pipeline and ancillary facilities would occur within designated critical habitat for southwestern willow flycatcher at the Paria River crossing and additional riparian habitats identified as suitable or potential for both species during the field surveys (LPP Final Study Report 13 – Special Status Wildlife Species [UBWR 2016a]). Construction-related effects would be short-term and would dissipate immediately following completion of the Proposed Project. Construction activities would alter designated critical habitat for flycatcher and suitable habitat at the other riparian crossings. Restoration at riparian crossings would minimize long-term effects of construction activities allowing for biological and physical features of the habitat to be restored; however, this may take more than one full year to achieve restoration objectives. Operational effects would be primarily associated with the potential for collisions with transmission lines, these effects would occur over the life of the ROW but would be minimized by following the EPMs including APLIC guidelines (APLIC 2006, 2012) and Section 7 consultation conservation measures. Effects associated with maintenance activities would be similar to those expected during construction; however, such effects would be less intense and more focused in areas where maintenance actions are needed.

The LPP water exchange contract would have beneficial effects to proposed critical habitat for western yellow-billed cuckoo in the Upper Colorado and Green Rivers, particularly at Canyonlands National Park at the confluence of the Green and Colorado Rivers (Unit-5, Green River 2) and the Ouray National Wildlife Refuge (Unit 1- Green River 1) (79 FR 48547). The intent of the LPP water exchange contract is to allow flows from Flaming Gorge Dam to meet the ESA Upper Colorado River Recovery Implementation Program, which would also be expected to maintain the physical and biological features of proposed critical habitat for cuckoos; therefore, it is expected the LPP water exchange contract would maintain dynamic riverine processes for meeting biological and physical features. Return flows associated with water delivery of Lake Powell water associated with the Proposed Project may result in increased flows into the Virgin River system contributing to maintenance of or a potential increase in water flows, which would be beneficial to maintaining habitat for these species.

Indirect and Direct Species-Specific Effects: Mojave Desert Tortoise

There would be no effects to designated critical habitat or lands managed under the Red Cliffs Desert Reserve. The Proposed Project would cross occupied Mojave Desert tortoise habitat, which would include vegetation removal, excavation, and vehicle use. Direct effects to tortoise may be expected because Proposed Project-related vegetation removal, excavation, and vehicle use have the potential to disturb or destroy desert tortoise and their burrows. Direct effects may include loss, fragmentation, and degradation of habitat; fatality as a result of crushing or burying; and mishandling

of tortoises that could lead to water expulsion and death if they are not able to access water and rehydrate quickly. The pipeline and access roads are not expected to create barriers to tortoise movement; however, the Proposed Project could contribute to fatality, habitat fragmentation, and degradation.

Approximately 1,694 acres were surveyed for tortoises. Within the survey area, 1,012 acres was determined to be low quality habitat, 517 acres was high quality habitat, and 165 acres was unsuitable. There are 346.9 acres of high quality habitat and 567.4 acres of low quality habitat that may be disturbed on BLM-managed lands. On state lands, approximately 40 acres of low quality habitat may be disturbed. On private lands, 58 acres of high quality habitat, 117 acres of low quality habitat, and 85 acres of unsuitable habitat may be disturbed. Tortoise burrows were documented on BLM-managed lands within high quality habitat. Overall, there would be a total of 578 acres of temporary and permanent disturbance associated with the pipeline and transmission lines within desert tortoise habitat. Most disturbance would be temporary. Permanent disturbance associated with transmission lines would be less than 1 acre and approximately 25 acres of permanent disturbance would occur at HS-5. Refer to Table 3.15-4 for acres of disturbance by jurisdiction.

Table 3.15-4 Disturbance to Mojave Desert Tortoise Habitat

Agency	Permanent Effects (acres)				Temporary Effects (Acres)			
	High Quality Habitat	Low Quality Habitat	Not Suitable Habitat	Total	High Quality Habitat	Low Quality Habitat	Not Suitable Habitat	Total
BLM	27	7	-	34	77	167	-	244
NPS	0	0	0	0	0	0	0	0
Reclamation	0	0	0	0	0	0	0	0
Tribe	0	0	0	0	0	0	0	0
State	0	4	0	4	0	36	0	36
Private	0	7	0	7	58	110	85	253
Total	27	18	0	45	135	313	85	533

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

Construction effects to Mojave Desert tortoise would occur for the duration of construction activities and could have result in fatalities of individual tortoise; however, implementation of EPMs and Section 7 consultation conservation measures would minimize potential for fatality. Construction-related effects would be short-term and would dissipate immediately following completion of the Proposed Project. Revegetation would minimize long-term effects of construction on Mojave Desert tortoise habitat; however, restoration in these habitats is difficult often resulting in low success, and the potential for invasive species such as cheatgrass is high. Operational effects would be primarily associated with the potential for recurring effects from vehicle use for operation activities. Operational effects may include potential for predation by common ravens and other predators, which would occur long-term. Although effects associated with maintenance activities would be similar to those expected during construction, they would be less intense and more focused.

Indirect and Direct Species-Specific Effects: Colorado River Fish (Colorado Pikeminnow, Razorback Sucker, Bonytail Chub, and Humpback Chub)

Hydrologic models (refer to Appendix C-10, Hydrology) indicate that the Proposed Project would not change river flows in the Green and Colorado rivers downstream from Flaming Gorge Dam. The LPP water exchange contract would have beneficial effects to Colorado River fish and designated critical habitat within the Upper Colorado River and Green River and would continue to allow flows from Flaming Gorge Dam to meet the ESA Upper Colorado River Recovery Implementation Program, which would maintain the physical and biological features of designated critical habitat for these species including flow and temperature recommendations. The quantity and quality of water would not be affected by the Proposed Project. Physical habitat within the Green and Colorado River 100-year floodplains would not be modified. The biological environment including food supply, predation, and competition for important elements would not be affected. Water quality modeling (refer to Appendix C-11, Water Quality) results indicate that the Proposed Project would not substantially affect water temperatures in Glen Canyon Dam releases. Effects of water withdrawal from Lake Powell would have minimal effects on ESA-listed fish and designated critical habitat below Glen Canyon Dam. These species inhabit warmer waters well-below Glen Canyon Dam, and changes to temperature, total dissolved oxygen, etc. would not be detectable because these species are found over 15 river miles below Glen Canyon Dam.

Indirect and Direct Species-Specific Effects: Virgin River Fish (Virgin River Chub and Woundfin)

Impacts to the Virgin River from the operation of the Proposed Project were modeled (refer to Appendix C-10, Hydrology). Differences in simulated streamflow along the Virgin River in the upper portions of the Washington County system near Quail Creek Reservoir were typically small, and within the degree of accuracy of the USGS stream gages. Releases from Quail Creek Reservoir are often used to supplement instream flows in the Virgin River down to the Washington Fields Diversion. Quail Creek Reservoir would typically maintain a higher storage volume because some LPP water would be stored in the reservoir. Therefore, measurable flow increases in drier months and years from the Proposed Project would be expected due to maintained Quail Creek Reservoir releases into the Virgin River and would have similar flows to compared to current releases into the Virgin River from Quail Creek Reservoir.

Modeled streamflows also increased in the lower portions of the Virgin River near the state line because secondary demands in 2060 were not at a level to fully reuse all Virgin River and LPP return flows from the St. George Municipal and Industry demand center. These increases in streamflows occurred in the drier summer and fall months when municipal demand is highest and more return flows enter the river. Peak winter and spring runoff flows would not be measurably affected by the Proposed Project. Because Virgin River modeling evaluated changes in streamflow through 2060, there are no data beyond 2060 for changes to Virgin River flows from the Southern Alternative. However, increases in instream flows from return flows would be expected to decrease as secondary demands increase. LPP return flows would be reused to meet secondary demands. Effects could also be less under drier, hotter climate change projections because there would be less reuse water available from Virgin River supplies and more of the LPP return flows would be reused to meet secondary demands. Generally, the modeling shows increases to Virgin River summer and fall streamflows, which would provide a beneficial effect to flow stability, temperatures, and turbidity for the species (USFWS 2008). As more reuse occurs over time, the magnitude of the beneficial effect would decrease, but the streamflows would not decrease below levels under the No Action Alternative.

The USFWS designated critical habitat for Virgin River chub and woundfin as the mainstem Virgin River and its 100-year floodplain extending from the confluence of LaVerkin Creek to Halfway Wash, Nevada. Thus, critical habitat begins upstream of the modeled reach and extends beyond it into Nevada. Other than increased flows into the Virgin River system, the Proposed Project would not affect water quality or change the magnitude, duration, and frequency of flow events. The Proposed Project would not modify the physical habitat within the Virgin River 100-year floodplain and would not alter biological productivity of the river system. This would benefit Virgin River chub and woundfin populations in different ways, depending on the species and life stage. This benefit would also act to offset effects of drought and high water uses on Virgin River fish species. Return flows may increase to the Virgin River, which may offset effects of drought and high water uses on Virgin River aquatic resources.

Indirect and Direct Species-Specific Effects: ESA-Listed Plants (Dwarf bear-poppy, Jones Cycladenia, Shivwits Milk-vetch, Siler Pincushion Cactus, Ute Ladies'-tresses Orchid, and Welsh's Milkweed)

Direct effects of construction-related activities could result in losses of individual plants, and permanent loss and degradation of habitat (i.e., soils and vegetation) as a result of vegetation clearing, soil excavation, piling of soil material, vehicle and construction equipment driving, crushing, and compaction, and human foot traffic in sensitive, erosive soils.

Indirect effects may include the spread of invasive and noxious species, increased habitat fragmentation and reduced gene flow between plant populations, increased soil erosion and dust deposition, changes to water flow and drainage patterns, reduce photosynthesis and reproductive output, increased fire frequencies due to invasive species proliferation such as cheatgrass, potential for herbicide drift from treating noxious weeds, and increased use of access roads by construction vehicles and the public leading to dust deposition. Maintenance and access roads could be accessed by the public for recreational purposes, which could increase trampling, illegal collection, and increased OHV use which could lead to a loss and degradation of plants and habitat.

There would be no effect to designated critical habitat for ESA-listed plants. Suitable habitats for dwarf-bear poppy, Jones cycladenia, Shivwits milk-vetch, and Welsh's milkweed would be affected by the Proposed Project; however, based on distance to nearest known populations for these species in relation to the Proposed Project and associated infrastructure, limited suitable habitat, and the species not being encountered during the field surveys, effects to occupied habitat for these species are expected to be negligible.

The only ESA-listed plant species encountered during the field surveys is Siler pincushion cactus. Based on results of the 2010 surveys, the Proposed Project may result in disturbance to suitable and occupied habitat, including changes in runoff patterns that could alter water availability or erosion patterns, increase the presence or dominance of noxious weeds or invasive species, or creation of large volumes of dust that could settle on plants or flowers and reduce photosynthesis and reproductive output. Dust production along access roads is likely to vary spatially with soil conditions and temporally with wind conditions.

Effects to Ute ladies'-tresses orchid are tied to the LPP water exchange contract, which would mitigate the potential for water depletions within the upper reaches of the Colorado and Green Rivers. There would be no direct effects of the Proposed Project on Ute ladies'-tresses orchid. The LPP water exchange contract would ensure maintenance of water flows within the Green and Colorado Rivers downstream of Flaming Gorge Reservoir, which would be beneficial to the species.

3.15.2.3 Southern Alternative

The Southern Alternative would have similar direct and indirect effects to ESA-listed species and critical habitat as those described under Effects Common to All Action Alternatives except for Siler pincushion cactus. The Southern Alternative would result in 81 acres (47 acres on BLM-administered lands and 34 acres of private) of temporary disturbance to suitable habitat for Dwarf bear-poppy and 4 acres on private lands of permanent disturbance and 32 acres of temporary disturbance on private lands within suitable habitat for Shivwits milk-vetch. Suitable habitat for Jones cycladenia on private lands near Cedar Ridge and suitable habitat for Welsh's milkweed near Flat Top on state lands and BLM-managed lands may be affected. There were no populations or individual plants documented during surveys; therefore, no effects to known populations are expected. Preconstruction surveys would be completed within all suitable habitat.

The Southern Alternative would affect suitable (Refer to Table 3.15-5) and occupied habitat for Siler pincushion cactus. Occupied habitat along the Southern Alternative occurs near White Sage-Seaman Wash. Based on USFWS suitable habitat, the proposed pipeline for the Southern Alternative would intersect approximately 41 miles of suitable habitat for Siler pincushion cactus. There would be approximately 7 miles of suitable habitat intersected by the transmission lines which would be the same for both alternatives. A total of eight cacti were detected within the survey corridor along the Southern Alternative with some of these individuals occurring within 25 feet of the construction footprint outside of the proposed ROW. No documented Siler pincushion cactus were found within the proposed ROW but due to proximity of cacti to the ROW, effects to individuals could occur and construction would result in habitat loss, degradation, and fragmentation, as well, as possible effects associated with fugitive dust. EPMS and Section 7 consultation measures including surveys, flagging sensitive areas and dust abatement during construction would minimize effects for Siler pincushion cactus.

Table 3.15-5 Siler Pincushion Cactus Suitable Habitat Affected

Agency	Permanent Effects (acres)	Temporary Effects (acres)	Total
BLM	28	787	815
NPS	0	0	0
Reclamation	0	0	0
Tribe	0	0	0
State	0	68	68
Private	0	92	92
Total	28	947	975

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

Resource Management Plan Amendment

There is no critical habitat for the southwestern willow flycatcher in the ACEC. This species has declined in population due to riparian habitat loss and fragmentation resulting from the draining of wetlands; channeling and levying of streambeds; construction of canals, drains, and impoundments; livestock grazing and off-road vehicle use in riparian areas and wetlands; and the invasion of riparian habitat by invasive species. Other probable factors contributing to population decline include predators and brood-parasitism by brown-headed cowbirds.

Two patches of suitable habitat are located along Kanab Creek, one patch at Clearwater Spring and the other a half-mile downstream from the spring. Both sites have extensive stands of dense tamarisk and also contain native woody riparian vegetation such as willow species and cottonwood.

RMPA Sub-alternative 1

Under this alternative new land use authorizations could be allowed in the ACEC even when another reasonable alternative exists. While the proposed amendment to Decision No. MA-LR-06 would still require mitigation for effects from new land use authorizations (determined during site-specific Project planning).

RMPA Sub-alternative 2

Under this alternative potential effects to southwestern willow flycatcher habitat could occur because the size of the ACEC would be reduced by 905 acres with no specific provision for mitigation from new land use authorizations in the area that has been excluded from the ACEC. Construction, operation, and maintenance of new ROWs (and other land use authorizations) could result in direct effects to southwestern willow flycatcher habitat, as well as indirect effects to riparian resources from sedimentation and erosion as vegetation is removed. However, existing Federal laws (including the ESA) would still apply so potential effects to southwestern willow flycatcher habitat would be evaluated during Proposed Project-specific environmental review and analysis and mitigated to the extent possible.

RMPA Sub-alternative 3

Under this alternative, effects to southwestern willow flycatcher habitat would be similar to those described under RMPA Sub-alternative 1. In addition, in RMPA Sub-alternative 3, the utility corridor would no longer be an avoidance area for new land use authorizations, increasing the likelihood for adverse effects, however, mitigation would be required to address any effects identified in site specific analysis. Alternative 3 would result in a decrease of 175.5 acres in the overlap area of the utility corridor and the ACEC as compared to RMPA Sub-alternative 1—the potential for new ROWs may therefore be reduced since utility corridors are areas where new utilities are encouraged. The proposed amendment would still require mitigation for effects from new land use authorizations that would be determined during site-specific Project planning, although disturbance to flycatcher habitat (from Project construction) could still occur, and potential habitat could be lost in the short term.

Conservation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of threatened and endangered species resources.

In addition to EPMs, the following conservation measures should further reduce effects to ESA-listed species.

ESA-listed Plants

- Within sensitive areas (i.e., habitat for Siler pincushion cactus), close or gate access roads to prevent public access to the ROW.
- Within occupied habitat for ESA-listed plants, coordinate with federal agencies to develop seed mixes for restoration and rehabilitation activities.

Residual Effects

Residual effects associated with public access to the ROWs include illegal collection, dust, and off-road vehicle access, which could lead to long-term effects to Siler pincushion cactus.

Implementation of the mitigation measures would minimize these effects. Coordination of a seed mix within occupied habitat for ESA-listed plants would ensure that seed mixes are developed that are suitable for the habitats and would minimize the potential for aggressive seed mixes to be identified that may compete with ESA-listed plants, possibly making habitats unsuitable for some species.

3.15.2.4 Highway Alternative

The Highway Alternative would have similar direct and indirect effects to ESA-listed species and critical habitat as those described under Effects Common to All Action Alternatives except for effects to Siler pincushion cactus. Effects to dwarf bear-poppy, Shivwits milk-vetch, and Welsh's milkweed suitable habitat would be the same as the Southern Alternative.

The Highway Alternative would affect suitable (Refer to Table 3.15-6) and occupied habitat for Siler pincushion cactus on the KIR. Based on USFWS suitable habitat, the proposed pipeline for the Highway Alternative would intersect approximately 23 miles of suitable habitat for Siler pincushion cactus. There would be approximately 7 miles of suitable habitat intersected by the transmission lines, the same for both alternatives. Approximately 2,945 individuals were observed within the ROW for the Highway Alternative, although about two thirds of the encountered individuals were reported dead (see LPP Final Study Report 12 – Special Status Plant Species and Noxious Weeds [UBWR 2016b]). Most individuals were found on the KIR, scattered along Arizona State Route 389 from west of Fredonia to the intersection of State Route 389 and the road to Pipe Springs National Monument. Siler pincushion cactus were found within the proposed ROW, and effects to individuals could occur. Construction would result in habitat loss, degradation, and fragmentation, as well as possible effects associated with fugitive dust. EPMs including dust abatement during construction would minimize effects; however, the inability to avoid individual cacti within the proposed ROW could lead to injury and mortality of individuals resulting in potential for effects to suitable and known occupied habitat.

Table 3.15-6 Siler Pincushion Cactus Suitable Habitat Affected

Agency	Permanent Effects (acres)	Temporary Effects (acres)	Total
BLM	28	434	462
NPS	0	0	0
Reclamation	0	0	0
Tribe	0	92	92
State	0	60	60
Private	0	124	124
Total	28	710	738

Key:

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

Conservation Measures

The conservation measures proposed for the Highway Alternative are the same as those proposed for the Southern Alternative because resource concerns are the same.

Residual Effects

Residual effects for the Highway Alternative are the same as those for the Southern Alternative.

3.15.2.5 Comparative Analysis of Alternatives

The Southern Alternative and Highway Alternative may affect ESA-listed species, designated critical habitat, or suitable habitat as described. Implementation of EPMS and Section 7 consultation conservation measures would minimize potential effects to ESA-listed species and provide opportunity for restoration of habitats affected. Effects to ESA-listed species and habitats would be similar for all alternatives due to similarity in vegetation communities that would be affected except for effects to Siler pincushion cactus. Effects to California condor, Mexican spotted owl, southwestern willow flycatcher (suitable and designated critical habitat), western yellow-billed cuckoo, and Mojave Desert tortoise would be the same or similar across the action alternatives. Effects to dwarf bear-poppy and Shivwits milk-vetch suitable habitat would be the same across the action alternatives and effects to suitable habitat would occur on private lands. The Southern Alternative would affect suitable habitat for Jones cycladenia on private lands. Effects to Welsh's milkweed would be the same across the action alternatives with effects occurring on state and BLM-managed lands. There are no effects to known individuals for dwarf bear-poppy, Shivwits milk-vetch, Jones cycladenia, and Welsh's milkweed. Effects to Siler pincushion cactus suitable habitat is greater for the Southern Alternative affecting 975 acres of suitable habitat (BLM-managed lands [815 acres], state [68 acres] and private [92 acres]); however, the Southern Alternative would affect fewer plants (eight individuals) that were identified during surveys. The Highway Alternative would affect a total of 738 acres of suitable habitat (BLM-managed lands [462 acres], state [60 acres], private [124 acres] and KIR (92 acres)); however, the Highway Alternative would affect more plants (2,945 individuals).

3.16 Visual Resources

3.16.1 Affected Environment

The term visual (or scenic) resources refers to the composite of basic terrain, geologic and hydrologic features, vegetative patterns, and built features that influence the visual appeal of a landscape. This section of the DEIS identifies and describes the existing conditions associated with visual resources located within the Proposed Project study corridor and assesses the potential effects or impacts on these resources based on the construction, operation, and maintenance of the LPP.

3.16.1.1 Regulatory Framework and Methodology

The area of analysis for visual resources are the viewsheds from sensitive viewing platforms (e.g., highways, residential areas, and developed recreation sites) within which project features could be seen by casual observers for out to 5 miles of either side of the project alignments and features. This distance was selected as it corresponds with BLM's delineation of the foreground/middle ground visual distance zone and beyond which developments are less or not noticeable. The area of analysis is shown for each alternative on Figures 1.2-1 and 1.2-2 in Appendix C-19, Visual Resources. The temporal scope of analysis for visual resources is the life of the Proposed Project.

Regulatory Framework

Visual resource analysis for all federal agencies regarding the Proposed Project would be pursuant to NEPA (42 USC 4321 et seq.; Sections 101(b) and 102(a)). In addition to NEPA, the BLM is also subject to FLPMA (43 USC §1701 et seq.; Sections 102(a)(8), 103(c) and 505(a)), the BLM Visual Resource Management Manual (8400) and BLM Visual Resource Contrast Rating Handbook (H-8431-1) (BLM 1984, 1986). Visual resource analysis for the NPS regarding LPP would be pursuant to the NPS Organic Act of 1916, (54 USC 100101 et seq.) as amended, and other laws, regulations, and NPS Management Policies which furthers the purpose of the Organic Act and the NPS mission. Both BLM and NPS at GCNRA have visual resource objectives in their respective land use and general management plans. Other federal and state agencies within the Project Area of analysis do not have specific VRM and analysis policies.

BLM resource management plans assign VRM classes to land within each field office's jurisdiction. Each management class has an objective statement that determines the approach for assessing the effects of activities on visual resources. The objectives, as described in the BLM VRM manual, are listed below.

- Class I - The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes but does not preclude very limited management activity. The level of change to the characteristic landscape should be negligible and must not attract attention.
- Class II - The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- Class III - The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the casual observer's

view. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

- Class IV - The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention.

The NPS does not have a specific management program for GCNRA visual resources. However, the GCNRA General Management Plan does identify management zones and objectives for those zone that apply to VRM (see LPP Final Study Report 16 – Visual Resources [UBWR 2016]).

The GCNRA Natural Zone includes the recreation area's outstanding scenic resources, relatively undisturbed areas isolated and remote from the activities of man, or areas bordering on places with established land-use practices complimentary to those of the Natural Zone. Maintenance of isolation and natural processes while allowing grazing activities is the management strategy. The GCNRA Natural Zone has similar management objectives to the BLM VRM Class I and II objectives.

A full description of the regulatory framework is provided in Section 1.1 of Appendix C-19, Visual Resources.

Methodology

Effects on visual resources refer to the change in scenic (aesthetic) values resulting from modifications to the landscape. Effects were assessed in terms of visual character, visual elements and visual patterns—with respect to the anticipated magnitude of change in landscape character. Visual character is the overall impression created by individual elements and overall patterns. Visual elements, such as form, line, color and texture, are the attributes of the visible landscape and Proposed Project. Visual patterns result from the presence or absence and the arrangement of individual elements within a landscape. The landscape character of the Project Area varies because of changes in landscape components and their patterns. The anticipated magnitude of change in landscape character and the visibility of the proposed alignments were evaluated, considering the varying levels of visual sensitivity within the Project Area.

Across the Project Area, the primary methodology for evaluating visual effects was based on the BLM VRM Contrast Rating System as described in BLM Handbook 8431-1 (BLM 1986); additional agency methodology used is explained in Section 1.2 of Appendix C-19, Visual Resources. The degree to which a project or activity affects the visual quality of a landscape mostly depends on the visual contrast created between the project and the existing landscape which was measured by comparing the form, line, color and texture of the project components with those of the characteristic landscape and documented on BLM Contrast Rating Forms. Visual effects were also evaluated in terms of effects over time: short-term effects include those from construction to 10 years post-construction, while long-term effects include those that would exist for the life of the Proposed Project.

The primary components of the visual analysis included the following:

- Establishing 32 stationary and linear key observation points from which to conduct contrast rating analyses – see Figures 1.2.3 and 1.2.4 in Appendix C-19, Visual Resources, for key observation point locations.

- Creating 23 visualizations depicting conditions five to 10 years post-construction for the range of Proposed Project features - Figures 1.2.3 and 1.2.4 in Appendix C-19, Visual Resources.
- Preparing visibility analyses to identify the visibility of Proposed Project features – see Attachment, B, Visibility Analyses, in Appendix C-19, Visual Resources.
- Establishing distance zones for the foreground (0 to 0.5 miles) and middle ground (0.5 to 5 miles) from the Proposed Project features and from viewing platforms.
- Establishing 21 visual assessment units (VAUs) along the project alignments from which to determine magnitude of change in landscape character and levels of contrast from sensitive viewing platforms; see Figures 1.2.5 through 1.2.9 in Appendix C-19, Visual Resources.

The magnitudes of change in landscape character and levels of contrast from sensitive viewing platforms effect threshold are shown in Table 3.16-1.

This assessment of visual effects included evaluation of the overall significance of effects on the visual landscape as well as an assessment of the effects of individual project components. Effects on visual resources are considered significant if construction, operation, or maintenance activities would result in any of the following conditions:

- Magnitude of change from existing visual character to post-project visual character that is considered to be substantial within the foreground distance zone;
- Proposed Project features visible within the foreground distance zone from an area of high visual sensitivity attracting attention away from existing landscape conditions and resulting in a fundamental and visually incompatible change in the existing setting;
- Substantial level of landscape modification or strong contrast visible within the foreground distance zone from an area of high visual sensitivity (e.g., residence, non-motorized trail, or high-volume roadway);
- Non-conformance with VRM objectives that would require an amendment to the relevant federal resource management plan to change the VRM class; or
- Nonconformance with other agencies' scenic management plans.

Table 3.16-1 Effect Thresholds for Magnitude of Change in Landscape Character and Level of Contrast from Sensitive Viewing Platforms

Level of Effect Key Crosswalk		Definitions
<i>Contrast Rating Levels (8400-4 – Section D)</i>	<i>Magnitude of Change Levels</i>	-
None	No Effect	There would be no change to the current landscape character as a result of Proposed Project construction, operation, or maintenance.
N/A	Negligible	Proposed Project components would not be visible or perceived in the landscape. Landscape character would remain intact with no apparent change to existing visual elements (line, form, color, and texture) or pattern character (dominance, scale, diversity, and continuity).

Table 3.16-1 Effect Thresholds for Magnitude of Change in Landscape Character and Level of Contrast from Sensitive Viewing Platforms (continued)

Level of Effect Key Crosswalk		Definitions
Weak	Subtle	Proposed Project components would create weak contrast in the landscape and would be generally compatible with the visual setting when viewed from a sensitive viewing platform. Magnitude of change to existing landscape character would be subtle. Changes in visual pattern elements or pattern character would not attract attention and would be visually subordinate in the visual setting.
Moderate	Notable	Project components would create moderate contrast in the landscape and would be visually prominent within the visual setting when viewed from a sensitive viewing platform. Magnitude of change to existing landscape character would be notable. Changes in visual pattern elements or pattern character would attract attention.
Strong	Substantial	Project components would create strong contrast in the landscape and would generally be incompatible with the visual setting when viewed from a sensitive viewing platform. Magnitude of change to existing landscape character would be substantial. Changes in visual pattern elements or pattern character would dominate the visual setting.

3.16.1.2 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the POD (see Appendix E, Plan of Development) are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

The Project Proponent agreed to visual, revegetation, and restoration EPMs as part of their POD that would reduce adverse effects on visual resources. Those measures include ensuring that all Proposed Project features (e.g., buildings, roads, transmission lines) would be colored and textured to blend with surrounding landscape colors; that lighting would be shielded and directed downward and follow International Dark Sky standards; that rock cuts and other disturbed areas in sensitive viewsheds would be blended to match natural landforms and colors; and that trees and shrubs along ROW edges would be selectively thinned to reduce contrast and those that provide screening would be retained to the extent possible. Details of the visual EPMs are located in Section 1.3 of Appendix C-19, Visual Resources, and those for revegetation and restoration are located in Section 1.3 of Appendix C-13, Vegetation Communities.

3.16.1.3 Existing Conditions

Detailed descriptions of the existing landscape character are provided Appendix C-19, Visual Resources. BLM Visual Resource Inventory (VRI) results for the field offices where they are complete are detailed in Table 3.16-2 below, and an explanation of the factors that result in VRI Class determinations are included in Section 1.4.2.1 of Appendix C-19, Visual Resources. The visual resource objectives for BLM, NPS at GCNRA, and Arizona Scenic Routes are explained in Section

1.4.3 of Appendix C-19, Visual Resources, and in Table 3-3 of the Revised LPP Final Study Report 16 - Visual Resources (BLM 2020).

Of the BLM-managed lands with VRI, less than 10 miles of either pipeline alignment or less than 20 miles of transmission lines run through VRI Class II areas, those most valued for high quality scenery. The Southern Alternative would pass through 10 more miles of areas highly sensitivity to change than the Highway Alternative. The Southern Alternative would pass through 35 more miles of area with low quality scenery than the Highway Alternative. Both Alternatives would be primarily within the Foreground/Middleground Zone, which extends out to 5 miles from commonly used viewing platforms, though the Southern Alternative would have 10 miles in the Background and Seldom Seen Zones while the Highway Alternative has none.

Across BLM-managed lands, less than 5 percent of either alternative cross VRM Class II areas (see Table 3.16-3). The Southern Alternative, including the electric transmission system alignment associated with the Southern Alignment, crosses about 65 miles of VRM Class III areas and about 72 miles of VRM Class IV areas. The Highway Alternative, including the electric transmission system alignment associated with the Highway Alignment, crosses about 62 miles of VRM Class III areas and about 41 miles of VRM Class IV areas.

Table 3.16-2 BLM Visual Resource Inventory Classes and Factors – Miles Crossed by Proposed Project Alignments

Alignments	Miles	Visual Resource Inventory Class				Visual Sensitivity Rating				Scenic Quality Rating				Visual Distance Zones			
		Class II	Class III	Class IV	N/A ^(a)	High	Moderate	Low	N/A ^(a)	A	B	C	N/A ^(a)	FM	BG	SS	N/A ^(a)
Both Alternatives	88	6	42	16	25	11	32	21	25	2	52	10	25	50	0	13	25
Highway Alternative	46	1	14	0	30	13	3	0	30	1	4	12	30	15	0	0	30
Southern Alternative	52	1	23	25	3	23	9	17	3	1	1	47	3	39	9	1	3
Transmission Lines ^(b)	69	16	16	9	28	15	14	12	28	3	31	7	28	31	4	6	28
Totals	-	24	95	49	87	62	57	50	87	6	87	76	87	136	14	20	87

Note:

(a) Miles of BLM-managed lands where visual resource inventory data does not exist.

(b) Transmission line alignments are the same for both alternatives.

Key:

FM = Foreground/Middleground

BG = Background

SS = Seldom Seen

Table 3.16-3 BLM Visual Resource Management Classes Crossed by Proposed Project Alignments^(a)

VRM Class	Approximate Distance in Miles	Approximate Percentage of Total
Southern Alignment		
II	2.9	3
III	51.1	51
IV	46.3	46
Electric Transmission System Alignment Associated with the Southern Alignment		
II	0.4	1
III	14.0	35
IV	26.0	64
Highway Alignment		
II	0.4	1
III	49.3	76
IV	15.3	23
Electric Transmission System Alignment Associated with the Highway Alignment		
II	0.4	1
III	13.1	33
IV	26.0	66

Note:

(a) Calculations reflect only miles of Proposed Project alignments that cross BLM-managed lands.

Key:

VRM = visual resource management

3.16.2 Environmental Consequences

3.16.2.1 No Action Alternative

No effects on visual resources would occur from implementation of this alternative. The pipeline, associated facilities or electrical transmission lines would not be constructed and the existing landscape character and views from sensitive viewing platforms would not be altered, so visual resources would not be affected.

However, under this alternative, projects already planned by the Project Proponent would continue to occur. Disturbance, due to these projects, would vary in space and time. Most other impacts would be short-term and project-specific, but visual resources are often a longer-term effect. Effects to visual resources would be minimized through implementation of standard industry practices by the Proponent.

3.16.2.2 Southern Alternative

The large facilities (BPSs or HSs and associated infrastructure) that would be constructed adjacent to roads and highways for the Southern Alternative would create moderate to strong contrast and result in notable to substantial changes in the landscape character. Those located in areas that are primarily undeveloped would create the greater magnitude of change. The transmission lines would create negligible to moderate contrast and result in negligible to notable changes in the landscape character depending on their location and proximity to other utility lines or development. The pipeline disturbance would create negligible to weak contrast and result in negligible to subtle change in the landscape character across the Project Area if environmental protection and mitigation measures are successfully implemented. Across the Southern Alternative where the alignments cross federal lands, BLM VRM objectives and NPS Zone visual objectives would be met.

A detailed discussion of visual effects associated with the Southern Alternative is included in Section 2.2 and Table 2.1-1, Visual Assessment Units Effect Table, of Appendix C-19, Visual Resources. Effects on special designations, scenic routes, Indian reservations, and parks and monuments are detailed in the 2020 Revised Final Visual Study Report (BLM 2020). Table 3.16-4 summarizes the long-term effects, applicable only under the Southern Alternative, to the landscape character and to the views from the sensitive viewing platforms for each VAU. The adverse effects on visual resources would primarily be associated with large facilities (BPSs and HSs and associated infrastructure) that would be constructed, most of which would be adjacent to roads and highways. Successful implementation of protection and mitigation measures would minimize adverse visual effects for the pipeline alignment. The electrical transmission system features would result in adverse effects depending on whether they are aligned with existing infrastructure or are sky lined.

Conformance with Bureau of Land Management Visual Resource Management Objectives and National Park Service Visual Objectives

The vast majority of the Southern Alternative Proposed Project alignments on BLM-managed lands pass through BLM VRM Class III or IV areas which allow for moderate to major changes in the landscape character. Only a sliver of Class II is crossed by a transmission line on the eastern side of Five Mile Mountain in a location where another transmission line exists. If environmental protection and mitigation measures are successfully implemented, the VRM objectives would be met.

Additional detail about conformance with BLM VRM objectives is provided in Section 2.2.1.11 of Appendix C-19, Visual Resources. The GCNRA Recreation and Resource Utilization Zone and the Development Zone, which have similar visual objectives to BLM VRM Class III and IV, respectively, allow for moderate to major levels of change, overlay the Southern Alternative project alignments, and thus the levels of change associated with the LPP.

Resource Management Plan Amendment

In the portion of the Project Area where an RMPA is being considered, the VRI documented that the area is of high quality scenery where maintaining the scenic quality is highly valued but that is in an area that is seldom seen by the general public. If environmental protection and mitigation measures are successfully implemented, the Proposed Project features (pipeline alignment) would create weak contrast in the long term resulting in subtle changes to the existing landscape character in a location where visitation by the general public is low.

RMPA Sub-alternative 1

Under RMPA Sub-alternative 1, new land use authorizations could be allowed in the ACEC even when another reasonable alternative exists. However, the proposed amendment to Decision No. MA-LR-06 would still require mitigation for effects on visual resources from new land use authorizations (determined during site-specific project planning). The proposed amendment to Decision No. LA-VR-01 would add new language to provide clarification that where a designated utility corridor overlaps an area of critical environmental concern, the VRM class is Class IV. Thus, the proposed amendment to Decision No. LA-VR-01 would provide for substantial changes in the landscape characteristics within the utility corridor located within the ACEC, increasing the likelihood of adverse effects to the ACEC's visual values.

Table 3.16-4 Summary of Long-term Effects by VAU/Platform for the Southern Alternative

Alternative	VAU No.	VAU Name	KOP No.	KOP Name	Project Components	Land Status/Ownership						Management Units	VAU VRM Class	Long-term Effects on VAU
						BLM	Reclamation	NPS	State	Tribe	Private			
Both	1	Lake Powell/Glen Canyon	2	Former McDonalds Parking Lot	Intake		X					GCNRA	Class 3,4 ^(a)	Negligible to Notable
					BPS-1			X						
					Pipeline		X	X						
					ETS		X	X						
			3	Pullout near Bridge	Intake		X							
					BPS-1			X						
					Pipeline		X	X						
					ETS		X	X						
			4	Chains Day Use Area	Intake		X							
					Pipeline		X	X						
					ETS		X	X						
Both	2	Wahweap	6	Wahweap Overlook	BPS-1			X				GCNRA AZFO ASDL	Class 3,4 ^(a)	Negligible to Subtle
					Pipeline			X	X					
					ETS	X		X	X					
Both	3	Big Water	7 linear	Blue Pool Mesa and Wash	Pipeline			X				GCNRA SITLA AZSO	Class 3,4 ^(a)	Negligible to Substantial
			8 linear	US 89/Larkspur Road Intersection	Pipeline			X			X			
			9	GSENM Big Water Visitor Center	Pipeline				X		X			
			10 a/b linear	Booster Pump Station-2 - US89 EB	BPS-2				X					
					Pipeline				X					
					ETS				X					
			n/a	n/a	ETS	X								

Table 3.16-4 Summary of Long-term Effects by VAU/Platform for the Southern Alternative (continued)

Alternative	VAU No.	VAU Name	KOP No.	KOP Name	Project Components	Land Status/Ownership						Management Units	VAU VRM Class	Long-term Effects on VAU
						BLM	Reclamation	NPS	State	Tribe	Private			
Both	4	East Clark Bench	11b linear	Booster Pump Station-3 - US89	BPS-3	X						SITLA KFO	Class 4	Negligible to Substantial
					Pipeline	X			X					
					ETS	X			X					
			12b	Booster Pump Station-3 - Cottonwood Road	BPS3	X								
					Pipeline	X			X					
					ETS	X			X					
Both	5	Rimrocks/ Paria River Valley	13 linear	Highway 89 near Toadstools Trailhead	Pipeline	X						KEPA SITLA	Class 3	Negligible to Subtle
			14 linear	Toadstools Trailhead	Pipeline	X								
			15	Paria Contact Station	Pipeline	X					X			
			n/a	n/a	ETS	X			X					
Both	6	Cockscomb	n/s	n/a	Pipeline	X						KEPA	Class 3	Negligible to Notable
					ETS	X								
Both	7	Fivemile Valley	18 linear	Booster Pump Station-4 US89	BPS4						X	KEPA	Class 2,3	Negligible to Notable
					Pipeline	X					X			
					ETS						X			
			n/a	n/a	ETS	X								

Table 3.16-4 Summary of Long-term Effects by VAU/Platform for the Southern Alternative (continued)

Alternative	VAU No.	VAU Name	KOP No.	KOP Name	Project Components	Land Status/Ownership						Management Units	VAU VRM Class	Long-term Effects on VAU
						BLM	Reclamation	NPS	State	Tribe	Private			
Both	8	Telegraph Flat	19	Road to Paria Interpretive Site	Pipeline	X					X	KEPA	Class 3,4	Negligible to Notable
			20 linear	Hydro Station 1 US89	HS1	X								
					Pipeline	X								
					ETS	X								
			21	High Point Regulation Tank / Great Western Trail TH	HPRT	X								
					Pipeline	X								
Southern Only	10	White Sage Wash	26	Shinarump Cliffs Overlook	Pipeline	X						AZFO ASDL	Class 2/3/4	Negligible to Subtle
					Access road	X								
			27	Dominguez-Escalante Trail Crossing	Pipeline	X								
					Access road	X								
			n/a	n/a	Pipeline				X					
Southern Only	12	Jacob Canyon/ Kanab Creek/ Pipe Valley	28	Kanab Creek ACEC	Pipeline	X						AZFO ASDL	Class 2/3/4 ^(b)	Negligible to Subtle
			29	Bitter Seeps Wash (Kanab Creek ACEC)	Pipeline	X								
			30 linear	Mount Trumbull Road (Antelope Valley Road)	Pipeline	X			X					
			n/a	n/a	Pipeline	X			X		X			

Table 3.16-4 Summary of Long-term Effects by VAU/Platform for the Southern Alternative (continued)

Alternative	VAU No.	VAU Name	KOP No.	KOP Name	Project Components	Land Status/Ownership						Management Units	VAU VRM Class	Long-term Effects on VAU
						BLM	Reclamation	NPS	State	Tribe	Private			
Both	15	Cottonwood Wash	33 linear	Hydro Station 2 Southern - Yellowstone Road	HS-2 HWY						X	ASDL AZFO	Class 3	Negligible to Substantial
					Pipeline	X			X		X			
					ETS	X					X			
Both	16	Colorado City/Hilldale	34 linear	Hydro Station 3 - Uzona Avenue	HS-3						X	ASDL	N/A	Negligible to Notable
					Pipeline				X		X			
					ETS						X			
Both	17	Uzona/ Canaan Wash	35 linear	Uzona Avenue/Canaan Wash	Pipeline	X					X	AZFO SGFO	Class 3/4	Negligible to Subtle
Both	18	Short Creek	n/a	n/a	Pipeline	X			X		X	SGFO SITLA	Class 4	Negligible to Subtle
Both	19	Frog Hollow	37	Little Creek Overlook	HS-4	X						SGFO Private SITLA	Class 3,4	Negligible to Substantial
					Pipeline	X					X			
					ETS	X					X			
			38 linear	Hydro Station 4 - Frog Hollow Road	HS-4	X								
					Pipeline	X								
					ETS	X					X			
Both	20	Hurricane Cliffs Road	39 linear	Hurricane Cliffs Road	ETS	X						SGFO	Class 2,4	Negligible to Substantial
					HS-5	X								
					Pipeline	X								
			n/a	n/a	Pipeline						X			

Table 3.16-4 Summary of Long-term Effects by VAU/Platform for the Southern Alternative (continued)

Alternative	VAU No.	VAU Name	KOP No.	KOP Name	Project Components	Land Status/Ownership						Management Units	VAU VRM Class	Long-term Effects on VAU
						BLM	Reclamation	NPS	State	Tribe	Private			
Both	21	Sand Hollow	41 linear	Sand Hollow Terminal Station - Sand Hollow State Park	SHTS				X			SGFO SHSP	Class 4	Negligible to Substantial
					Pipeline	X			X		X			
					ETS	X			X		X			

(a) VRM Classes were used as proxy for GCNRA RRU (3) and Development (4) Zones objectives for visual resources.

(b) RMPAs considered for this location for a range of VRM Classes.

Key:

ACEC = area of critical environmental concern

ASDL = Arizona State Development Land

AZFO = Arizona Strip Field Office

BLM = Bureau of Land Management

BPS = booster pump station

ETS = electrical transmission system

GCNRA = Glen Canyon National Recreation Area

GSENM = Grand Staircase-Escalante National Monument

HS = hydro station

HWY = Highway

KEPA = Kanab Escalante Planning Area

KFO = Kanab Field Office

KOP = key observation point

NPS = National Park Service

Reclamation = Bureau of Reclamation

SGFO = St. George Field Office

SHSP = Sand Hollow State Park

SITLA = Utah School and Institutional Trust Lands Administration

TH = trailhead

Tribe = Kaibab Band of Paiute Indians

VAU = visual assessment unit

VRM = visual resource management

RMPA Sub-alternative 2

Under RMPA Sub-alternative 2, the ACEC would be reduced, and the VRM class of the excluded area (905 acres) would be reclassified as Class III. The change in management objectives from Class II to Class III allows partial (rather than full) retention of the existing character of the landscape and provides for a moderate level of change to the characteristic landscape (versus a low level of change under VRM Class II). Under Class III, changes should repeat (versus “must” repeat in Class II) the basic elements found in the predominant natural features of the landscape, management activities may attract the attention of the casual observer. RMPA Sub-alternative 2 would allow for moderate changes to the landscape character that could attract attention on those 905 acres excluded from the ACEC.

RMPA Sub-alternative 3

Under RMPA Sub-alternative 3, effects would be similar to those under RMPA Sub-alternative 1. In addition, in RMPA Sub-alternative 3, the utility corridor would no longer be an avoidance area for new land use authorizations, increasing the likelihood of adverse effects to visual resources; however, mitigation would be required to address any effects identified in site-specific analysis. The utility corridor expansion areas would change from either VRM Class II (areas in the ACEC) or Class III (areas outside of the ACEC) to VRM Class IV, and the area where the utility corridor is removed would be VRM Class II in the ACEC and would change from VRM Class IV to Class III outside of the ACEC. Changes by VRM class may be summarized as follows:

- Class II – net increase of 175.5 acres;
- Class III – net increase of 142.4 acres; and
- Class IV – net decrease of 317.9 acres.

Class IV would allow substantial changes to existing visual resources because VRM Class IV is intended to provide for management activities that require substantial modifications of the existing character of the landscape. Class II or Class III would allow for less change to the existing characteristic landscape because the objective of Class II is to retain the existing character, while the objective of Class III is to partially retain the existing character.

Mitigation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of visual resources.

In addition to the EPMs mentioned in Section 3.16.1.2, above, additional mitigation measures are needed to protect visual resources, have been considered for the visual resource effects analysis, and are needed to ensure that the BLM and NPS visual objectives are met. These include, but are not limited to, additional measures for restoration and revegetation such as slope rounding and contour grading; siting transmission lines as close to existing roads and transmission lines as possible; avoiding location of pipeline or transmission lines up landforms or on skylines when it is feasible; and using non-specular wire and finishes throughout Proposed Project. See Section 2.2.2 of Appendix C-19, Visual Resources for a comprehensive list of Mitigation Measures for the Southern Alternative.

3.16.2.3 Highway Alternative

The Highway and Southern Alternatives share pipeline alignments except the segments from Telegraph Flat past the KIR. The effects to the shared alignments would be the same, and as with the Southern Alternative, the Highway Alternative would result in notable to substantial adverse effects on visual resources associated with the large facilities (BPSs or HSs and associated infrastructure) that would be constructed adjacent to roads and highways. Those located in areas that are primarily undeveloped would create the greater magnitude of effect. The transmission lines create negligible to notable adverse effects depending on their location and proximity to other utility lines or development. The pipeline disturbance would result in negligible to subtle adverse effects across the Project Area if environmental protection and mitigation measures are successfully implemented, and it would create less overall change in landscape character compared to the Southern Alternative because more of the pipeline would parallel already disturbed highway alignments. Across the Highway Alternative where the alignments cross federal lands, BLM VRM objectives and NPS Zone visual objectives would be met.

A detailed discussion of visual effects associated with the Highway Alternative is included in Section 2.3 and Table 2.1-1, Visual Assessment Units Effect Table, of Appendix C-19, Visual Resources. Table 3.16-5 summarizes those long-term effects, applicable only under the Highway Alternative on the landscape character and to the views from the sensitive viewing platforms for each VAU. As with the Southern Alternative, the adverse effects on visual resources would primarily be associated with the large facilities (BPSs and HSs and associated infrastructure) that would be constructed, most of which would be adjacent to roads and highways. Successful implementation of protection and mitigation measures would result in adverse visual effects for the pipeline alignment. The electrical transmission system features would result in adverse effects depending on whether they are aligned with existing infrastructure or are sky lined.

Conformance with BLM VRM Objectives

Conformance with BLM VRM Objectives for VAUs where the Highway and Southern Alternatives overlap are discussed in Section 3.16.2.2, above. Where the Highway Alternative passes through other BLM-managed lands, project components create negligible to subtle contrast, thus meeting the VRM III or IV objectives. See Tables 2.3-3 and 2.3-4 in Appendix C-19, Visual Resources, for specifics.

Conformance with GCNRA Visual Objectives – Southern Alternative

Conformance with GCNRA visual objectives are the same as described in Section 3.16.2.2, above.

Mitigation Measures

The mitigation measures listed in Section 2.2.2 of Appendix C-19, Visual Resources, would be applied to this alternative as well.

Table 3.16-5 Long-term Effects by VAUs Associated Only with Highway Alternative

Alternative	VAU No.	VAU Name	KOP No.	KOP Name	Project Components	Land Status/Ownership						Management Units	VAU VRM Class	Long-term Effects on VAU
						BLM	Reclamation	NPS	State	Tribal	Private			
HWY Only	9	Kanab/Vermilion Cliffs	24 linear	US89 near Pioneer Gap	Pipeline	X					X	KEPA KFO	Class 3,4	Negligible to Subtle
HWY Only	11	Kanab/Fredonia/Lost Springs Wash	N/A	N/A	Pipeline	X			X		X	ASDL AZFO	Class 3	Negligible to Subtle
HWY Only	13	Shinarump Cliffs	31	Kaibab-Paiute Tribal Headquarters	Pipeline			X		X		KIR PSNM	N/A	Negligible to Subtle
HWY Only	14	Potter Canyon	N/A	N/A	Pipeline				X	X	X	KIR ASDL	N/A	Negligible to Subtle
Both	15	Cottonwood Wash	32 linear	HS 2 Highway - HWY 389 WB	HS-2 HWY						X	ASDL AZFO	Class 3	Negligible to Substantial
					Pipeline	X			X		X			
					ETS	X					X			

Key:

ASDL = Arizona State Development Land

AZFO = Arizona Strip Field Office

BLM = Bureau of Land Management

BPS = booster pump station

ETS = electrical transmission system

HS = hydro station

HWY = Highway

KEPA = Kanab Escalante Planning Area

KFO = Kanab Field Office

KIR = Kaibab Indian Reservation

KOP = key observation point

NPS = National Park Service

N/A = not applicable

PSNM = Pipe Spring National Monument

Reclamation = Bureau of Reclamation

Tribal = Kaibab Band of Paiute Indians

VAU = visual assessment unit

VRM = visual resource management

3.16.2.4 Comparative Analysis of Alternatives

On lands managed by BLM and the Utah School and Institutional Trust Lands Administration (SITLA), the visual effects would range from negligible to substantial in both action alternatives. The substantial effects would be associated with the large booster pump station and hydrostation facilities constructed along the pipeline that would create strong contrast to the existing landscape character. On Tribal-managed lands negligible to subtle visual effects would be associated with the pipeline alignment in the Highway Alternative which would create weak contrast; the Southern Alternative would not cross Tribal-managed lands. On NPS-managed lands in GCNRA, the visual effects associated with the Southern Alternative would range from negligible to notable, with the notable effects being associated with the large facilities which create moderate contrast. And at Pipe Spring National Monument the visual effects would be negligible to subtle associated with the disturbances associated with the pipeline alignment in the Highway Alternative. For Reclamation, notable visual effects would result from the construction of the Intake Pump Station and associated facilities which would create moderate contrast, whereas Reclamation does not manage any lands associated with the Highway Alternative. Only in short segments, ASDL lands are crossed by the pipeline and a transmission line that parallels an existing one, thus creating weak contrast and resulting in negligible to subtle visual effects. On private lands the large facilities would be located adjacent to existing infrastructure or screened by landform and vegetation, resulting in notable visual effects from the moderate contrast created. For both alternatives, several of the booster pump station and hydrostation facilities create the strong contrast which results in substantial magnitudes of change to visual resource compared to the pipeline alignments and transmission lines. See Table 3.16-6 for a summary of the contrast created by the station facilities, and Table 3.16-7 for a comparison of the magnitude of change across land status/ownership by alternative.

Table 3.16-6 Summary of Visual Effects Created by Station Facilities

Facility	Acreage of Permanent ROW	Land Status / Ownership	BLM VRM Class/NPS Zone	Contrast Created	Conformances with Visual Objectives
Water Intake	26.92	Reclamation	N/A	Moderate	N/A
BPS-1	16.12	NPS	RRU (Class 3 proxy)	Moderate	Meets
BPS-2	6.45	State	N/A	Strong	N/A
BPS-3	6.71	BLM	Class 4	Strong	Meets
BPS-4	12.42	Private	N/A	Moderate	N/A
High Point Regulating Tank	5.15	BLM	Class 3	Weak	Meets
HS-1	10.34	BLM	Class 3	Moderate	Meets
HS-2 HWY & So ALT	7.62	Private	N/A	Strong	N/A
HS-3	14.46	Private	N/A	Moderate	N/A
HS-4	4.42	BLM	Class 4	Strong	N/A
HS-5	24.61	BLM	Class 4	Strong	N/A
HS-6 (Sand Hollow Station)	10.60	Private/State	N/A	Strong	N/A

Key:

BPS = booster pump station

BLM = Bureau of Land Management

HS = hydrostation

N/A = not applicable

NPS = National Park Service

Reclamation = Bureau of Reclamation

ROW = right-of-way

RRU = Recreation and Resource Utilization Zone

VRM = visual resource management

Table 3.16-7 Summary of Visual Effects from Each Alternative by Land Status/Ownership

Alternative	BLM	Tribe	NPS	Reclamation	SITLA	ASDL	Private
No Action	None	None	None	None	None	None	None
Southern Alt. & RMPA Sub-alternative 1	Negligible to Substantial	None	Negligible to Notable	Notable	Negligible to Substantial	Negligible to Subtle	Negligible to Notable
Southern Alt. & RMPA Sub-alternative 2	Negligible to Substantial	None	Negligible to Notable	Notable	Negligible to Substantial	Negligible to Subtle	Negligible to Notable
Southern Alt. & RMPA Sub-alternative 3	Negligible to Substantial	None	Negligible to Notable	Notable	Negligible to Substantial	Negligible to Subtle	Negligible to Notable
Highway Alternative	Negligible to Substantial	Negligible to Subtle	Negligible to Notable	Notable	Negligible to Substantial	Negligible to Subtle	Negligible to Notable

Key:

ASDL = Arizona State Development Land

BLM = Bureau of Land Management

NPS = National Park Service

Reclamation = Bureau of Reclamation

RMPA = Arizona Strip Field Office Resource Management Plan Amendment

SITLA = Utah School Institutional Trust Lands Administration

Tribe = Kaibab Band of Paiute Indians

By following existing linear infrastructure and passing through more developed areas, the Highway Alternative would create less contrast and be less noticeable by blending with developed landscape characteristics, and thus result in less adverse effects to visual resources than the Southern Alternative.

The primary difference in the action alternatives across all ownership is that from where the alignments diverge until they rejoin (from Telegraph Flat to the western boundary of the KIR), approximately 31 miles of the Southern Alternative would go through primarily undeveloped areas with natural landscape characteristics whereas the Highway Alternative would go through only about 15 miles of primarily undeveloped areas. The Highway Alternative would follow approximately 38 more miles of paved roads or highways. The divergent segment of the Southern Alternative would pass through primarily undeveloped landscape for approximately 14 miles in two locations (from Highway 89 through White Sage to the Navajo-McCullough 500 kV transmission line corridor and by the southeastern boundary of KIR). It would follow existing dirt roads for approximately 6 more miles also near the southeastern boundary of KIR and along Yellowstone Road. The remaining length of the divergent segment of the Southern Alternative (almost 30 miles) would run parallel to or within a half mile of Navajo-McCullough 500 kV transmission line. All of the divergent segment of the Highway Alternative would either align with, be parallel to, or be within a half mile of paved highways and streets, dirt roads, powerlines of a variety of sizes, and/or residential and commercial development. From the point of divergence to reconnection, the Highway Alternative would follow existing linear infrastructure and pass through more developed areas than the Southern Alternative, therefore the Highway Alignment would create less contrast and be less noticeable by blending with culturally-modified landscape characteristics, and thus result in less adverse effects on visual resources than the Southern Alternative. The Highway Alternative would create less visual contrast

in an area seen by far more viewers along U.S. Highways 89 and 389 and in Fredonia compared to the Southern Alternative, which would create more visual contrast in areas seen by far fewer viewers. For both action alternatives, visual resource management objectives range from Class II to IV on BLM lands and NPS visual objectives for the Recreation and Resource Utilization Zone and Development Zone would be met if environmental protection and mitigation measures are successfully implemented.

Details of these differences in Alternative by project feature mileages across land ownership is included in Tables 3.16-8 and 3.16-9.

Table 3.16-8 Miles of Southern Alternative Adjacent to Development by Land Status/Ownership

Southern Alternative	Land Status/Ownership						Total Miles
	BLM	Reclamation	NPS	Tribe	State	Private	
Pipeline							
Total miles of pipeline	71.9	0.2	10.5	0.0	25.2	32.6	140.5
Miles pipeline adjacent to highways/paved roads ^(a)	27.3	0.0	7.6	0.0	13.0	13.2	61.1
Miles pipeline adjacent to dirt roads	8.5	0.2	2.9	0.0	0.1	10.2	21.9
Miles pipeline adjacent to existing transmission lines ^(b)	13.8	0.0	0.0	0.0	8.2	4.1	26.1
Miles of pipeline that pass through primarily undeveloped areas (not included in previous criteria)	22.3	0.0	0.0	0.0	4.0	5.2	31.5
Transmission Lines							
Total miles of transmission lines	35.2	0.7	3.7	0.0	24.2	6.3	70.0
Miles transmission lines adjacent to existing transmission lines	22.1	0.3	2.3	0.0	18.0	2.2	44.9

Notes:

(a) Highways and paved roads supersede proximity to transmission lines.

(b) Transmission lines supersede proximity to dirt roads.

Key:

BLM = Bureau of Reclamation

NPS = National Park Service

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

Table 3.16-9 Miles of Highway Alternative Adjacent to Development by Land Status/Ownership

Highway Alternative	Land Status/Ownership						Total Miles
	BLM	Reclamation	NPS	Tribe	State	Private	
Pipeline							
Total Miles of pipeline	43.0	0.2	10.5	16.4	21.0	42.9	134.2
Miles pipeline adjacent to highways/paved roads ^(a)	30.9	0.0	7.6	16.4	16.1	27.6	98.8
Miles pipeline adjacent to dirt roads	4.4	0.2	2.9	0.0	0.7	6.6	14.9
Miles pipeline adjacent to existing transmission lines ^(b)	0.5	0.0	0.0	0.0	2.3	3.2	6.0
Miles of pipeline that pass through primarily undeveloped areas (not included in previous criteria)	7.2	0.0	0.0	0.0	1.9	5.5	14.5
Transmission Lines							
Total miles of transmission lines	34.5	0.7	3.7	0.0	24.2	6.0	69.1
Miles transmission lines adjacent to existing transmission lines	22.1	0.3	2.3	0.0	18.0	2.2	44.9

Notes:

(a) Highways and paved roads supersede proximity to transmission lines.

(b) Transmission lines supersede proximity to dirt roads.

Key:

BLM = Bureau of Land Management

NPS = National Park Services

Reclamation = Bureau of Reclamation

Tribe = Kaibab Band of Paiute Indians

3.17 Cultural Resources

3.17.1 Affected Environment

Cultural resources are definite locations of human activity, occupation, or use identifiable through field survey, historical documentation, or oral evidence. The term includes archaeological, historic, or architectural sites, structures, or places with important public and scientific uses, and may include definite locations (sites or places) of traditional cultural or religious importance to specific social and/or cultural groups. In most cases, cultural resources that are located along the Project Area are finite, unique, fragile, and nonrenewable. Cultural resources that meet the eligibility criteria for listing in the National Register of Historic Places (NRHP or National Register) are formally referred to as historic properties. Cultural resources also include traditional cultural properties (TCPs) and traditional cultural districts (TCDs). For this DEIS, sacred sites (as defined in Executive Order 13007), TCPs and TCDs are analyzed in Section 3.18, Ethnographic Resources.

3.17.1.1 Regulatory Framework and Methodology

Pursuant to Section 106 of the National Historic Preservation Act (Title 54 of the USC, hereafter simply referred to as “Section 106”), federal agencies must consider whether any historic property within a project’s APE could be affected by the undertaking.

To understand the cultural resources near and within the Proposed Project, an expansive 2-mile APE (1 mile on either side of the centerline) and literature review was applied to the Proposed Project. The width of this APE was chosen to provide an understanding of the location, type, and

density of cultural resources in the general area, along with any previously recorded cultural resources that are within the footprint of any construction activities associated with the Proposed Project. The 2-mile APE also assists in providing understanding of the types and densities of cultural resources that would most likely be encountered or negatively affected from an indirect effect to the setting (e.g., visual, auditory, atmospheric) by the Proposed Project.

To determine which cultural resources would be directly affected, a Class III-Intensive Pedestrian Survey (Class III survey) was conducted within a 250-foot-wide survey area for the Proposed Project and alternative actions. A Class III survey of the proposed ancillary facilities was also conducted. A 100-foot survey area around these facilities included facilities such as construction staging areas and access roads. The 250-foot survey area and the 100-foot survey area are referred to in this DEIS as the “Project APE.”

A geoarchaeological study was performed in support of the Class III survey. The results of this study are documented in *The Lake Powell Pipeline Class III: Appendix H Utah-Arizona Literature Search and Maps* (UBWR 2018a). The purpose of this study was to assess the potential of a number of archaeological resources to contain geological deposits suitable to preserved relatively intact and buried cultural zones that would be at risk from pipeline construction. The results of the study provide an aid in the decision-making process for archaeological testing and data recovery as a method for mitigating potential impacts on significant or sensitive archaeological resources.

These APEs and their subsequent identification efforts (e.g., literature reviews, Class III surveys, and geoarchaeological studies), were designed to provide an understanding of potential effects of construction operation and maintenance of the Proposed Project. These study reports are listed in Appendix C-20, Cultural Resources.

3.17.1.2 Environmental Protection Measures

Environmental Protection Measures (EPMs) as outlined in the Plan of Development are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

Construction, operation, and maintenance of the Proposed Project would affect cultural resources that are listed in or eligible for inclusion in the National Register. To protect historic properties, the Project Proponent proposes to implement the measures that would be contained within the final POD. These measures would summarize the procedures contained within a pending multiple-agency programmatic agreement document to manage the effects of the Proposed Project on historic properties and ensure compliance with Section 106 (*Programmatic Agreement Among the Bureau of Land Management; Kaibab Band of Paiute Indians; Arizona State Historic Preservation Officer; Utah State Historic Preservation Officer; and Advisory Council on Historic Preservation; Regarding the Lake Powell Pipeline Project in Southern Utah and Northern Arizona – In Progress*). When finalized, this agreement would call for the implementation of Historic Property Treatment Plans (HPTPs) for each state. The purpose of the HPTPs is to resolve (i.e., reduce, avoid, or mitigate) existing or potential project-related adverse effects on historic properties within the APEs throughout construction, operation, and maintenance of the Proposed Project. Measures that would be outlined in the HPTP include, but are not limited

to procedures for: avoidance measures, cultural resource monitoring, unanticipated discoveries, mitigation, reporting, and public outreach.

3.17.1.3 Existing Conditions

The previously recorded cultural resources found in the literature review for the Proposed Project are presented in project literature searches (UBWR 2018b, 2018c, and 2018d). The literature review encompassed a 1-mile corridor on either side of the pipeline route and proposed transmission lines, known as the 2-mile APE.

For the Proposed Project, most of the previously recorded prehistoric sites within the 2-mile APE are associated with Ancestral Puebloan Basketmaker II and Basketmaker III through Pueblo II periods, although some Archaic and Ancestral Numic sites were documented. Some site types found within the 2-mile or Project APE, such as pueblos and pit houses, contain more subsurface artifacts, features, and deposits than sites types that are mostly present on the ground surface (e.g., lithic scatters). The potential for subsurface archaeological remains, and at times human remains, at pueblos or pit houses, increases their archaeological complexity and may increase the concerns an Indian tribe or the public in any damage that may occur to these site types. Historic sites primarily consist of linear resources (e.g., roads, trails, utility corridors, and waterways). Other historic sites include refuse scatters, farm and homesteads, ranches, campsites, waterworks, mining sites, lime kilns, historic inscriptions, standing structures, and cemeteries and graveyards. Most of these sites are associated with mid-19th to late 20th century Euro-American populations. A listing of these site types is presented below in Table 3.17-1.

Table 3.17-1 Results from the 2-mile APE Literature Review along the Highway and Southern Alternatives (Combined)

Site Type	Utah	Arizona	Kaibab Indian Reservation	Total in 2-Mile APE
Prehistoric Sites	897	343	19	1,259
Historic Sites	138	35	4	177
Multi-component Sites	49	12	7	68
Historic Standing Structures	44	22	0	66
Historic General Land Office Features	100	57	0	157
Unknown Composition and Age	0	0	7	7
NRHP Listed Historic Property	10	2	0	12

Key:

APE = area of potential effect

NRHP = National Register of Historic Places

The results of the Class III survey are documented in *The Lake Powell Pipeline Class III Final Report, Volume 1: Utah Survey Report*; *The Lake Powell Pipeline Class III Final Report, Volume 2: Arizona Survey Report*; and *The Lake Powell Pipeline Class III Final Report, Appendix I: Kaibab-Paiute Indian Reservation Survey Report* (UBWR 2018b, 2018e, and 2018f). The total number of cultural resources found within the ROW for the Southern Alternative was 272 and 259 for the Highway Alternative. The types of sites that were located during the Class III survey are further described in the following sections.

3.17.2 Environmental Consequences

3.17.2.1 No Action Alternative

If the LPP were not built, the Proposed Project would have no additional adverse effects to cultural resources. However, the Proposed Project is responsible for an increased awareness of cultural resources in the area, which has been a beneficial effect. Archaeologists, tribes, and the public are now more aware of the types and density of cultural resources within the 2-mile APE. Under the No Action Alternative, no amendment to the RMP would be required so current management of the resources for which the ACEC was designated (including cultural resources) as prescribed in the RMP would continue. However, under this alternative, projects already planned by the Project Proponent would continue to occur. Disturbance of cultural sites, due to these projects, would vary in space and time. Most effects would be short term and could be mitigated. Most effects to cultural resources, due to construction of other planned projects, would be minimized through implementation of standard industry practices by the Project Proponent.

3.17.2.2 Southern Alternative

The Southern Alternative would have adverse effects on cultural resources including historic properties. The prehistoric, historic, and multicomponent sites identified and documented within the Project APE would be affected in different ways and to different degrees by construction requirements for the various facilities. For example, the pipeline route would not be able to be shifted enough to avoid all sites; however, the position of buildings and some facilities could be moved to avoid sites. While avoidance is always the preferred option, sites that cannot be avoided would need some form of mitigation for negative effects to historic properties. This mitigation will be outlined in the HPTP. This document will also address protection and management needs for cultural resources prior to, during, and after construction of the pipeline and other associated effects.

Sites that span the Project APE or lie across the Project APE would be affected by construction; measures outlined in the HPTP would be implemented to mitigate the effects on these cultural resources. Many of the cultural resources within the transmission corridors may be avoided by spanning the sites and relocating some towers. However, some tower locations may directly affect a limited number of sites. Access roads for these towers may also create effects on the cultural resources that may require mitigation and/or monitoring. While some of the sites lie adjacent to other access roads, several of the access roads are, themselves, historic roads or have associated features that may not be avoided.

From the Class III survey of the Southern Alternative, a total of 272 cultural resources sites are within or partially within the “footprint” of the ROWs for construction of the pipeline, access roads, and other project-related facilities. Two hundred fourteen of these cultural resources are eligible for the NRHP; 58 are not eligible. Effects may include but are not limited to complete destruction, partial destruction, artifact breakage, visual effects, auditory effects, and atmospheric effects. Table 3.17-2, below, lists these resources.

Table 3.17-2 Eligibility of Cultural Resources within the Rights-of-Way of the Southern Alternative (Including Shared Areas with Highway Alternative)

National Register Status	Number of Sites
Non-eligible	58
Eligible	214
Total	272

The Project Proponent detailed the visual effects that the LPP could have on the various resources located within or near the 2-mile APE (UBWR 2018b, 2018e, and 2018f). These reports identify the following resources and the visual effects on historic properties: Dominquez-Escalante Trail, Old Spanish National Historic Trail, Honeymoon Trail, Pipe Spring National Monument, Historic Highway US-89A, Temple Historic Trail (Antelope Valley - County Road 109), and the ACEC. The report notes that both the Dominquez-Escalante and Old Spanish Trail were single-use trails with no visible evidence of their specific location. The report indicates that the short-term and long-term effects on these resources ranges from low to very low, with some negative effects in the foreground of the resource.

Resource Management Plan Amendment

Designation of an ACEC highlights areas where special management attention is needed to protect and prevent irreparable damage to important historic, cultural, and scenic values; general fish or wildlife resources; or other natural systems or processes. The ACEC designation indicates to the public that the BLM recognizes that an area has significant values and has established special management measures to protect those values. In addition, designation also serves as a reminder that significant values or resources exist that must be accommodated when future management actions and land use proposals are considered near or within an ACEC. Designation of ACECs is achieved only through the planning process, either in the RMP itself or through a plan amendment.

Kanab Creek is a culturally special place to the Paiute people. Kanab Creek is defined by its contribution to the aboriginal adaptation of Southern Paiute people to their survival during the historic period. Riverine and spring oasis farming were central to Paiute adaptation in the area, and the permanent waters of Kanab Creek were key to this farming. The Kaibab Paiute people farmed the length of Kanab Creek; plants were gathered and animals of all kinds were hunted. Kanab Creek also defined one of the major north-south access trails from the mountains of southern Utah to the Colorado River. Along this trail was a two-way flow of goods and materials drawn from neighboring Indian tribes to the south, as well as the seasonal movement of plants and animals found in various ecological zones (Stoffle et al. 1997). The ACEC area incorporates the BLM-administered portion of Kanab Creek in Arizona. The ACEC was designated in part for its relevant and important cultural values; it is considered to have significant regionally important cultural resources vulnerable to vandalism and effects.

Accordingly, in 2011 the Kaibab Tribal Council designated the area as a TCP and sacred site, Resolution of the Governing Body of the Kaibab Band of Paiute Indians, No. K-07-11 (Mar. 17, 2011), and in 2019 the Kaibab Tribal Council designated it as an integral component of a larger Traditional Cultural District. Resolution of the Governing Body of the Kaibab Band of Paiute Indians, No. K-27-19 (May 16, 2019).

Designation of the ACEC provides additional protection to archaeological and historical resources. One example is Decision No. MA-AC-10, which limits motorized use in an area of critical

environmental concern to the footprint of a designated road (versus Decision No. MA-TM-05 that allows vehicles to pull off designated routes up to 100 feet either side of centerline of the route). This would minimize inadvertent damage to cultural resources along routes in the ACEC. Other management prescriptions in the RMP provide additional protection to cultural resources as well.

RMPA Sub-alternative 1

Under RMPA Sub-alternative 1, RMP Decision No. MA-LR-06 would be amended so that new land use authorizations could be allowed in the ACEC. However, the proposed amendment to Decision No. MA-LR-06 would still require routing new utilities away from cultural resources and mitigation for effects from new land use authorizations (determined during site-specific planning). These effects would be evaluated during project-specific environmental review and analysis, which would include mitigation of effects to the extent possible. The proposed amendment to Decision No. LA-VR-01 would clarify that where a designated utility corridor overlaps an area of critical environmental concern, the VRM class is Class IV rather than Class II as it is elsewhere in the ACEC, potentially allowing substantial changes in landscape characteristics. This change would affect the visual character in that portion of the ACEC by potentially allowing new land use authorizations to be more obtrusive and visible on the landscape.

RMPA Sub-alternative 2

Under RMPA Sub-alternative 2, potential effects on cultural resources could occur because the size of the ACEC would be reduced by 905 acres with no specific provision for mitigation from new land use authorizations in the area that has been excluded from the ACEC. In addition, other area of critical environmental concern management prescriptions in the RMP that provide additional protection to cultural resources would no longer be applicable to the lands excluded from the ACEC. Construction and O&M of new ROWs (and other land use authorizations), as well as the use and maintenance of designated routes, construction of new range facilities, and management of salable or leasable minerals could result in direct effects on cultural resources, and indirect effects on sites from erosion as vegetation is removed. However, existing federal laws (including the NHPA) would still apply; therefore, potential effects on cultural resources would be evaluated during project-specific environmental review and analysis and mitigated to the extent possible.

RMPA Sub-alternative 3

Under RMPA Sub-alternative 3, effects on cultural resources would be similar to those described under RMPA Sub-alternative 1. In addition, the utility corridor would no longer be an avoidance area for new land use authorizations, potentially increasing the likelihood of adverse effects to cultural resources. However, RMPA Sub-alternative 3 would result in a decrease of 175.5 acres of overlap between the utility corridor and the ACEC, thus decreasing the likelihood of new land use authorization that may disturb cultural resources in this area. However, the proposed amendment would still require mitigation for effects from new land use authorizations that would be determined during site-specific project planning. In addition, other area of critical environmental concern management prescriptions in the RMP that provide additional protection to cultural resources would still be applicable since the size of the ACEC would not be reduced.

Mitigation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of cultural resources.

The HPTPs will discuss specific project-related effects at each identified historic property within the APE and will recommend one of three general management recommendations: avoidance, monitoring, or mitigation/data recovery.

3.17.2.3 Highway Alternative

The Highway Alternative would adversely affect cultural resources including historic properties. These places would be affected by the Proposed Project in diverse ways. All cultural resources located along the Proposed Project have the potential to be adversely affected by construction and operation of the Proposed Project.

The prehistoric, historic, and multicomponent sites identified and documented within the Project APE would be affected in different ways and to different degrees by construction requirements for the various facilities. For example, the pipeline route would not be able to be shifted enough to avoid sites; however, the position of buildings and some facilities could be moved to avoid sites. While avoidance is always the preferred option, sites that cannot be avoided would need some form of mitigation for adverse effects. This mitigation would be outlined in the HPTPs. This document would also need to address protection and management needs for cultural resources prior to, during, and after construction of the pipeline and other associated effects.

Sites that span the Project APE or lie across the Project APE would be affected by construction. Measures outlined in the HPTPs would be implemented to mitigate the effects on these cultural resources. Many of the cultural resources within the transmission corridors may be avoided by spanning the sites and relocating some towers. However, some tower locations may directly affect a limited number of sites. Access roads for these towers may also create effects on the cultural resources that may require mitigation and/or monitoring. While some of the sites lie adjacent to other access roads, several of the access roads are, themselves, historic roads or have associated features that may not be avoided.

From the Class III survey of the Highway Alternative, a total of 259 cultural resources sites are within or partially within the “footprint” of the ROWs for construction of the pipeline, access roads, and other project-related facilities. Two hundred six of these cultural resources are eligible to the NRHP. Fifty-three of these cultural resources are not eligible. Effects may include, but are not limited to, complete destruction, partial destruction, artifact breakage, visual effects, auditory effects, and atmospheric effects. Table 3.17-3, below, lists these resources.

Table 3.17-3 Eligibility of Cultural Resources within the Rights-of-Way of the Highway Alternative (including Shared Areas with Southern Alternative)

National Register Status	Number of Sites
Non-eligible	53
Eligible	206
Total	259

The Proponent Project detailed the visual effects that the LPP could have on the various resources located within or near the 2-mile APE (UBWR 2016). This report identifies the following resources and the visual effects on historic properties: Dominguez-Escalante Trail, Old Spanish National Historic Trail, Honeymoon Trail, Pipe Spring National Monument, Historic Highway US-89A, Temple Historic Trail (Antelope Valley Road - County Road 109), and the ACEC. The report notes that both the Dominguez-Escalante and Old Spanish Trail were single-use trails with no visible

evidence of their specific location. The report indicates that the short- and long-term effects on these resource ranges from low to very low, with some effects in the foreground of the resource.

Mitigation Measures

The mitigation measures for this alternative are the same as those listed in the Southern Alternative.

3.17.2.4 Comparative Analysis of Alternatives

The Proposed Project would have adverse effects on cultural resources including historic properties. More cultural resources would be affected by the Southern Alternative than the Highway Alternative (Table 3.17-4, below); however, the Southern Alternative would affect fewer (n=14) complex sites with the potential for human remains than the Highway Alternative (n=21) (see Table 3.17-5 below). With one major deviation, the Southern Alternative and Highway Alternatives are similar in that they begin at Lake Powell and end at Sand Hollow. Along these alternative routes are numerous cultural resources that are culturally sensitive, sacred, and/or declared historic properties, eligible for inclusion on the NRHP. These places would be affected by the Proposed Project in diverse ways. Effects may include, but are not limited to, complete destruction, partial destruction, artifact breakage, visual effects, auditory effects, and atmospheric effects. Table 3.17-4, below, lists these resources.

Table 3.17-4 Cultural Resources Identified by the Class III Survey within the Proposed Project's Right-of-Way for the Southern and Highway Alternatives that May Be Directly or Indirectly Affected

National Register Status	Southern Alternative	Highway Alternative
Non-eligible	58	53
Eligible	214	206
Total	272	259

The Class III surveys identified a variety of prehistoric site types. Some of these site types, such as pueblos and pit houses, usually contain subsurface artifacts, features, and deposits. Subsurface deposits may include, but are not limited to, room blocks, ceremonial rooms, storage features, hearths, artifacts, and middens. In some instances, human remains have been found near or within pueblos and pit houses. With the abundance of archaeological information at these site types and their potential to contain human remains, their importance and sensitivity is recognized. Other prehistoric site types, such as camp sites and lithic scatters, may also contain subsurface deposits and may provide important information about the prehistory of the area; however, the archaeological complexity and potential for human remains is usually less than at a pueblo or pit house. The number of pueblos and pit houses recorded within the Project APE are listed in Table 3.17-5.

Table 3.17-5 Pueblo and Pit House Sites Identified in the Project APE for the Southern and Highway Alternatives That May be Directly or Indirectly Affected

Site Type	Southern Alternative	Highway Alternative
Pueblo	10	19
Pit house	4	3
Total	14	21

Key:

APE = area of potential effect

Farmsteads and camps/habitation sites are known to usually contain important information (e.g., subsurface deposits and substantial artifact assemblages) or are sometimes associated with important

events, important people, or vernacular architectural/engineering design. Each alternative has a similar amount of historic camp/habitation sites and farmsteads. For example, the Southern Alternative has six historic camp/habitation sites and two farmsteads and the Highway Alternative has seven historic camp/habitation sites and two farmsteads.

Sites that are of particular concern, that may be directly or indirectly affected within the Project APE, include rock art, historic inscriptions, and rock shelters. Potential adverse effects on these cultural resources within the Project APE are listed in Table 3.17-6, below.

Table 3.17-6 Particular Sites of Concern within the Project APE for the Southern and Highway Alternatives

Site Type	Southern Alternative	Highway Alternative
Rock art	2	2
Historic inscriptions	2	3
Rock shelters	4	4
Rock shelter with historic inscriptions	1	1
Total	9	10

Key:

APE = area of potential effect

Table 3.17-6, above, shows a similar number of sites of concern that may be affected by either the Highway or the Southern Alternative. It should be noted that even if a pueblo or pit house, historic camp, farmstead, rock art, historic inscription, or rock shelter listed in the above tables are located within the Project APE, any alteration, damage or destruction to these historic properties may be avoided through project design. If alteration, damage, or destruction to these historic properties is projected to occur, avoidance and mitigation measures outlined in the HPTP would be employed to lessen these effects.

Sites similar to those listed in Tables 3.17-5 and 3.17-6, above, are present within the 2-mile APE. Because cultural resources may be located farther away in distance from Project APE and within the 2-mile APE, negative effects from either the Highway or the Southern Alternative would be fewer than potential effects within the Project APE. Since both alternatives share the same alignment for a long distance, indirect effects (e.g., visual) would be similar in magnitude for both alternatives. However, indirect effects on the Kanab Creek area south of the KIR are more likely to occur if the Southern Alternative is selected. Conversely, if the Highway Alternative is selected, indirect effects on cultural resources near and within the KIR are more likely to occur.

3.18 Ethnographic Resources

3.18.1 Affected Environment

Ethnographic resources are resources that are considered important to living communities. The tribes' perspective informs this section and may not align with the federal agencies' perspectives. In general, these resources may include buildings, locations, sacred locations, viewsheds, archaeological sites, plant habitats, shrines, or other places where individual modern communities have a deep connection to their past. In contrast, the cultural resources section of the DEIS focuses solely on archaeological resources (prehistoric and historic sites). This division was made to give greater emphasis on modern community concerns, particularly those of Native American Tribes.

For the full discussion on the topic, please refer to Appendix C-21, Ethnographic Resources.

3.18.1.1 Regulatory Framework and Methodology

The regulatory framework for ethnographic resources occurs together with those regulations protecting archaeological resources, in part because ethnographic resources may include prehistoric and historic sites that are venerated by living communities (NPS 2018). Pursuant to Section 106 of the NHPA (hereafter, Section 106 or NHPA depending on context), the federal agencies must consider whether any historic property within a project's APE could be affected by the undertaking by making a "reasonable and good faith effort" to identify historic properties (NHPA Section 800.4(b)(1)). This sentence requires defining several terms to better understand what it entails.

Historic property is a legal term with eligibility requirements attached to it. Ethnographic resources that meet the eligibility criteria for listing in the NRHP are formally referred to as historic properties and/or TCPs depending on context and have protection under law. TCPs are rooted in a traditional community's history and are important in maintaining the continuing cultural identity of the community. A TCP may be eligible for inclusion in the NRHP based on its associations with the cultural practices, traditions, beliefs, lifeways, arts, crafts, or social institutions of a living community. A TCD is a geographic area (district) with multiple historic properties within a defined area and may also be eligible for inclusion on the NRHP.

Another important type of ethnographic resource is a "Sacred Site":

"Sacred site" means any specific, discrete, narrowly delineated location on Federal land that is identified by an Indian tribe, or Indian individual determined to be an appropriately authoritative representative of an Indian religion, as sacred by virtue of its established religious significance to, or ceremonial use by, an Indian religion; provided that the tribe or appropriately authoritative representative of an Indian religion has informed the agency of the existence of such a site. (E.O. 13007)

When federal agencies know of sacred sites, they shall:

... "to the extent practicable, permitted by law"...

(1) accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and (2) avoid adversely affecting the physical integrity of such sacred sites.

Where appropriate, agencies shall maintain the confidentiality of sacred sites..." (E.O. 13007)

An APE is defined as "the geographic area or areas within which an undertaking may cause changes in the character or use of historic properties" (36 CFR 800.16[d]). To understand the cultural resources near and within the Project Area, an expansive 2-mile APE (1 mile on either side of the centerline) and literature review was applied to the Proposed Project.

The Advisory Council on Historic Preservation (ACHP) has created guidance on what constitutes a "reasonable and good faith effort":

Prior to beginning the identification stage in the Section 106 process, the regulations (at 36 CFR § 800.4) require the federal agency to do the following:

- Determine and document the APE in order to define where the agency will look for historic properties that may be directly or indirectly affected by the undertaking;
- Review existing information on known and potential historic properties within the APE, so the agency will have current data on what can be expected, or may be encountered, within the APE;
- Seek information from others who may have knowledge of historic properties in the area. This includes the State Historic Preservation Officer (SHPO)/Tribal Historic Preservation Officer (THPO) and, as appropriate, Indian tribes or Native Hawaiian organizations who may have concerns about historic properties of religious and cultural significance to them within the APE.

Following these initial steps, the regulations (36 CFR § 800.4(b)(1)) set out several factors the agency must consider in determining what is a “reasonable and good faith effort” to identify historic properties. They call for the agency official to “take into account past planning, research and studies; the magnitude and nature of the undertaking and the degree of federal involvement; the nature and extent of potential effects on historic properties; and the likely nature and location of historic properties within the APE.” The Secretary of the Interior’s standards and guidelines for identification provide guidance on this subject. The agency official should also consider other applicable professional, state, tribal, and local laws, standards, and guidelines. The regulations note that a reasonable and good faith effort may consist of or include “background research, consultation, oral history interviews, sample field investigation, and field survey.”

When asked to provide its advisory opinion (pursuant to 36 CFR§ 800.2(b)(2)) on the adequacy of a specific identification effort, the ACHP will evaluate the agency’s efforts in light of these factors and the following criteria:

1. The identification effort is reasonable when it is logically designed to identify eligible properties that may be affected by the undertaking, without being excessive or inadequate in light of the factors cited above. While it may be appropriate in some circumstances to identify all historic properties in the APE, it is important to note that the regulations *do not require* identification of all properties.
2. The identification effort is carried out in good faith when it is fully implemented by or on behalf of the federal agency (ACHP 2011, emphasis in original).

The general methodology to identify ethnographic resources for the Proposed Project was, first, to invite tribes to participate. Several tribes wished to visit the Project Area with tribal elders and other knowledgeable tribal members. Locations were picked out in advance as probable areas of concern. Additional locations were chosen during the field trips as needed. At each location, comments made by the tribal members were recorded and later compiled. The draft ethnographic report was then submitted to each tribe for verification. Ethnographic reports were prepared by the Hopi, Hualapai, Southern Paiute Advisory Committee (SPAC; consisting of the Kaibab Tribe, Paiute Indian Tribe of Utah, and San Juan Southern Paiute Tribe), and the Zuni. Much of the material within the reports is considered by the tribes as too sensitive for public disclosure.

The procedures for protecting cultural resources (archaeological and ethnographic resources) eligible for listing in the NHRP, including site protection buffers, monitoring, handling unanticipated

discoveries, mitigation, reporting, and public outreach, will be memorialized in the *Programmatic Agreement among the Bureau of Land Management; Kaibab Band of Paiute Indians; Arizona State Historic Preservation Officer; Utah State Historic Preservation Officer; and Advisory Council on Historic Preservation; regarding the Lake Powell Pipeline Project in Southern Utah and Northern Arizona* (in progress) and detailed in HPTPs for the Proposed Project. The purpose of the HPTPs is to resolve (i.e., reduce, avoid, or mitigate) potential project-related adverse effects on historic properties within the APEs throughout construction, operation, and maintenance of the Proposed Project.

3.18.1.2 Environmental Protection Measures

EPMs as outlined in the POD (see Appendix E, Plan of Development) are measures or procedures that are part of the Proposed Project and would be implemented as standard practice, including measures or procedures that could reduce or avoid adverse impacts. EPMs would be applied regardless of landownership, except where the jurisdictional agency or landowner determines changes to the EPM(s) would ensure greater consistency with governing statutes, policies, or plans. Proper communication and coordination would occur with the jurisdictional agency, private landowner, etc., to ensure changes to EPMs are modified and applied appropriately.

The proposed pipeline would incorporate EPMs into the design of the pipeline by first, avoiding areas of cultural concern. Avoidance is achieved by moving the pipe and its associated construction activities to the side of sites, but within the 250-foot corridor surveyed for cultural resources. The next design feature is to reduce the footprint of the pipeline construction, where possible, within identified viewsheds to minimize impacts. The Proposed Project would incorporate visual deflectors, such as placement of trees and boulders to minimize viewshed concerns. Once the pipeline is in the ground, disturbed areas would be revegetated with seed mixtures appropriate to the plant community as described in the Proponent's Plan of Development (UDWRe 2020) and Appendices C-13, Vegetation Communities; C-14, Wetland and Riparian; and C-15, Special Status Plants.

3.18.1.3 Existing Conditions

The existing conditions within the Project Area include human-landscape interactions, ethnographic categories, and ethnographic findings. Human-landscape interactions include the significant length of time, also known as “deep time,” that Native Americans have existed on the landscape. For example, the SPAC ethnography declares that the Southern Paiute were created in the region and consequently, all prehistoric sites are part of their heritage (SPAC 2020). The Hopi and Zuni also have similar claims (Colwell-Chanthaphonh et al. 2011; Molenaar and Greaves 2013). This deep time component helps explain the tribes' experience in understanding how resources were and are used within the area.

Ethnographic categories refer to particular types of physical and non-physical aspects of the landscape. For example, a difficult concept for many people is commonplace for Native American tribes: the world is alive and interconnected. Many Native Americans believe that everything has a spirit/sentience. This includes animals, plants, rocks, canyons, rivers, and even air. It is believed that the Creator gave each an individual, sentient spirit (with its own voice, desires, and life) as each element was placed into the world. What appears to a non-Indian as just a pebble is a wondrous act of creation, connected to the whole earth, with a unique spirit that can listen, speak, and interact with those of suitable spiritual temperament. This idea of a spiritual landscape filled with individual spiritual elements is central to Native American objections to construction projects. People are

disrupting the work of Creation by moving what belongs (integrated into this particular space) and replacing it with what does not belong (matter from a different integrated landscape).

Another type of general category is prehistoric sites. Each tribe expressed a profound reverence for prehistoric sites and artifacts as evidence of ancestral use of the land, and as part of a spiritual landscape. Plants and animals are very important to traditional customs and practices. Plants have spiritual power, which helps in healing, bringing spiritual power, and inviting supernatural forces. Likewise, animals have spirits and ancestors which can guide and empower those with correct understanding. Natural world formations are very important to Native Americans. These may include rock formations, springs, water ways, and mountains. Each of these is considered a living being, with particular strengths, abilities, and sentience. Their viewsheds are also an important aspect of their identity.

Ethnographic findings refers to particular resources that were identified during tribal visits. Because federal law is concerned with particular site types and their eligibility to the NRHP, each tribe was asked to identify TCPs and sacred sites, so that they could be incorporated into the planning process for the Proposed Project. These are discussed in Appendix C-21, Ethnographic Resources, but are summarized here.

The Hopi ethnography identified all prehistoric sites as TCPs eligible for the NRHP under Criteria A-D per federal regulations due to their connection with ancestral use of the area. No other TCPs were identified.

The Hualapai ethnography did not identify any TCPs.

The SPAC ethnography and other documents identified sacred sites, TCPs, a TCD, and areas of cultural concern. For example, the Resolution of the Governing Body of the Kaibab Band of Paiute Indians, No. K-07-11 (March 17, 2011) states that:

[T]he Kaibab Tribal Council is requesting the following places and landscapes be declared as sacred sites under Executive Order 13007; Kanab Creek, Elephant Foot, Yellowstone Mesa, Moonshine Ridge, Indian Knoll, Milk Mountain, Pilgrimage Trail, Eagle Mountain and Ancestral Village; ... the Kanab Creek corridor and tributaries are accepted as sacred by the spiritual leaders of the Tribe, Tribal Elders, and the Tribal Council;

Many of these locations are included in the Kanab Creek TCD.

The SPAC ethnography and other documents identified sacred sites, TCPs, a TCD, and areas of cultural concern. The Kanab Creek Traditional Cultural District was also declared a sacred site. The district comprises about 90,000 acres and includes multiple TCPs, historic and prehistoric sites, and other areas of cultural concern. The Milk Mountain Pilgrimage Trail consists of a path from the Pariah River to Milk Mountain, which includes locations where offerings were made. This path is associated with prehistoric sites and shamanistic rituals. The "Take Out Point/Colorado River" was declared a TCP with no associated details. (Other TCPs identified are either outside of the Project Area in its present form or inside the TCD.) The SPAC identified other areas of cultural concern, which do not rise to the level of sacred sites and TCPs or TCDs. However, if the Proposed Project could accommodate their avoidance, it would create good will to the local community. The SPAC identified several areas of cultural concern including plant habitat areas, Pioneer Gap to the Turn-Off to U.S. Highway 89A, U.S. Highway 89A to the Reservation Boundary, Lost Spring Wash,

Kanab Creek Crossing, Sand Dune, Cottonwood Creek Aboriginal Southern Paiute Agricultural Community, Sandy Canyon Aboriginal Southern Paiute Agricultural Community, Sand Wash Aboriginal Southern Paiute Agricultural Community, Moccasin-Twomile Aboriginal Southern Paiute Agricultural Community, Moccasin-Twomile: Pipe Spring Aboriginal Southern Paiute Agricultural Community, Pipe Valley Aboriginal Southern Paiute Agricultural Community, and the Gould Creek Wash Crossing.

The Zuni ethnography declared the Grand Canyon (plus tributaries), Colorado River (plus tributaries), and all prehistoric sites as both sacred sites and TCPs and evaluated them under the NRHP criteria per federal regulations. The Grand Canyon, from rim to rim and including all tributary canyons is important to Zuni creation, homeland, and identity. The Colorado River (plus tributaries) features prominently in Zuni history and belief. The Zuni also consider all prehistoric sites as evidence of ancestral use of the area.

3.18.2 Environmental Consequences

3.18.2.1 No Action Alternative

The No Action Alternative would have no additional effects on ethnographic resources. If the LPP were not built, the Proposed Project would have no additional effects on ethnographic resources. However, under this alternative, projects already planned by the Project Proponent would continue to occur. Disturbance, due to these projects, would vary in space and time. Most effects would likely be long-term in nature. Mitigation measures and standard industry practices would be implemented on future planned projects to minimize effects.

3.18.2.2 Southern Alternative

The Southern Alternative would have long-term, adverse effects on ethnographic resources including sacred sites, TCPs, and a TCD. The Southern Alternative begins at Lake Powell and ends at Sand Hollow Reservoir. Along the path are numerous ethnographic resources that are culturally sensitive, sacred, and/or declared historic properties eligible for inclusion on the NRHP. These places would be affected by the Proposed Project in diverse ways:

The Southern Alternative would affect the following resources:

Sacred Sites = 5

Colorado River as sacred site and the Colorado River Canyon as sacred site: The Zuni have declared the Colorado River system as a sacred site, including the canyons. This sacred site comprises more than 1,450 miles. The Proposed Project would impinge on a very small part of the sacred site. The federal agencies would comply with E.O. 13007 with regards to these sacred sites.

Kanab Creek as sacred site: The Kanab Creek and tributaries have been declared a sacred site by the Kaibab Band of Paiute Indians. This sacred site stretches at least 65 miles long. The Proposed Project would impinge on a very small part of the sacred site. The federal agencies would comply with E.O. 13007 with regards to this sacred site.

Elephant Foot/Indian Knoll/Moonshine Ridge/Yellowstone Mesa as integrated sacred site. This integrated sacred site area is part of the Kanab Creek TCD (see below). Actions that may affect these sacred sites would comply with E.O. 13007.

Milk Mountain Pilgrimage Trail: Milk Mountain Pilgrimage Trail, also known as “*Kavaicunvac Puba Po*,” lies along both alternatives. It is a sacred site and considered a TCP for the Kaibab Paiute. The trail depends on viewsheds for direction and spiritual power. Consequently, effects to viewsheds are considered particularly egregious. As presently understood, the first three stops along the pilgrimage trail parallel U.S. Highway 89, a modern highway.

U.S. Highway 89 is a multilane highway that has already caused wide-spread changes in the viewshed of the trail. The Proposed Project, regardless of alternative, parallels U.S. Highway 89 from the Paria River to Catstair Canyon to Five Mile Spring (and a substantial distance beyond). This is essentially the same route as the trail for this portion of the trail. Due to the presence of an already disturbed landscape/viewshed, there would be only minor temporary visual effects on the trail for this stretch of the Proposed Project due to construction activities. Once the underground pipeline is built, and revegetated, there may be a minor visual effect, but much less than the existing highway.

The pilgrimage trail represents a shaman’s journey into spiritual power. Consequently, it is used infrequently, and years could pass before a shaman makes the journey. The presence of the proposed underground pipeline would not impinge on Indian religious practice.

Traditional Cultural District = 1

Kanab Creek TCD: The TCD lies at the southern edge of the KIR. It measures about 18 miles long and 18 miles wide and extends south of the reservation for about 15 miles. The TCD includes over 90,000 acres of land. For comparative purposes, the TCD comprises an area larger than the District of Columbia, which has about 65,000 acres. The physical disturbance of the pipeline corridor would disrupt 403.50 acres (direct effect) and would be visible from many sites of cultural importance to the Tribe as it parallels the existing towers of the Navajo-McCulloch Transmission Line through the TCD along the already designated energy corridor. The TCD would be affected by short-term clearing of ground and re-vegetation efforts. However, the Proposed Project would add access to the Kanab Creek Canyon, which is a very sacred place as identified by the SPAC. The crossing would impair locations of *Puha* (spiritual energy) that are sacred to the Tribe and increase access to very sensitive prehistoric and historic sites, which could lead to vandalism. Historic sites that are sacred to the Kaibab Paiute are located within the Kanab canyon, including the Ghost Dance TCP. These are unique and cannot be replaced or moved. Additional cultural sites are present that are prehistoric and sacred to the Tribe. The viewscape itself is part of the spiritual dimensions of the TCD.

Prehistoric Sites as TCPs = 202

The Hopi and the Zuni have categorically defined every prehistoric site along the Proposed Project as TCPs. Once they are formally included on the NRHP as an ethnographic resource, they can be individually mitigated. There are 202 prehistoric sites along the Southern Alternative that would be directly affected. The individual physical effects to these sites would range from low to severe, with some sites minimally affected by the Proposed Project construction and others entirely impacted.

Traditional Cultural Properties = 2

Colorado River as TCP: The Zuni assert that the Colorado River [*K'yawan' A:bonanne*] is a TCP. Because the intake structure is located physically above the Colorado River and the Proposed Project would remove water from the Colorado River to a different water basin, there may be a negative effect on the river and spiritual resources of the Colorado River for the duration of the

Proposed Project. The Zuni and other tribes expressed strong negative emotions about moving the water in this unnatural way (pipeline to a different basin). A SPAC member called this aspect of the Proposed Project an abomination and expressed deep concern for the water babies (spirits) that live in the river and help it thrive.

There is an ethnographic concern with the Proposed Project's effect on the Colorado River, both as a physical place and, more especially, as a spiritual place upon whom the tribes depend. The physical dimension of the Proposed Project's impact is negligible. In terms of the river corridor, the area of effect is tiny. As a quantity of water, the project water is already allocated to the State of Utah for use. The damage to the spiritual dimension is harder to quantify and constitutes an adverse effect.

Take Out Point/Colorado River: This location was identified as a TCP, but no details were provided to Reclamation as of this writing, March 27, 2020, by the Tribe or its representatives.

Other TCPs are along the proposed Southern Alternative route but are part of the TCD and not duplicated here.

Areas of Cultural Concern = 2

Critical plant habitat and Gould Creek Wash Crossing: The plant habitat and Gould Creek Wash Crossing are locations that the Tribe identified to Reclamation as potentially culturally important but do not rise to the level of federal protection. Any changes to the pipeline or transmission line alignment to avoid these areas would be appreciated by the local community but is not mandated by federal law.

Resource Management Plan Amendment

The ACEC was designated as part of the RMP. The Southern Alternative would cross through the ACEC under one of three possible amendments. Regardless of which RMPA sub-alternative is chosen, this crossing would have long-term, adverse effects on the Kanab Creek TCD (which is a sacred site) because all of the proposed RMPA sub-alternatives would allow construction of the Proposed Project through the ACEC.

The proposed Kanab Creek crossing would impair locations of *Puha* (spiritual energy) that are sacred to the Tribe and could open very sensitive prehistoric sites to potential vandalism. Historic sites that are sacred to the Tribe are located within the canyon. These are unique and cannot be replaced or moved. Additional cultural sites are present that are prehistoric and sacred to the tribe. The viewscape itself is part of the spiritual dimensions of the TCD.

The Proposed Project could open these currently remote areas up due to construction activities and access routes. This would provide additional opportunities for these areas to be visited by people who may not understand the sacredness of this canyon. Once additional access is provided, it is difficult to preserve sacred sites in their original condition.

Sub-alternatives 1

Under this alternative, the portion of the ACEC overlapped by the utility corridor would no longer be an avoidance area for new land use authorizations. However, the proposed amendment to Decision No. MA-LR-06 would still require routing new utilities away from ethnographic sites and mitigation for impacts from new land use authorizations (determined during site-specific project planning).

RMPA Sub-alternative 1 would allow for the construction of the proposed pipeline through the Kanab Creek TCD, which is a sacred site. Construction through this sacred area would result in long-term, adverse effects to the spiritual, historic, cultural, and aesthetic values of this area, per the discussion above.

Sub-alternatives 2

Under this alternative, the size of the ACEC would be reduced by 905 acres with no specific provision for mitigation from new land use authorizations in the area that has been excluded from the ACEC. In addition, other ACEC management prescriptions in the RMP that provide additional protection to sensitive resources would no longer be applicable to the lands excluded from the ACEC. Construction, operation, and maintenance of new rights-of-way (and other land use authorizations), as well as the use and maintenance of designated routes, construction of new range facilities, and management of salable or leasable minerals could result in direct and indirect effects on ethnographic resources as projects are implemented. However, existing federal laws would still apply so potential effects on ethnographic resources on public lands would be evaluated during project-specific environmental review and analysis, and mitigated to the extent possible, which could reduce effects on specific ethnographic resources.

RMPA Sub-alternative 2 would allow for the construction of the proposed pipeline through the Kanab Creek TCD, which is a sacred site. Construction through this sacred area would result in long-term, adverse effects to the spiritual, historic, cultural, and aesthetic values of this area, per the discussion above.

RMPA Sub-alternatives 3

Under this alternative, effects on ethnographic resources would be similar to those described under RMPA Sub-alternative 1. Sub-alternative 3 would result in a decrease of 175.5 acres in the overlap area of the utility corridor and the ACEC as compared to RMPA Sub-alternative 1. However, RMPA Sub-alternative 3 would also include the amendment of Decision No. MA-LR-06 as outlined in Alternative 1, so while the portion of the ACEC overlapped by the utility corridor would no longer be an avoidance area for new land use authorizations, the proposed amendment would still require mitigation for impacts from new land use authorizations that would be determined during site-specific project planning. In addition, other ACEC management prescriptions in the RMP that provide additional protection to resources would still be applicable since the size of the ACEC would not be reduced.

RMPA Sub-alternative 3 would allow for the construction of the proposed pipeline through the Kanab Creek TCD which is a sacred site. Construction through this sacred area would result in long-term, adverse effects to the spiritual, historic, cultural, and aesthetic values of this area, per the discussion above.

Mitigation Measures

Minor changes to the EPMs should be implemented to meet agency-specific goals and objectives for management of ethnographic resources.

Under federal regulations for historic properties, a programmatic agreement and other derivative mitigation documents would be created to mitigate the adverse effects the Proposed Project may incur upon historic properties. These mitigation measures would be developed in accordance to federal law with the tribes, State Historic Preservation Offices, and interested public. As part of this

process, site-specific mitigation, monitoring, and project-level survey plans would be developed to mitigate the adverse effects of this Proposed Project. The Kaibab Tribe developed proposed mitigation and avoidance recommendations for both alignments (SPAC 2012).

3.18.2.3 Highway Alternative

The Highway Alternative would have long-term, adverse effects on ethnographic resources, including sacred sites, TCPs, and a TCD. The Highway Alternative begins at Lake Powell and ends at Sand Hollow Reservoir. Along the path are numerous ethnographic resources that are culturally sensitive, sacred, and/or declared historic properties eligible for inclusion on the NRHP. These places would be affected by the Highway Alternative in diverse ways:

The Highway Alternative would affect the following resources:

Sacred Sites = 4

Colorado River as sacred site and the Colorado River Canyon as sacred site: See comments above under Southern Alternative.

Kanab Creek as sacred site: See comments above under Southern Alternative.

Milk Mountain Pilgrimage Trail: See comments above under Southern Alternative.

Prehistoric Sites as TCPs = 190

This discussion is the same as above, but with 190 prehistoric sites instead of 202.

Traditional Cultural District = 1

Kanab Creek TCD: The TCD would be visible from the proposed Highway Alternative. The visual effect would be obvious during construction and then masked by the existing highway.

Traditional Cultural Properties = 2

Colorado River as TCP and Take Out Point/Colorado River: See analysis above under Southern Alternative.

Areas of Cultural Concern = 13

The areas listed below are locations that do not rise to the level of federal protection. Any changes to the pipeline or transmission line alignment to avoid these areas would be appreciated by the local community but is not mandated by federal law.

Critical plant habitat; Pioneer Gap to the Turn-Off to U.S. Highway 89A; U.S. Highway 89A to the Reservation Boundary; Lost Spring Wash; Kanab Creek Crossing; Sand Dune; Cottonwood Creek Aboriginal Southern Paiute Agricultural Community; Sandy Canyon Aboriginal Southern Paiute Agricultural Community; Sand Wash Aboriginal Southern Paiute Agricultural Community; Moccasin-Twomile Aboriginal Southern Paiute Agricultural Community; Moccasin-Twomile: Pipe Spring Aboriginal Southern Paiute Agricultural Community; Pipe Valley Aboriginal Southern Paiute Agricultural Community; and Gould Creek Wash Crossing.

Mitigation Measures

The mitigation methodologies for this alternative are the same as those identified in the Southern Alternative. The Kaibab Paiute Tribe developed proposed mitigation and avoidance recommendations for both alignments (SPAC 2012).

3.18.2.4 Comparative Analysis of Alternatives

The Proposed Project would have long-term adverse effects on ethnographic resources including sacred sites, TCPs, and a TCD. The Kaibab Tribe prefers the Highway Alternative if the LPP were to be built. There are three alternatives to consider for the Proposed Project. The least damaging to ethnographic resources is the No Action Alternative. However, this alternative does not fit the purpose and need of the Proposed Project.

The Southern Alternative and Highway Alternative would both affect sacred sites (Colorado River as sacred site, Colorado River Canyon as sacred site, Kanab Creek as sacred site, and the Milk Mountain Pilgrimage Trail) in the same ways. Both alternatives would affect numerous prehistoric sites, TCPs, and areas of cultural concern. From the perspective of the Kaibab Tribe, the Highway Alternative is preferred, if the LPP were to be built, because it does not go through the Kanab Creek TCD, which includes multiple sacred sites and TCPs, in particular the Kanab Creek Canyon within the current ACEC. The Hopi, Hualapai, and Zuni ethnographies did not define a preference for either alternative but reiterated their concern for the spiritual and physical resources that may be affected by the Proposed Project should it be constructed.

Should the Southern Alternative be chosen, the BLM would comply with E.O. 13007 with regard to three sacred sites including the Kanab Creek, Elephant Foot/Indian Knoll/Moonshine Ridge/Yellowstone Mesa as integrated sacred site, and the Milk Mountain Pilgrimage Trail. There would also be 125 individual direct effects to prehistoric sites. There are also two areas of cultural concern (critical plant habitat and Gould Creek Wash Crossing) that the tribes prefer would be avoided. Two prehistoric sites, on NPS-managed land would be mitigated. The BIA would comply with E.O. 13007 with regard to the Kanab Creek as sacred site. Additionally, Reclamation would comply with E.O. 13007 with regard to the sacred sites that are along the proposed route such as the Colorado River as sacred site and the Colorado River Canyon as sacred site. In addition, Reclamation would mitigate adverse effects to the Colorado River as a TCP and the Take Out Point/Colorado River as a TCP. Reclamation would mitigate one prehistoric site.

Should the Highway Alternative be chosen, the BLM would comply with E.O. 13007 with regard to the Kanab Creek (and tributaries) as a sacred site, and Milk Mountain Pilgrimage Trail as a Sacred Site. There are 80 prehistoric sites that would be mitigated for direct effects. The TCD would be mitigated. There are also two areas of cultural concern (critical plant habitat and Gould Creek Wash Crossing) that it would be useful to avoid. The BIA would comply with E.O. 13007 with regard to the Kanab Creek as sacred site. The BIA would mitigate 11 prehistoric sites (direct effects). There are also 11 areas of cultural concern that it would be useful to avoid. The NPS would mitigate two prehistoric sites. Additionally, Reclamation would comply with E.O. 13007 with regard to the sacred sites that are along the proposed route such as the Colorado River as sacred site and the Colorado River Canyon as sacred site. In addition, Reclamation would mitigate adverse effects to the Colorado River as a TCP and the Take Out Point/Colorado River as a TCP. Reclamation would mitigate one prehistoric site.

3.19 Indian Trust Assets

3.19.1 Affected Environment

Indian Trust Assets (ITAs) are legal interests in property held in trust by the United States for federally recognized Indian tribes or individual Indians (e.g., Reclamation 2009: Section 4.19-1 and Reclamation 2017: Section 19). ITAs may include land, minerals, federally reserved hunting and fishing rights, federally reserved water rights and claims, and instream flows associated with trust land. Beneficiaries of the Indian trust relationship are federally recognized Indian tribes with trust land; the United States is the trustee. By definition, ITAs cannot be sold, leased, or otherwise encumbered without approval of the United States. (For the full discussion on the topic of ITAs, please see Appendix C-22, Indian Trust Assets.)

3.19.1.1 Regulatory Framework and Methodology

Federal agencies are required to actively engage federally recognized tribal governments and consult with such tribes on a government-to-government level when their action(s) may affect ITAs (*Federal Register*, Vol. 59, No. 85, May 4, 1994, pages 22951-22952). Interior is required to “protect and preserve ITAs from loss, damage, unlawful alienation, waste, and depletion” (Interior, Secretarial Order 3215). It is the general policy of the Interior to perform its activities and programs in such a way as to protect ITAs and avoid adverse effects whenever possible.

As part of the initial Proposed Project under FERC, efforts to identify ITAs included letters sent to tribes, the BIA (Western Region Office), and Reclamation asking for identification of any ITAs within or near the Project Area in 2008 to 2010. Only the KIR was identified as an ITA.

There are three main types of ITAs: Lands and Minerals, Hunting/Fishing Rights, and Water Rights.

Lands and Minerals: The KIR is an ITA whose present boundaries were established under Executive Order 2667 in 1917. A review of the American Indian/Alaska Native/Native Hawaiian Areas National Shapefile indicated that the KIR is the only tribal land that intersects the Project Area. The Navajo Nation has tribal land near the inflow at Lake Powell; however, the reservation boundary is 2.7 miles away from the Proposed Project at its nearest point. Mineral extraction is not a component of the Proposed Project.

Hunting/Fishing Rights: Treaties establishing reservations sometimes included language that allowed hunting and fishing off the reservation. Such is not the case for the KIR. In contrast, Navajo hunting outside of their reservation is in coordination with the State of Utah.

Water Rights: Water lies at the heart of this Proposed Project. While there are no water rights explicitly stated in the treaty creating the KIR, Tribal water rights are assumed under the Supreme Court’s 1908 *Winters v. United States* decision, with an early priority date.

Effects on existing ITAs would be considered adverse if the action:

- Interferes with the use, value, occupancy, character, or enjoyment of an ITA, including effects on general fish and wildlife where fishing and hunting rights exist.
- Fails to protect ITAs from loss, damage, waste, depletion, or other negative effects including from disturbances such as noise or changes to visual resources.

- Fails to protect treaty-based fishing, hunting, gathering, water and similar rights of access and resource use on traditional tribal lands.

3.19.1.2 Environmental Protection Measures

There are no EPMs specific to ITAs.

3.19.1.3 Existing Conditions

The reservation includes five villages, a non-Indian community (Moccasin), and Pipe Spring National Monument. The reservation occupies a small section of the ancestral territory of the Tribe, who are themselves part of the Southern Paiute people. At present, there are about 240 members in a reservation of about 189 square miles.

3.19.2 Environmental Consequences

3.19.2.1 No Action Alternative

The No Action Alternative would have no effect on ITAs. Should the Proposed Project not be built, then existing conditions would continue, and projects planned by the Project Proponent would go through future NEPA review and analysis. As currently constituted, there would be no effect on the KIR ITA.

3.19.2.2 Southern Alternative

The Southern Alternative would have a short-term effect on ITAs.

Based upon the criteria developed above in Section 3.19.1, above, effects on existing ITAs would be considered adverse if the action:

1. Interferes with the use, value, occupancy, character, or enjoyment of an ITA, including effects on general fish and wildlife where fishing and hunting rights exist. The Southern Alternative would not interfere with the KIR, but the Tribe would not benefit from its use. Because this route goes around the reservation boundary, it would not change the current land or governmental activities on the reservation. However, the construction area outside of the KIR would be visible from the ITA. The visual effect would occur until the area is revegetated.
2. Fails to protect ITAs from loss, damage, waste, depletion, or other negative effects, including from disturbances such as noise or changes to visual resources. The Southern Alternative would result in a buried pipeline placed outside and parallel to the reservation's southern boundary. It would have a temporary effect on the KIR ITA due to the visual change, until the area is revegetated.
3. Fails to protect treaty-based fishing, hunting, gathering, and similar rights of access and resource use on traditional tribal lands. The Southern Alternative would have no effect on these types of activities because the executive order establishing the KIR does not contain off-reservation hunting, fishing, gathering, or similar rights. The Southern Alternative would not affect the assumed water right of the Tribe because (1) it uses Utah's allocated water and not that of any tribe, and (2) because Utah's LPP allocation would be diverted in priority.

Mitigation Measures

Mitigation measures proposed to minimize effects to visual resources, and addressed in Section 3.16, Visual Resources, would also apply to the ITA.

3.19.2.3 Highway Alternative

The Highway Alternative would have short-term and long-term effects on ITAs.

Effects on existing ITAs would be considered adverse if the action:

1. Interferes with the use, value, occupancy, character, or enjoyment of an ITA, including effects on fish and wildlife where fishing and hunting rights exist. The Highway Alternative would allow the Tribe to use its land for the betterment of its people.
2. Fails to protect ITAs from loss, damage, waste, depletion, or other negative effects including from disturbances such as noise or changes to visual resources. The Highway Alternative would have short-term visual effects on the reservation. The pipeline construction would create a visual corridor devoid of vegetation during construction. Once construction is completed, however, the pipeline corridor would be reclaimed and revegetated, so visual contrasts would disappear over time. In addition, the LPP corridor would become substantially unnoticeable over time because it would be parallel to an existing paved highway where disturbance has already occurred. The placement of the pipeline through the reservation would encumber the KIR ITA for decades along the proposed LPP route similar to the effects of the existing Arizona SR-389.
3. Fails to protect treaty-based fishing, hunting, gathering, and similar rights of access and resource use on traditional tribal lands. The Highway Alternative would impair resource use on the reservation (i.e., within the ROW corridor) during construction. Traditional plant resources within the construction corridor would be disturbed, and revegetation efforts could take years to achieve full growth. The Highway Alternative would not affect the assumed water right of the Tribe because (1) it uses Utah's allocated water and not that of any tribe, and (2) because Utah's LPP allocation would be diverted in priority.

Mitigation Measures

Mitigation for the Highway Alternative would be addressed in the BIA grant of ROW, including regulatory conditions on the use of the land, as well as any terms and conditions negotiated between the Tribe and the Project Proponent as part of the Tribe giving its consent to the ROW. Such mitigation may include those measures already provided for other visual effects, the timing of construction, access to locations with sensitive cultural resources, revegetation, and traffic control.

3.19.2.4 Comparative Analysis of Alternatives

There are three alternatives to compare: the No Action Alternative, the Highway Alternative, and the Southern Alternative. The No Action Alternative would have no effect to the ITA.

The Highway Alternative would affect the ITA more than the Southern Alternative, but these effects would be mitigated through the conditions on the BIA ROW grant, including those negotiated between the Project Proponent and the Tribe. The effects include an encumbrance on the reservation in the form of a permanent ROW pipeline; visual effects; noise effects; and short-term impediments to resource use and collection. In addition, the Tribe's negotiation would include the payment of just compensation for the ROW encumbrance, which the Tribe would use for the betterment of its people.

In contrast, the Southern Alternative avoids the ITA completely, therefore not allowing the Tribe to benefit from the use of its resource, but there would be a slight short-term visual effect during construction. That effect would not be mitigated.

3.20 Socioeconomics

3.20.1 Affected Environment

This analysis is based on national, regional, and local perspectives. For the purposes of this analysis, the local economic region includes four counties: Kane County, Utah; Washington County, Utah; Coconino County, Arizona; and Mohave County, Arizona. Economic data are also included for communities and the KIR within the local economic region to evaluate economic benefits and project affordability. Additional information supporting this section is provided in Appendix C-23, Socioeconomics. The Proposed Project is a non-federal water project. The Ability to Pay (ATP) and cost-benefit ratios are presented here exclusively for informational purposes and are not required for the Proposed Project to proceed.

3.20.1.1 Regulatory Framework and Methodology

This analysis was conducted based on the financing and cost recovery provisions of Chapter 28, Part 4 of the Lake Powell Pipeline Development Act (UCA 73-28-101). Details of financing and cost recovery are subject to the contracts that would be developed under that Act.

An economic analysis was conducted, with benefits and costs considered regardless of whether they accrue to those inside or outside the four counties. Interest during construction was added to construction costs to represent the full economic cost of the Proposed Project. A financial analysis evaluated cash flows and affordability from the perspective of individual businesses, households, and agencies. A regional impact analysis evaluated both short- and long-term effects from construction and operations, within the four-county area.

3.20.1.2 Environmental Protection Measures

There are no environmental protection measures specified for socioeconomics.

3.20.1.3 Existing Conditions

Appendix C-23, Socioeconomics provides a detailed explanation of the existing socioeconomic conditions of the counties. These conditions are summarized below.

Demographics and Population

From 2000 to 2018, population growth was highest in Washington County and lowest in Kane County. Overall, the four-county region experienced population growth of about 44.5 percent from 2000 to 2018, which is higher than for all of Utah and Arizona. Historic population changes for the four-county study area, Utah, and Arizona are shown in Table 3.20-1.

Table 3.20-1 Socioeconomic Area of Analysis Population Totals (2000–2018)

Area	2000	2018	Change from 2000 to 2018
Kane County	6,046	7,350	21.56%
Washington County	90,354	171,700	90.03%
Coconino County	116,320	142,854	22.81%
Mohave County	155,032	209,550	35.16%
4-County Region	367,752	531,454	44.51%
Utah	2,233,169	3,161,105	41.55%
Arizona	5,130,632	7,171,646	39.78%

Source: U.S. Census Bureau, n.d.

Population projections indicate the four counties will continue to grow substantially.

Historic growth trends would not necessarily be expected to continue into the future. Therefore, population projections were obtained for the study area counties and for all of Utah and Arizona. Population projections for the socioeconomic area of analysis vary considerably. The Arizona Department of Administration, Office of Employment and Population Statistics estimates projections for both low, median, and high growth scenarios to 2055 and the University of Utah, Kem C. Gardner Policy Institute provide projections from 2020 to 2065. Coconino County, Arizona, is predicted to experience the least growth, while Washington County, Utah, is predicted to experience the largest growth in the socioeconomic area. Table 3.20-2 presents populations for the socioeconomic area from 2025 to 2055. The Arizona projections are for the medium growth scenario. The population projections indicate the study area will continue to grow into the future.

Table 3.20-2 Arizona Population Projections (2025–2055)

County/State	2025	2035	2045	2055
Kane	8,684	9,611	10,179	10,736
Washington	219,019	286,768	355,549	429,295
Coconino	154,400	160,200	162,600	163,100
Mohave	230,500	255,400	280,500	306,000
Utah	3,615,036	4,178,317	4,745,057	5,285,767
Arizona	7,791,800	8,777,600	9,682,300	10,504,500

Sources: Arizona Department of Administration n.d.; University of Utah Kem C. Gardner Policy Institute 2020

Housing and Development

From 2014 to 2018, all four counties experienced growth in their housing stock; Washington County experienced the largest growth, while Kane County experienced the lowest level of growth. Residential home values varied substantially across the four counties. In 2018, Mohave County had the lowest median residential home value, while Coconino County had the highest. From 2014 to 2018, all four counties experienced an increase in median home values. Table 3.20-3 shows median home values in the socioeconomic analysis area.

Table 3.20-3 Median Residential Home Values

Year	Kane County ^(a)	Washington County ^(a)	Coconino County	Mohave County	Utah	Arizona
2018	\$190,000	\$262,200	\$293,800	\$189,300	\$303,300	\$241,100
2017	\$190,200	\$240,300	\$277,400	\$157,100	\$275,100	\$223,400
2016	\$187,300	\$221,700	\$272,000	\$148,700	\$250,300	\$205,900
2015	\$175,300	\$212,600	\$228,600	\$139,400	\$234,600	\$194,300
2014	\$168,200	\$209,500	\$227,500	\$120,200	\$223,200	\$176,700

Source: U.S. Census Bureau, ACS one-year estimates except (a), which are ACS five-year estimates.

The availability of temporary housing is a significant factor in a region's ability to support temporary workers who need to relocate for project work. In 2014 and 2018, Kane County had the highest housing vacancy rates while Washington County had the lowest. Table 3.20-4 shows median housing vacancy rates for the socioeconomic analysis area.

Table 3.20-4 Housing Vacancy Rates in the Socioeconomic Analysis Area

Year	Kane County ^(a)	Washington County ^(a)	Coconino County	Mohave County	Utah	Arizona
2018	56.02%	17.87%	29.27%	21.69%	9.91%	13.89%
2017	57.78%	18.79%	27.37%	23.52%	10.07%	14.88%
2016	55.82%	19.45%	27.38%	25.43%	10.54%	14.93%
2015	52.36%	19.84%	28.75%	25.74%	10.32%	15.91%
2014	49.94%	19.89%	26.93%	27.62%	10.19%	16.52%

Source: U.S. Census Bureau, ACS one-year estimates except (a), which are ACS five-year estimates

Employment, Income, and Poverty

Unemployment rates in 2019 ranged from 2.4 percent in Washington County to 5.5 percent in Coconino County. From 2009 to 2018, all four counties experienced growth in per capita personal incomes. All counties in the socioeconomic area of analysis had unemployment rates higher than their respective state's rate. However, unemployment in the study area has steadily decreased over the last 10 years and is currently at a very low level. Table 3.20-5 shows historical unemployment rates in the socioeconomic analysis area.

Table 3.20-5 Unemployment Rates from 2010 to 2019

Year	Unemployment Rate (percentage)					
	Utah	Arizona	Kane County	Washington County	Coconino County	Mohave County
2010	7.30	9.90	9.70	10.10	9.50	12.40
2011	5.60	8.80	8.50	7.70	9.20	11.60
2012	4.80	7.90	7.70	6.20	8.50	10.50
2013	3.80	7.40	5.30	4.50	7.90	9.50
2014	3.30	6.50	5.70	4.00	7.00	8.10
2015	3.30	5.70	5.40	3.80	6.60	7.40
2016	3.10	5.20	4.10	3.40	6.30	6.00
2017	2.90	4.80	3.90	3.20	5.40	5.80
2018	2.70	4.80	4.00	3.30	6.20	6.10
2019	2.20	4.50	2.80	2.40	5.50	5.40

Source: U.S. Bureau of Labor Statistics, Local Area Unemployment Statistics.

In 2018, Coconino County had per capita personal incomes higher than for all of Utah and Arizona. Mohave County had the lowest per capita personal incomes in 2018. From 2009 to 2018 all four counties experienced growth in per capita personal incomes. Kane County experienced the most growth, while Mohave County experienced the least growth in per capita personal income. Table 3.20-6 shows per capita personal income for the socioeconomic analysis area. Washington, Kane, and Mohave Counties all have relatively low incomes compared to Utah and Arizona as a whole, indicating limited available disposable income.

Table 3.20-6 Per Capita Personal Income for Study Region Counties, Utah, and Arizona

Year	Per Capita Personal Income					
	Utah	Arizona	Washington County	Kane County	Coconino County	Mohave County
2009	\$31,833	\$33,418	\$29,574	\$25,452	\$33,924	\$25,384
2010	\$32,156	\$33,635	\$29,455	\$26,028	\$34,406	\$25,582
2011	\$34,200	\$34,968	\$31,221	\$26,823	\$37,094	\$25,501
2012	\$36,139	\$36,123	\$32,449	\$27,991	\$36,814	\$26,011
2013	\$36,725	\$36,602	\$32,514	\$29,292	\$38,336	\$26,768
2014	\$38,517	\$38,226	\$34,670	\$31,163	\$40,639	\$28,450
2015	\$40,867	\$39,676	\$37,427	\$33,039	\$42,726	\$29,366
2016	\$42,375	\$40,671	\$37,837	\$34,775	\$44,279	\$30,286
2017	\$44,002	\$42,505	\$39,099	\$36,809	\$46,662	\$31,742
2018	\$46,320	\$44,329	\$40,257	\$38,847	\$48,129	\$33,148

Source: Bureau of Economic Analysis (BEA) 2020

Additional data were obtained for median household income and poverty rate for all people in the local economic region and for the KIR. Table 3.20-7 shows median household income and poverty rates for Utah, Arizona, the four-county region, and the KIR.

Table 3.20-7 Median Household Income and Percentage of Population in Poverty for Study Region Counties, Utah, Arizona, and the KIR

Area	Median Household Income	Persons in Poverty
Utah	\$68,374	9.0%
Arizona	\$56,213	14.0%
Washington County	\$56,877	9.7%
Kane County	\$48,269	10.5%
Coconino County	\$57,616	15.9%
Mohave County	\$43,266	16.8%
Kaibab Indian Reservation	\$33,438	20.9%

Source: U.S. Census Bureau, 5-year ACS estimates

Table 3.20-7 shows that the KIR is experiencing economic hardship relative to the four-county region and the states. The KIR median household income is nearly \$10,000 less than the lowest income county in the region. In addition, the poverty rate is 4.1 percent higher than the highest poverty rate county.

Fiscal Conditions

County levels of revenues, expenditures, debt, assets, and liabilities are all indicators of the economic health of the four counties. The better the fiscal condition of the region, the greater the ability of the region to finance expansion of infrastructure to support growth and development. The fiscal conditions of each county are summarized below.

Washington County long-term governmental debt was about \$233 per capita as of the end of 2018. From 2017 to 2018 governmental revenues increased by 4.41 percent and expenses decreased by 5.24 percent, resulting in increased net revenue from 2017 to 2018 of 119 percent. Assets represent financial obligations to the county such as cash, receivables, and capital assets such as equipment. Liabilities represent financial obligations to other entities such as current accounts payable and long-term bonds payable. As of the end of 2018, Washington County had total governmental assets of \$148,947,571 and total liabilities of \$41,312,923, for an asset-liability ratio of 3.61.

Kane County long-term governmental debt was about \$1,297 per capita as of the end of 2018. From 2017 to 2018 governmental revenues decreased by 8.33 percent and expenses increased by 18.82 percent, resulting in decreased net revenue from 2017 to 2018 of 88 percent. As of the end of 2018, Kane County had total governmental assets of \$73,900,000 and total liabilities of \$17,300,000, for an asset-liability ratio of 4.27.

Coconino County had essentially no long-term governmental debt as of the end of 2018. From 2017 to 2018 governmental revenues increased by 8.16 percent and expenses increased by 22.25 percent, resulting in decreased net revenue from 2017 to 2018 of 148 percent. As of the end of 2018, Coconino County had total governmental assets of \$287,680,000 and total liabilities of \$160,270,000, for an asset-liability ratio of 1.79.

Mohave County long-term governmental debt was about \$639 per capita as of the end of 2018. From 2017 to 2018 governmental revenues increased by 7.15 percent and expenses increased by 9.63 percent, resulting in decreased net revenue from 2017 to 2018 of 106 percent. As of the end of 2018, Mohave County had total governmental assets of \$362,219,556 and total liabilities of \$136,343,665, for an asset-liability ratio of 2.66.

The overall fiscal condition of the economic region appears to be conducive to continued economic growth as indicated by asset-liability ratios greater than 1.0 and generally increasing revenues. However, expenses are also increasing leading to potential challenges in the future to contain costs.

3.20.1.4 Water Supply Reliability Benefits

Water supply reliability benefits are an important consideration in an evaluation of the water supply benefits of the LPP. Additional supplies provided by the LPP will reduce potential gaps in supply and demand in the future as well as decreasing the potential for shortage events at any particular time. Water reliability benefits in the WCWCD are estimated using previously completed studies of water supply reliability benefits. Use of previously estimated benefit values as a basis for estimating benefits is an application of benefits transfer. Several studies have been completed in several states that have estimated water reliability benefits and the benefits of avoiding water supply shortages. The household benefits from avoiding a shortage, or increasing water supply reliability, are estimated to range from about \$89 to \$360 per household per year, with a best estimate of \$300 per household per year. Water reliability benefits to commercial establishments were estimated to range from \$360 to \$1,800 per establishment per year, with a best estimate of \$1,800.

The estimated total water supply reliability benefits, in present value, from the Southern and Highway Alternatives are shown in Table 3.20-8.

Table 3.20-8 Estimated Total Water Supply Reliability Benefits from the Southern and Highway Alternatives

Sector and Growth Assumption	Estimated Present Value of Benefits Over 100 Years (millions)		
	Low	High	Best
Households			
No growth	\$153.93	\$622.64	\$518.87
2.516% annual growth	\$395.02	\$1,597.82	\$1,331.53
2.516% growth for 55 years, then reduced by 50%	\$351.48	\$1,429.72	\$1,184.78
Commercial Establishments			
No growth	\$62.03	\$309.81	\$309.81
2.516% annual growth	\$153.27	\$766.34	\$766.34
2.516% growth for 55 years, then reduced by 50%	\$138.97	\$694.83	\$694.83
Total for Households and Commercial Establishments			
No growth	\$215.96	\$932.78	\$828.68
2.516% annual growth	\$548.29	\$2,364.16	\$2,097.87
2.516% growth for 55 years, then reduced by 50%	\$490.45	\$2,124.55	\$1,879.61

Water supply activities associated with the No Action Alternative are aimed at maintaining current conditions in the near future and do not address potential reliability issues that could occur in the long-term future. Therefore, water reliability benefits are not likely to be generated under the No Action Alternative because long-term potential gaps in supply and demand would remain as they currently are. Other methods, such as conservation, could be implemented to address future supply and demand gaps, but these methods would not generate reliability benefits as measured by willingness to pay.

3.20.1.5 Economic Costs

The economic costs of the No Action and the LPP alternatives include all resource costs associated with projects and activities. These costs include construction costs; energy costs; operation, maintenance and replacement (OM&R) costs, and interest during construction (IDC). Total construction costs for the Southern Pipeline Alternative estimated by Stantec, excluding the Kane County System, are estimated to be \$1,480.5 million and total construction costs for the Highway Alternative, again excluding the Kane Pipeline County System, are estimated to be \$1,433.0 million.

Under the No Action Alternative, the Project Proponent would not incur the costs of the Proposed Project but would still need to supply water. The estimated costs of that supply are based on the estimated costs of the Ash Creek project, Sand Hollow Regional Pipeline, and various well projects presented in a 2017 Regional Water Impact Fee Facilities Plan & Analysis for the WCWCD (Zions Public Finance and Applied Analysis 2017). The costs of these projects indexed to 2019 using the gross domestic product price deflator is \$82.5 million.

OM&R estimates provided by Stantec for the Southern and Highway Alternatives are estimated to be \$5.120 million annually in 2019 dollars and pumping energy costs are estimated to be \$4.096 million annually, for total annual costs of \$9.216 million. OM&R costs for No Action were not presented, in the 2017 Zions Public Finance and Applied Analysis report but using the same percentage of annual costs relative to construction cost as for the Southern and Highway Alternatives results in annual No Action OM&R costs of \$471,300.

Interest during construction represents the difference between funds appropriated for construction and the economic cost of capital invested in the project when the project is brought into service at the end of construction. This difference represents an economic cost that must be included in economic justification and can be thought of as an opportunity cost for funds that could be invested elsewhere if they were not tied up in project construction. Interest during construction is considered as part of project costs regardless of the source of project funds, unless the project is entirely funded through existing equity accounts.

The Southern and Highway Alternatives are more costly than the No Action Alternative, as demonstrated in present value terms in Table 3.20-9.

Table 3.20-9 Estimated Total Proposed Project Alternative Costs

Pipeline Alternative	Construction (millions)	Interest during Construction (millions)	Present Value of Annual Operation, Maintenance, Replacement, and Power (millions)	Estimated Total Project Costs
Southern	\$1,480.5	\$105.2–\$220.4	\$312.9	\$1,898.6–\$2,013.8
Highway	\$1,433.0	\$101.8–\$213.3	\$312.9	\$1,847.7–\$1,959.2
No Action	\$82.5	\$5.9	\$16.0	\$104.4

3.20.1.6 Ability to Pay and Affordability

Ability to pay (ATP) is a measure of the financial resources available to pay toward an obligation or for a good or service. Estimated ATP compared to anticipated water payments with the alternatives in place can be used to evaluate water supply affordability and the financial viability of a project. Two approaches are used to estimate ATP. The first is based on an EPA benchmark for affordability and the second is based on an evaluation of actual water payments made by households and business in various communities.

EPA established affordability criteria for drinking water systems as a result of 1996 amendments to the Safe Drinking Water Act. These amendments allowed small public water supply systems to use less extensive water treatment technology if the most effective technology was not considered affordable. EPA established a 4 percent of median household income benchmark for affordability (2 percent for wastewater treatment and 2 percent for drinking water supplies). This benchmark was later amended to 4.5 percent to allow 2.5 percent for drinking water expenses.

The ability to pay of the WCWCD water users is also estimated using actual household water payment and income data for 43 New Mexico communities, 69 Colorado communities, and 62 Arizona communities. ATP for commercial establishments is based on the New Mexico water payment and gross taxable receipts data for 16 New Mexico cities. Commercial water payment data were not available for Colorado and Arizona. The estimated percentage of household income actually spent on water service is inferred to be an indication of household ability to pay and the percentage of gross taxable receipts is interpreted to be an indication of commercial ability to pay. The range of estimated ability to pay for water service in the WCWCD under current conditions is presented in Table 3.20-10.

Table 3.20-10 Total Ability to Pay for the WCWCD

ATP Category	Low (millions)	High (millions)	Best (millions)
Household	\$25.4	\$72.3	\$33.6
Commercial	\$41.6	\$78.8	\$41.6
Total	\$66.0	\$151.1	\$75.2

Key:

ATP = ability to pay

WCWCD = Washington County Water Conservancy District

The estimated current ability to pay is not representative of conditions that would be expected in the future with growth in population. Kem C. Gardner Policy Institute projections of growth in the number of households to 2065 for Washington County is 2.526 percent. Future ATP for the WCWCD is estimated by applying this growth rate to the estimate of current ATP. Applying this growth rate to current ATP assumes that future growth in commercial output and sales would be the same as the growth in the number of households. As a sensitivity analysis growth rates of 2 percent, 1.5 percent, and 1 percent were also applied to recognize that the projected level of growth is not a guarantee of future conditions. Based on the assumptions described above, future annual ability to pay is projected to range from \$124.91 million based on 1 percent growth to \$268.38 million based on the Kem Gardner projections by 2070. Future total water related charges for WCWCD water users is estimated to be \$210.34 million by 2070.

The estimated ATP for the WCWCD study area based on the Kem C. Gardner projections indicates ATP is sufficient to cover all water service costs, including pipeline alternative costs, through 2070. Under the 2 percent growth scenario ATP is sufficient to cover all water service costs until 2067 and under the 1.5 percent growth scenario ATP is sufficient to cover costs until 2045. Under the 1 percent annual growth scenario ATP would not be sufficient to cover costs by 2039. Under a no growth scenario ATP would not be sufficient to cover all costs after 2032 if a pipeline project were built.

Future ATP to cover costs is dependent on continued growth in the region and that the cost of service assumptions for the future actually occur. If the cost of service (including water charges, fees, and property taxes) increases at a rate that is higher than expected, then this will have an adverse effect on affordability. In addition, two communities in the study area (La Verkin and St. George) were considered to be in the economic hardship category as indicated by poverty percentage and some households in these communities could be more affected by rate increases in the region than other communities.

3.20.1.7 Regional Economic Impacts

The primary purpose of a regional impact analysis is to evaluate the effect of an alternative on income, employment, and the value of output produced on a region of interest. For this analysis, three different impact regions are identified and the regional impacts are estimated for each region. The first is a three-state region that includes Utah, Arizona, and Nevada. The second region is the state of Utah. The third region evaluated is a four-county local effect region that includes Washington County and Kane County in Utah, and Coconino County and Mohave County in Arizona.

The regional economic effects from each project proposal are analyzed using the IMPLAN (Economic Impact Analysis for Planning) model and estimated construction and OM&R expenditures within the study region. The regional effects associated with each alternative are measured in terms of changes in employment, labor income, value added, and value of output. Industry output is a measure of the value of industry's total production and is comparable to Gross Regional Product.

The short-term regional economic effects are as listed in Table 3.20-11. These effects are the result of construction related expenditures. OM&R expenditures do not result in significant regional effects. These effects are positive. These regional effects are not comparable or additive to economic benefits from a broad national perspective.

Table 3.20-11 Short-Term Regional Economic Effects from the No Action Alternative and Southern and Highway Alternatives

Region and Alternative	Employment	Labor Income	Value Added	Value of Output
4-County Local Region				
Southern Alternative	1,303	\$52,698,448	\$80,901,905	\$167,052,104
Highway Alternative	1,262	\$51,007,684	\$78,306,267	\$161,692,445
No Action	73	\$2,936,591	\$4,508,212	\$9,308,881
State of Utah Region				
Southern Alternative	11,059	\$600,014,400	\$939,942,216	\$1,727,023,555
Highway Alternative	10,705	\$580,763,684	\$909,785,338	\$1,671,614,154
No Action	616	\$33,435,453	\$52,377,733	\$96,237,382
3-State Region (Arizona, Colorado, and New Mexico)				
Southern Alternative	14,724	\$806,166,057	\$1,249,696,313	\$2,261,567,889
Highway Alternative	14,251	\$780,301,224	\$1,209,601,361	\$2,189,008,327
No Action	820	\$44,923,100	\$69,638,600	\$126,071,000

The comparison of effects for each alternative indicate the Southern and Highway Alternatives would result in a positive regional effect, with substantially more employment and value added than the No Action Alternative. However, overall these one-time effects amount to less than 1 percent of total annual gross regional product for each respective region.

Additional Potential Effects

There are additional potential effects associated with the LPP. These effects include grazing acreage, ecosystem values associated with disturbed vegetation and riparian acres, recreation, and changes in domestic and commercial water use. Potential effects on the KIR are also considered.

The permanent grazing effects for all land managers and owners are estimated to be 112.6 acres for the Southern Alternative and 114.9 acres for the Highway Alternative. Temporary effects were also estimated for additional acreage. Adverse permanent grazing effects are estimated to be about \$327 annually for the Southern Alternative and \$333 annually for the Highway Alternative. The present value of grazing effects over 100 years results in a present value of \$10,700 for the Southern Alternative and \$10,900 for the Highway Alternative.

The value of ecosystem services on permanently disturbed vegetation acres are estimated to be about \$33,700 annually for the Southern Alternative and \$34,100 annually for the Highway Alternative. The present value of the vegetation ecosystem effects over 100 years is \$1,103,300 for the Southern Alternative and \$1,116,400 for the Highway Alternative.

Assuming a long-run price elasticity of demand for domestic water supply of -0.65, a 5.2 percent annual increase in water prices and an assumed increase in retail water charges over 30 years would result in a 3.38 percent annual decrease in water use per user. The Kem C. Gardner growth projection for the number of households to 2065 in Washington County was an average annual growth rate of 2.536 percent. Therefore, the combined effects of an increase in water prices and growth in the number of households at the above rates would lead to a decrease in overall demand of 24.7 percent. The No Action Alternative would result in less water for future use.

The KIR has a population with relatively low income and high unemployment. As a result, any ROW payments associated with the LPP alternatives would provide some needed funds to the Kaibab Tribe. In addition, pipeline construction activities and expenditures would provide added short-term opportunities for employment and income in the study region, including the KIR.

3.20.2 Environmental Consequences

3.20.2.1 No Action Alternative

The No Action Alternative does not address water reliability issues associated with future growth which adversely affects water supply reliability and would result in negligible regional economic effects over the long term due to relatively low-cost construction of relatively small projects to meet demand for water in the region. However, future planned projects by the Project Proponent would continue to be built. Building additional facilities would create costs that would need to be paid back over time. These projects would be subject to future NEPA review and analysis.

Water Supply Reliability

Under the No Action Alternative, the Proposed Project would not be constructed, the WCWCD would attempt to meet future water demands by constructing other smaller projects, and/or by implementing conservation or other demand reduction measures (see Section 2.3.1, above). Assuming population growth continues in the region at levels projected by the Kem C. Gardner Policy Institute growth scenario, the No Action Alternative would result in adverse future water supply reliability issues.

Economic Costs

If the Proposed Project is not constructed, the variety of smaller projects and activities that would be required are estimated in the short and medium term to have present value estimated total costs of \$104.4 million, including construction, interest during construction, and operation, maintenance, and replacement. The economic costs of the No Action Alternative are small relative to existing water supply infrastructure and the LPP.

Ability to Pay and Affordability

For the No Action Alternative, under current conditions and the Kem C. Gardner projections for future growth, ATP is demonstrated to be affordable to 2070 and beyond. ATP is estimated to currently be \$75.2 million annually and current water related charges are \$37.94 million, indicating a large net ability to pay for future No Action water cost increases. Therefore, the No Action Alternative would not adversely affect ATP and water supply affordability.

Regional Economic Effects

Regional economic effects from construction and operation of the other smaller projects that would be required for needed water supplies under the No Action Alternative are estimated to result in employment impacts of 73 jobs in the four-county region, 616 jobs in Utah, and 820 jobs in the three-state region. These short-term (during construction) beneficial effects are less than 1/10 of 1 percent of total regional employment. There are no regional effects from long-term OM&R operations.

3.20.2.2 Southern Alternative

The Southern Alternative would result in beneficial effects to water supply reliability in the region, adverse effects from the project cost, beneficial regional economic effects during construction, and beneficial regional economic effects during operation.

Water Supply Reliability

The best estimate of total water supply reliability benefits for households and commercial establishments for the Southern Alternative are estimated to have a present value ranging from \$1,879.6 million to \$2,097.9 million, based on a range of possible growth rates for households and businesses. This effect is beneficial and can be compared to costs to evaluate net economic effects.

Economic Costs

The estimated net present value cost of constructing and operating the Southern Alternative is between \$1,898.6 million and \$2,013.8 million, depending on the assumed construction period. The economic costs of the Southern Alternative are considerably higher than the No Action Alternative. Additional costs associated with disturbance of land affecting vegetation and grazing were estimated to have a present value of \$1.11 million.

Ability to Pay and Affordability

Assuming growth rates based on the Kem C. Gardner projections, ATP is sufficient to pay the costs of the Southern Alternative through the year 2070. Assuming a more moderate growth rate of 2 percent, ATP is sufficient to pay the costs to the year 2067 and ATP is sufficient to cover costs assuming a 1.5 percent growth rate to the year 2047. Assuming no population growth, ATP would be insufficient to cover Southern Alternative costs by 2032.

Regional Economic Effects

The regional, short-term positive economic effects of the Southern Alternative are substantially greater than those of the No Action Alternative. Construction of the Southern Alternative is estimated to result in employment impacts of 1,303 jobs in the four-county region, 11,059 jobs in Utah, and 14,724 jobs in the three-state region. These short-term (during construction) beneficial effects are less than 1 percent of total regional employment. There are no regional effects from long-term OM&R operations.

Mitigation Measures

No mitigation measures are proposed.

3.20.2.3 Highway Alternative

The effects of the Highway Alternative are similar to the those anticipated with the Southern Alternative; the Highway Alternative would result in beneficial effects to water supply reliability in the region, adverse effects from the project cost, beneficial regional economic effects during construction, and beneficial regional economic effects during operation.

Water Supply Reliability

The water supply reliability benefits of the Highway Alternative would be the same as those for the Southern Alternative.

Economic Costs

The estimated net present value cost of constructing and operating the Highway Alternative is between \$1,847.7 million and \$1,959.2 million, depending on the assumed construction period. The economic costs of the Highway Alternative are considerably higher than the No Action Alternative. Additional costs associated with disturbance of land affecting vegetation and grazing were estimated to have a present value of \$1.13 million.

Ability to Pay and Affordability

Assuming growth rates based on the Kem C. Gardner projections, ATP is sufficient to pay the costs of the Highway Alternative through the year 2070. Assuming a more moderate growth rate of 2 percent, ATP is sufficient to pay the costs to the year 2067 and ATP is sufficient to cover costs assuming a 1.5 percent growth rate to the year 2047. Assuming no population growth, ATP would be insufficient to cover Highway Alternative costs by 2032.

Regional Economic Impacts

The regional, short-term positive economic effects of the Highway Alternative are substantially greater than those of the No Action Alternative. Construction of the Highway Alternative is estimated to result in employment impacts of 1,262 jobs in the four-county region, 10,705 jobs in Utah, and 14,251 jobs in the three-state region. These short-term (during construction) beneficial impacts are less than 1 percent of total regional employment. There are no regional effects from long-term OM&R operations.

Mitigation Measures

No mitigation measures are proposed.

Comparative Analysis of Alternatives

The No Action Alternative is less than 6 percent of the total cost of the Southern and Highway Alternatives. However, No Action does not generate water supply reliability benefits associated with projected future growth in the region. The Southern Alternative and the Highway Alternative generate the same level of water supply reliability benefits, but the Highway Alternative costs about 2.7 percent less than the Southern Alternative.

The ATP of the WCWCD service area is currently sufficient to pay the water related costs for the No Action Alternative up to 2070 and beyond. Assuming population growth equal to Kem C. Gardner projections, ATP is sufficient to pay for the Southern Alternative and the Highway Alternative. However, water rates with LPP will be substantially higher than under No Action and if population growth is less than the Kem C. Gardner projections, ATP could be less than the LPP alternatives by about 2040.

The No Action Alternative generates a low level of regional effects in terms of jobs, income, and value of output while the Southern Alternative and Highway Alternative each create significant short-term regional effects during construction. Employment effects range from 1,262 to 1,303 jobs for the four-county region, 10,705 to 11,059 jobs for Utah, and 14,251 to 14,724 jobs for the three-state region. These jobs would be beneficial to areas experiencing high unemployment and low income.

3.21 Environmental Justice

3.21.1 Affected Environment

3.21.1.1 Regulatory Framework and Methodology

Executive Order 12898 - Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations was issued by President William J. Clinton in 1994 and is the impetus for including an analysis in NEPA documents on disadvantaged populations. Its purpose is to focus federal attention on disproportionately high and adverse environmental and human health effects of federal actions on minority and low-income populations, with the goal of achieving environmental protection for all communities. E.O. 12898 does not dictate how federal agencies should respond to potential effects on minority and low-income populations, only that those effects be disclosed.

A survey of the environmental justice (EJ) characteristics of a selection of blockgroups was completed to determine whether one or more EJ populations was present in the study area. Blockgroups surveyed included blockgroups through which the LPP alternative routes pass, as well as a sample of blockgroups from the surrounding region. EJ population percentage data were identified by means of the EPA's EJScreen web tool (EPA 2018). Figures 3.21-1 through 3.21-3 depict the census blockgroup numbers and location.

There are three types of EJ populations: minority, low-income, and American Indian. A minority or low-income EJ population was found to be present if the EJ population exceeded 50 percent of the population of the blockgroup or the EJ population was 10 or more percentage points above the corresponding EJ population of the state of Utah or the state of Arizona, which served as reference populations for their respective counties. An American Indian EJ population was found to be present if a concentrated population of American Indians—based on U.S. Census Bureau data, compiled by Headwaters Economics—was present in a surveyed blockgroup (Headwaters Economics 2020).

3.21.1.2 Environmental Protection Measures

There are no EPMS for EJ for this project.

3.21.1.3 Existing Conditions

All three types of EJ populations are present in the Project Area (Table 3.21-1).

Table 3.21-1 Percentage of Population within Each Blockgroup by Type of Environmental Justice Population

Population	Low Income	Minority	American Indian
Blockgroup 040050021001	19%	54%	37.74%
Blockgroup 040059422011	41%	99%	96.57%
Blockgroup 040059422021	78%	98%	97.68%
Blockgroup 040050021006	19%	91%	91.11%
Blockgroup 040050021004	54%	43%	38.38%
Blockgroup 490251301002	45%	15%	0.25%
Blockgroup 490251301001	28%	4%	0.58%
Blockgroup 040050020001	49%	30%	19.56%
Blockgroup 040050020002	34%	17%	3.72%
Blockgroup 040159501003	69%	6%	5.66%
Blockgroup 490251302001	22%	6%	0.95%
Blockgroup 490251302002	33%	2%	0.0%
Blockgroup 490532701005	67%	0%	0.0%
Blockgroup 490532709011	39%	10%	3.94%
Blockgroup 490532709022	41%	17%	0.34%
Blockgroup 490532708022	57%	44%	13.35%
Blockgroup 49053279021	24%	20%	2.18%
Blockgroup 040050021007	62%	70%	63.83%
Blockgroup 490251302003	29%	16%	5.78%
State of Utah	11.0%	21.0%	1.1%
State of Arizona	17.0%	44.4%	4.4%

A low income EJ population is present. The percentage of the population classified as low income in multiple blockgroups analyzed is equal to or greater than 50 percent, or it is more than 10 percentage points higher than that of the reference populations of the state of Utah and the state of Arizona. A low income EJ population, therefore, is considered present for the purposes of this analysis.

A minority EJ population is also present. The percentage of the population identified as belonging to a minority group in multiple blockgroups analyzed is equal to or greater than 50 percent, or it is more than 10 percentage points higher than that of the reference populations of the state of Utah and the state of Arizona. A minority EJ population, therefore, is considered present for the purposes of this analysis.

An American Indian EJ population is present. There are multiple concentrated populations of American Indians living within one or more of the blockgroups included in the analysis. An American Indian EJ population, therefore, is considered present for the purposes of this analysis.

3.21.2 Environmental Consequences

3.21.2.1 No Action Alternative

The No Action Alternative would have no effect on EJ populations. If the LPP were not built, the Proposed Project would have no additional negative effects on EJ populations.

3.21.2.2 Southern Alternative

The Proposed Project would disproportionately affect the low-income and American Indian EJ populations. The American Indian EJ population would be adversely affected due to construction activities for the Proposed Project, which would cause permanent damage to locations that are culturally significant to local tribal groups, visual effects, and social effects on the tribes. Low-income households would be disproportionately affected by expected increases in water rates and by other economic variables that are influenced by the price of water (see Appendix C-23, Socioeconomics). No disproportionate adverse effects on the minority EJ population are anticipated.

The Tribe has indicated that the Southern Alternative would damage culturally significant natural landscape features and would harm the Tribe's well-being (Appendix D, Analysis and Perspective of the Tribe, Supplement #3). The adverse effects of these specific physical damages to these landscape features would be unique to the Tribe and would not be shared by the wider population. Disproportionate adverse effects on the Tribe are, therefore, anticipated to occur under this alternative. Additional concerns from the Tribal perspective are provided in Appendix C-21, Ethnographic Resources, and Appendix D, Analysis and Perspective of the Tribes.

Mitigation Measures

No mitigation measures are proposed.

3.21.2.3 Highway Alternative

The Proposed Project would disproportionately affect the low-income and American Indian EJ populations. Similar to the Southern Alternative, the American Indian EJ population would be adversely affected due to construction activities for the Proposed Project, which would cause permanent damage to locations that are culturally significant to local tribal groups, visual effects, and social effects on the tribes, and disproportionate adverse effects on low-income households are anticipated due to expected increases in water rates. No disproportionately high adverse effects to the minority EJ population are anticipated.

In addition, although the Tribe has indicated that the Highway Alternative would damage culturally significant natural landscape features and would harm the Tribe's well-being, the effect would not

affect the Tribe to the same degree as under the Southern Alternative (see Appendix D, Analysis and Perspective of the Tribe – Environmental Justice, Supplement #3). The adverse effects of these specific physical damages to these landscape features would be unique to the Tribe and would not be shared by the wider population. Disproportionate adverse effects on the Tribe are, therefore, anticipated to occur under this alternative. Additional concerns from the Tribal perspective can be found in Appendix C-21, Ethnographic Resources and Appendix D, Analysis and Perspective of the Tribe.

Under the repayment plan for the Proposed Project described in Section 3.20, Socioeconomics, and Appendix C-23, Socioeconomics, low-income populations living within the area to be served by the Proposed Project are expected to pay a higher percentage of their disposable incomes for water delivery, for property impact fees (whether directly or indirectly), and for local goods and services that incorporate higher water costs into their price structures in comparison to the broader community. Because demand for basic culinary water service is relatively price inelastic—meaning that the baseline amount of water consumed per person in a typical household is relatively inflexible regardless of the price charged per unit consumed—it is expected that lower income homes would experience disproportionate adverse economic effects from implementation of the proposed action. See the socioeconomic resources referenced above for additional information.

Mitigation Measures

No mitigation measures related to EJ are proposed for this project.

3.21.2.4 Comparative Analysis of Alternatives

The Proposed Project would have disproportionate adverse effects on EJ populations, regardless of the action alternative. Adverse effects on American Indian populations would be less under the Highway Alternative than the Southern Alternative.

Under either of the proposed action alternatives, there would be disproportionate adverse effects on the low income and American Indian EJ populations. The effects on low-income populations due to repayment would be adverse for both action alternatives. Effects on the concentrated American Indian populations living within the study area would be greater under the Southern Alternative than the Highway Alternative.

4 Irreversible and Irretrievable Commitment of Resources of the Proposed Action

NEPA requires the evaluation of irreversible and irretrievable commitment of resources (40 CFR §1502.16). However, these “resources” have not been defined in the regulations. Reclamation has interpreted them in the following manner (Reclamation 2012):

- **Irreversible commitment of resources** occurs as a result of the use or destruction of a specific resource (e.g., minerals extraction, destruction of cultural resources) that cannot be replaced or, at a minimum, restored over a long period of time and possibly at great expense.
- **Irretrievable commitment of resources** refers to actions resulting in the loss of production or use of natural resources. It represents opportunities foregone for the period of time that a resource cannot be used (e.g., land conversion to new uses, construction of levees preventing the natural flooding of floodplains).

4.1 No Action Alternative

Under the No Action Alternative, the LPP would not be built. The WCWCD would pursue other water supply projects as described in Section 2.3.1, above. There is the potential for both the irreversible and irretrievable commitment of resources through the use of fossil fuels, destruction of culturally important resources, and land conversion to support water storage projects. Because these projects are not well defined at this point, quantifying these resources is not possible. However, it is acknowledged that those projects would likely include the irreversible and irretrievable commitment of resources.

4.2 Southern Alternative

Implementing the Southern Alternative would result in impacts to two sites that are considered sacred by the Indian tribes as described in Section 3.18, Ethnographic Resources, and Appendix C-21, Ethnographic Resources. It is the perspective of the tribes that construction of the pipeline would harm the integrity of the sites, including the *Puha* (energy) of the area. In addition, the integrity of 214 eligible cultural sites ranging in site complexity from lithic/trash scatters to habitations would be lost and could not be restored to their original integrity (see Section 3.17, Cultural Resources, and Appendix C-20, Cultural Resources). Efforts would be made to mitigate impacts through development and implementation of cultural mitigation documents under Section 106 of the NHPA. However, restoration to the sites’ original state would be unlikely. Finally, construction and operation and maintenance of the LPP would result in the expenditure of fossil fuels that could not be recuperated.

4.3 Highway Alternative

Implementing the Highway Alternative would also result in impacts to a site considered sacred by the tribes and the loss of integrity of 206 eligible cultural sites ranging in site complexity from lithic/trash scatters to habitations. Efforts would be made to mitigate impacts through development and implementation of cultural mitigation documents under Section 106 of the NHPA. However, restoration to the sites' original state would be unlikely. Finally, construction and operation and maintenance of the LPP would result in the expenditure of fossil fuels that could not be recuperated.

5 Cumulative Effects

This chapter presents a summary of regulatory framework, methodology, and analysis of the contribution of the Proposed Project to overall cumulative effects when combined with other relevant past, present, and reasonably foreseeable future actions in the Project Area for each resource area analyzed in detail. For a more detailed discussion of all of these topics, see Appendix C-25, Cumulative Effects.

5.1 Regulatory Framework

According to the CEQ's regulations for implementing NEPA (40 CFR Section 1508.7), a cumulative effect is an effect on the environment that results from the incremental effect of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions. Cumulative effects can result from individually minor, but collectively significant actions taking place over a period of time. Thus, 40 CFR Section 1508.7 requires that these effects be analyzed for relevant resources in all EISs prepared under NEPA. This analysis also comports with the direction for cumulative effects assessment in Interior's regulations for implementing NEPA (43 CFR Part 46) and Reclamation's NEPA Handbook (Reclamation 2012).

5.2 Methodology

This cumulative effects analysis generally follows the methodology set forth in relevant CEQ, EPA and Reclamation guidance (White House CEQ 1997, 2005; EPA 1999; Reclamation 2012). Under these guidance documents, inclusion of projects within this analysis is based on identifying commonalities of effects from other projects to potential effects that would result from the Proposed Project. Cumulative effects are based on net effects (i.e., effects remaining after mitigation has been applied). If the Proposed Project would not affect a resource, there also would be no potential for cumulative effects on that resource. In general, the overlapping effects from past and present actions are taken into account as part of the baseline conditions described in the Affected Environment section for each resource area analyzed in this DEIS.

The approach taken for this cumulative effects analysis is consistent with the intent of CEQ Regulations for Implementing NEPA at 40 CFR 1502.22, *Incomplete or Unavailable Information*. This regulation directs agencies on how to proceed when evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS, and there is incomplete or unavailable information. While information describing the characteristics and potential effects of other projects and activities within the temporal and spatial boundaries used in this analysis is primarily qualitative, and, in some cases is incomplete or unavailable, there still is sufficient information to complete a fair disclosure and hard look at potential cumulative effects attributable to the Proposed Project.

For each resource that would be affected by the Proposed Project, this cumulative effects analysis includes the following steps:

- Any relevant interrelated effects from other past, present, and reasonably foreseeable future actions considered in this analysis are discussed; and
- The total combined cumulative effects of the Proposed Project and the effects from relevant past, present, and reasonably foreseeable future actions are discussed.

5.2.1 Spatial and Temporal Scope of Analysis

The following sections describe how the determination was made by Reclamation for the geographic and temporal boundaries used to identify other past, present, and reasonably foreseeable future actions that may have overlapping effects on one or more resources analyzed as part of this DEIS. For an action to be included in this analysis for a given resource, it must overlap with both the geographic *and* temporal scopes described in the sections that follow.

5.2.1.1 Geographic Scope of Analysis

The geographic scope of the cumulative effects analysis defines the physical limits or boundaries of the Proposed Project's effect on various resources, with the understanding that if the Proposed Project has no direct or indirect effect on a resource beyond a certain location, then there cannot be any overlapping effect from other actions that may lie beyond that point. Because the Proposed Project would affect various resources differently, the geographic scope for each resource analyzed in this DEIS varies. In general, the boundaries for the cumulative effects analysis for a specific resource are the same as those described in the Affected Environment section for each resource.

5.2.1.2 Temporal Scope of Analysis

The temporal scope used for this cumulative effects analysis has no set number of years going back in time; the key principle used for the analysis is to include past actions that may still contribute overlapping effects with the Proposed Project. For reasonably foreseeable future actions (RFFAs), the cumulative effects analysis considers effects that may occur up to 50 years into the future based on the expected operational life of the Proposed Project and lifespan of the LPP water exchange contract.

5.3 Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and reasonably foreseeable actions were identified using the geographic and temporal boundaries described above that could contribute to cumulative effects from construction and operation of the Proposed Project. Past and present actions identified are those that would likely have overlapping effects with the Proposed Project. RFFAs are future actions where there is a reasonable expectation that the action could occur, such as a proposed action already under environmental analysis; a project where environmental analysis has already been completed, but construction/implementation has not yet begun; a project that has already started construction; or a future action stated in a report, such as a planning document and/or that has obligated funding. These other actions were identified in consultation with local, state, and government agencies in the Project Area, and are listed and described in Section 2 of Appendix C-25, Cumulative Effects.

5.4 Resources Considered but Eliminated from Further Study

Four of the 24 resources that were initially identified for analysis in this DEIS were considered but eliminated from further study in Chapter 3 and in this chapter: air quality, EMF, general fish and wildlife, and paleontology. Cumulative effects for these resources, however, are discussed in Appendix C-25, Cumulative Effects.

5.5 Results and Environmental Consequences

5.5.1 Geology and Soils

5.5.1.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to geology and soil resources expected from past, present, and reasonably foreseeable future actions because it would not be constructed.

5.5.1.2 Southern Alternative

Surface-disturbing activities such as excavation, grading, removal of vegetation, and removal of biological soil crust cover is expected to result in direct effects associated with construction of LPP infrastructure. Areas disturbed during construction, or removed permanently for LPP facilities or roads, would support little or no vegetation. Soil erosion could occur from increased stormwater runoff as a result of protective vegetative and biological soil crust cover removal, soil compaction or alteration of drainage patterns related to construction of the pipeline, roads, and other associated infrastructure. These direct soil loss effects would occur within the Proposed Project ROW areas during construction and operation activities. Disturbance in most areas would be short term, and effects would be controlled through implementation of EPMs. Once construction is complete, the construction corridor would be restored, which would minimize soil erosion in the long term. An exception is the Kanab Creek crossing, where steep topography and areas of sensitive and erosion-prone soils occur. This area has the potential for higher rates of erosion.

Other past, present, and reasonably foreseeable future actions that could have overlapping effects to geology and soils include the continued construction and operation of the Southern Corridor Highway, which is a four-lane highway, part of which has already been constructed from I-15 south of St. George to SR-9 in Hurricane. Construction of the highway has eliminated, and will eliminate, soil resources within the footprint of the roadway. Ongoing operation of the highway will permanently remove access to soil resources within the footprint of the roadway.

Overall, construction and operation of the Southern Alternative would contribute to cumulative effects to geology and soils in combination with other past, present, and reasonably foreseeable future actions.

5.5.1.3 Highway Alternative

The cumulative effects would be similar to those described for the Southern Alternative.

5.5.2 Noise and Vibration

5.5.2.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects from noise and vibration expected from past, present, and reasonably foreseeable future actions because it would not be constructed. However, other past, present, and reasonably foreseeable future actions would still occur and may generate noise and vibration.

5.5.2.2 Southern Alternative

Construction and operation of the Southern Corridor Highway would add a new source of noise and vibration in the study area, and construction and operation of the roadway expansion projects listed in the table could increase traffic noise and vibration for nearby sensitive receptors. Noise sources are added logarithmically, and noise decreases with distance based on the inverse square law.

Fourteen completed and potential projects were analyzed for the potential of cumulative noise or vibration effects in combination with the Proposed Project; none would have cumulative long-term effects, and nine would have no cumulative short-term effects when combined with the Proposed Project; five would have short-term cumulative effects.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to noise and vibration in combination with other past, present, and reasonably foreseeable future actions.

5.5.2.3 Highway Alternative

The cumulative noise and vibration effects of the Highway Alternative would be the same as the Southern Alternative where pipeline routes are the same. Noise effects where the alternatives routes differ would be similar in intensity, but differ in the location combination with other sound and vibration sources.

Overall, construction and operation of the Highway Alternative would contribute to the overall cumulative effects to noise and vibration in combination with other past, present, and reasonably foreseeable future actions.

5.5.3 Land Use

5.5.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to land use expected from past, present, and reasonably foreseeable future actions. because it would not be constructed. However, other planned projects in the region would still occur, potentially having a cumulative adverse effect on land use and existing ROWs. These other projects may require coordination with existing crossings and physical above-ground features that would have a permanent effect on land use and existing ROWs and result in temporary adverse effects on grazing during construction.

5.5.3.2 Southern Alternative

The Southern Alternative could have short-term and temporary cumulative effects on land use when combined with the existing ROWs, and existing and reasonably foreseeable future improvements within the proposed alignment. However, these effects would be minimized by the EPMs.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to land use in combination with other past, present, and reasonably foreseeable future actions.

5.5.3.2 Highway Alternative

The Highway Alternative would have cumulative effects similar to those described for the Southern Alternative, differing primarily in location of effects where the ROWs differ.

5.5.4 Special Designations

5.5.4.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to lands with special designations expected from past, present, and reasonably foreseeable future actions because it would not be constructed. The No Action Alternative would have no effect on the Cockscomb WSA. This alternative would have no construction or operation effects because none would occur (i.e., no pipeline or associated infrastructure would be constructed). No activities would be authorized that would affect the opportunities for solitude in the WSA.

5.5.4.2 Southern Alternative

Adverse effects from the Proposed Project to the ACEC, the Old Spanish National Historic Trail, and Pipe Spring National Monument would contribute to the overall cumulative effects to these special designation lands from other past, present, and reasonably foreseeable future actions as described in Appendix C-25, Cumulative Effects. Under the Southern Alternative, noise produced during construction and operation would affect the opportunities for solitude in the portions of the Cockscomb WSA that are adjacent to the Project Area. Noise generated during construction activities would attenuate to background levels within 800 feet of the pipeline alignment and facility sites and would disrupt those seeking solitude, having a short-term, indirect effect. The LPP would not affect naturalness, opportunities for primitive and unconfined recreation, or the supplemental values because the Proposed Project would not occur within the WSA. Additional analysis of impacts to the Cockscomb WSA can be found in Appendix C-9, Recreation.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to lands with special designations in combination with other past, present, and reasonably foreseeable future actions.

5.5.4.3 Highway Alternative

Adverse effects from implementation of the Highway Alternative to the Old Spanish National Historic Trail, and Pipe Spring National Monument as described above would contribute to the overall cumulative effects to these special designation lands from other past, present, and reasonably foreseeable future actions. Under the Highway Alternative, effects to the Cockscomb WSA would be the same as the Southern Alternative. No cumulative effects to the ACEC would occur from the Highway Alternative.

Overall, construction and operation of the Highway Alternative would contribute to the overall cumulative effects to lands with special designations in combination with other past, present, and reasonably foreseeable future actions.

5.5.5 Transportation

5.5.5.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to transportation resources expected from past, present, and reasonably foreseeable future actions because it would not be constructed. However, other planned transportation or infrastructure projects would be constructed and implemented. These other projects may result in changes that affect transportation resources, such as delays associated with construction vehicles and workers and physical alterations to the existing transportation system (e.g., new or expanded roads).

5.5.5.2 Southern Alternative

This analysis of cumulative effects on transportation addresses the effects of the Southern Alternative in conjunction with past, present, or reasonably foreseeable future projects in or near the Proposed Project. It considers potential effects associated largely with potential changes to traffic. Depending on the schedule of construction activities, the potential for cumulative effects could vary. If construction were conducted simultaneously in the same or adjacent areas, some short-term cumulative effects on traffic may occur. Effects on traffic may involve lane closures, reduced speed zones, and/or detours throughout the duration of construction activities. No or limited cumulative operational effects are anticipated due to the contributions to additional traffic associated with the Southern Alternative.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to transportation in combination with other past, present, and reasonably foreseeable future actions.

5.5.5.3 Highway Alternative

The Highway Alternative would have cumulative effects similar to the Southern Alternative.

5.5.6 Recreation

5.5.6.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to recreation resources expected from past, present, and reasonably foreseeable future actions because it would not be constructed. However, several unrelated projects, including the Southern Corridor Highway and the Sand Hollow Regional Pipeline, would have long-term effects on access to recreational resources in the BLM Sand Mountain SRMA.

5.5.6.2 Southern Alternative

Construction activities for the Proposed Project under the Southern Alternative would have temporary direct effects on recreational users accessing some recreation resources. These effects include visual changes, air pollutants, noise, and additional LPP construction traffic on recreation

use, which could include temporary closures, detours, and congestion. In addition, some recreation lands would be unavailable for recreational use.

Other projects, including the Southern Corridor Highway and the Sand Hollow Regional Pipeline projects, would contribute additional effects to those caused by the Proposed Project. These effects include permanent removal of some open space and recreational lands, air pollution and noise from construction activities, visual changes to the landscape, and temporary and permanent closures of recreation lands.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to recreation resources in combination with other past, present, and reasonably foreseeable future actions.

5.5.6.3 Highway Alternative

The Highway Alternative would have the similar cumulative effects as described for the Southern Alternative.

5.5.7 Hydrology

5.5.7.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to hydrology when combined with the past, present, and reasonably foreseeable future actions because it would not be constructed. The hydrology modeling used in this analysis (see Appendix C-10, Hydrology) incorporates the effects of the No Action Alternative with other past, present, and reasonably foreseeable future actions. However, because the Proposed Project would not be implemented under this alternative, there would be no direct or indirect effects to the Colorado River and thus there would be no additional contribution to cumulative effects. The combined effect of other water development projects in Washington County with the planned projects from the No Action Alternative would contribute to decreased flows in the Virgin River and, potentially, its tributaries, depending on the location of those developments.

5.5.7.2 Southern and Highway Alternatives

The Proposed Project would contribute to reduced storage values in Lake Powell induced by reasonably foreseeable projects modeled in this analysis. This contribution is within the variability affected by hydrology and is insignificant compared against both hydrologic variability and cumulative reasonably foreseeable projects (Attachment B of C-10, Hydrology). The Proposed Project would also affect hydrology as a result of the pipeline crossing rivers, washes, and streams, especially where future storm events may lead to erosion and scour.

The Proposed Project would contribute to increased flows in the lower reaches of the Virgin River that were modeled in the VRDSM. This may offset other cumulative projects that reduce flows in those same stretches. This offset was not quantified within the VRDSM.

Overall, construction and operation of the Southern and Highway Alternatives would contribute to the overall cumulative effects to hydrology in combination with other past, present, and reasonably foreseeable future action.

5.5.8 Water Quality

5.5.8.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects on water quality expected from past, present, and reasonably foreseeable future actions because it would not be constructed. Other actions may affect water quality, including the following projects:

- Reclamation - Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead EIS and ROD (Reclamation 2007);
- BIA and BLM – St. George Wastewater Reuse Project (BIA and BLM 2002, as cited in UBWR 2016b);
- Reclamation and NPS - Glen Canyon Dam Long Term Management Plan EIS and ROD (Reclamation and NPS 2016); and

These actions and projects determine the elevation, storage, release, operational timing, and volume of water in Lake Powell, in addition to the release rates, volumes, and operational timing of releases from Glen Canyon Dam into the Colorado River. Under the No Action Alternative, these projects would continue to affect surface water quality in the study area. During periods of low water supply, the water volumes of Lake Mead and Lake Powell are regulated to conserve water, while maintaining hydroelectric supply for communities, agriculture, and industry. Dam releases during periods of low regional water supply could increase short-term turbidity and total dissolved solids downstream of dam releases into the Colorado River.

5.5.8.2 Southern Alternative

The cumulative effects of the Southern Alternative on the study area generally would not differ from those detailed above for the No Action Alternative, except for the cumulative effect posed by additional utility lines in the utility corridor through the ACEC. With the correct implementation of industry standards or practices, the Southern Alternative would have short-term effects on surface water and shallow groundwater quality during construction and operation activities. When combined with the St. George Wastewater Reuse Project, the Southern Alternative would have long-term cumulative effects on surface water quality. The Southern Alternative would utilize 3,000 acre-feet of off-stream storage of reuse water associated with the return flow management with the Proposed Project water distribution throughout the St. George, Utah, metropolitan area (UBWR 2016a). The influence of the Proposed Project could result in a change to the water quality of reuse water for parks, golf courses, and cemeteries. Reuse water would be managed in combination with other non-potable water supplies to meet system requirements, and the potential long-term cumulative effects on surface water quality (in this case, the reuse water) would not be significant (UBWR 2016a).

With correct implementation of EPMs, the Southern Alternative would have both short-term and long-term effects on surface water and groundwater quality during construction and operation activities. Under DNF conditions, median seasonal water temperatures of Glen Canyon Dam releases are projected to increase by 0.4 degrees Celsius (°C) (which is a +0.72 change on the Fahrenheit scale) in the spring to a change of +0.7°C (or +1.26 °F) in the winter due to water diversions via the Proposed Project. Release temperatures are slightly greater compared to the No Action Alternative because the Proposed Project would convey water from Lake Powell, decreasing the total pool elevation and the cold-water pool volume over time. Average annual temperature changes between the Southern Alternative and the No Action Alternative range from -0.4 °C (-0.72°F) to +1.6 °C (+2.9 °F).

There could be cumulative effects from the Proposed Project on surface water quality from the construction of other future utility lines in the utility corridor once the RMP were amended, when the effects are combined with those from past, present, and reasonably foreseeable future actions.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to water quality when combined with other past, present, and reasonably foreseeable future actions.

5.5.8.3 Highway Alternative

The cumulative effects of the Highway Alternative are similar to those described for the Southern Alternative, with the exception of the potential for additional utility lines in the ACEC/utility corridor since the RMPA would not be required under this alternative.

Overall, construction and operation of the Highway Alternative would contribute to the overall cumulative effects to water quality when combined with other past, present, and reasonably foreseeable future actions.

5.5.9 Aquatic Invasive Species

5.5.9.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to AIS expected from past, present, and reasonably foreseeable future actions because it would not be constructed. However, other past, present, and reasonably foreseeable future actions in the study area could result in effects on AIS, in particular those projects that may have overlapping effects on the potential for invasion of quagga mussels in several water bodies. Currently, the greatest threat to Sand Hollow and Quail Creek reservoirs is recreational boats spreading AIS. Sand Hollow Reservoir is classified as high risk for potential invasion due to the number of boaters traveling there from other nearby quagga mussel infested waterbodies such as Lake Powell and Lake Mead. Based on the usage data, Sand Hollow Reservoir has the highest threat of becoming infested with quagga mussels in Utah.

5.5.9.2 Southern Alternative

The inter-basin transfer of Proposed Project water from Lake Powell to Sand Hollow Reservoir through the Proposed Project could result in transfer of undesirable and invasive aquatic organisms from the upper Colorado River basin to the Virgin River basin. While no LPP water would be directly discharged into the Virgin River or any of its tributary streams, Quail Creek Reservoir has an outlet to the Virgin River and a direct connection to Sand Hollow Reservoir via a connecting pipeline. All of the Proposed Project water conveyed through the pipeline would flow into Sand Hollow Reservoir for the specific purpose of providing M&I raw water supply for treatment in a water treatment facility and distribution as culinary water. Thus, implementation of the Southern Alternative would increase the overall threat to spreading quagga mussels to Sand Hollow and Quail Creek Reservoirs. Implementing the EPMS would minimize that risk to the greatest extent given the practicality of treatments to this specific project, while using the best available information to inform both the EPMS and mitigation measures. While Sand Hollow Reservoir is designated as a high-risk reservoir (see Section 1.4 of Appendix C-12, Aquatic Invasive Species), the Proposed Project would contribute to additional risks of quagga mussel infestation from other past, present, and reasonably foreseeable future actions to a watershed that currently has no established populations.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to AIS in combination with other past, present, and reasonably foreseeable future actions.

5.5.9.3 Highway Alternative

Under the Highway Alternative, the cumulative effects would be the same as those described for the Southern Alternative.

5.5.10 Vegetation Communities

5.5.10.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to vegetation communities expected from past, present, and reasonably foreseeable future actions because it would not be constructed.

5.5.10.2 Southern Alternative

Effects to vegetation communities were assessed to address potential cumulative effects from the Southern Alternative. Such effects are assessed in conjunction with past, present, or reasonably foreseeable future actions in or near the Project Area.

Construction of the Proposed Project would cause temporary and permanent changes to the structure and composition of existing vegetation communities; these impacts would be reduced through implementation of EPMS.

The regions of Arizona and Utah that the Proposed Project traverses are not, in general, subject to intense residential and commercial developmental pressures, with the exception of the St. George and Hurricane, Utah, areas. St. George, Utah, is the fastest-growing metropolitan area in the country, according to Census Bureau data (WBUR 2018). It has been projected that St. George and Hurricane will both experience dramatic population growth over the next several decades as well, resulting in land development to accommodate increased demand for housing and commercial structures. The increase in population in the area has also resulted in a dramatic increase in the level of recreational activities such as OHV use, which is expected to continue growing. Continued growth in vehicle and OHV use and visitation in the region would likely increase disturbance to vegetation through trampling, soil compaction (which restricts root growth), increased deposition of dust on vegetation adjacent to travel ways, and introduction and spread of invasive plants. Droughts would also affect vegetation communities by reducing overall vegetative cover.

Other past and currently approved projects were also assessed to determine potential cumulative effects on vegetation when considered in combination with the LPP. These other actions are likely to cause similar effects to vegetation communities as the Proposed Project.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to vegetation communities in combination with other past, present, and reasonably foreseeable future actions.

5.5.10.3 Highway Alternative

The Highway Alternative would have the cumulative effects similar to those described for the Southern Alternative.

5.5.11 Wetland and Riparian

5.5.11.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to wetlands, riparian areas, and jurisdictional waters expected from past, present, and RFFAs because it would not be constructed. However, other past, present, and reasonably foreseeable future actions in the study area could result in effects on wetland and riparian resources. Wetland and riparian areas are uncommon in the study area. Population growth and development in the region will continue to increase the demand for water and the need to divert water from springs and streams, ultimately reducing the number and size of riparian areas. Any projects with a federal nexus would include resource protection measures. Projects without a federal nexus could have a more substantial effect on this resource than the Proposed Project due to a lack of regulatory protection of these resources.

5.5.11.2 Southern Alternative

Wetland and riparian areas are uncommon in this region. Population growth and development in the region will continue to increase the demand for water and the need to divert water from springs and streams, ultimately reducing the number and size of riparian areas. Any projects with a federal nexus would include resource protection measures. Projects without a federal nexus could have a more substantial effect on this resource than the LPP due to a lack of regulatory protection of these resources. However, implementing Proposed Project EPMs would reduce potential effects. Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to wetlands, riparian areas, and jurisdictional waters in combination with other past, present, and reasonably foreseeable future actions.

5.5.11.3 Highway Alternative

The Highway Alternative would have the same cumulative effects on wetlands, riparian areas, and jurisdictional waters as described for the Southern Alternative.

5.5.12 Special Status Plants

5.5.12.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to special status plant expected from past, present, and reasonably foreseeable future actions because it would not be constructed. Cumulative effects would occur to sensitive plant species from many of those other actions.

From a regional perspective, these plant species would experience an additive adverse effect. Actions that are linear in nature (e.g., roadways and telecommunication lines) would result in the most pronounced effects; however, many of these past, present, and reasonably foreseeable actions on federally managed lands require vegetation reestablishment criteria, focusing on native and non-native plant species, and, conversely, focusing on preventing/limiting the spread of weed and invasive plant species. Consequently, cumulative effects would occur; but existing and anticipated

effect minimization and reestablishment efforts for all actions are expected to result in a lower level of combined cumulative effects. However, if reestablishment of special status plant species is unsuccessful, it is expected that some noxious weeds and invasive plant species could have the capability to adapt to these extremely dry conditions and become established in areas where they were not previously.

5.5.12.2 Southern Alternative

From a regional perspective, special status plant species would experience an additive adverse effect based on past, present, and reasonably foreseeable future actions on federally managed lands. In addition, it is expected that some additional noxious weeds and invasive plant species could have the capability to adapt to these semi-arid conditions and become established in areas where they were not previously.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to special status plants in combination with other past, present, and reasonably foreseeable future actions.

5.5.12.3 Highway Alternative

Cumulative effects associated with the Highway Alternative would be similar to those discussed under the Southern Alternative.

5.5.13 Sensitive Species – Fish and Wildlife

5.5.13.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to sensitive fish and wildlife resources expected from past, present, and reasonably foreseeable future actions because it would not be constructed. However, other RFFAs that will occur will likely contribute to adverse effects on general fish and wildlife resources. The combined actions of land disturbance resulting from these past, present, and reasonably foreseeable future actions contribute to incremental loss, alteration, and fragmentation of foraging, nesting, breeding habitat and refuge and/or escape cover for wildlife. These effects could be more intense if future development occurs in areas where specialized habitat types are limited in the Project Area, such as riparian corridors. Residential, agricultural, and infrastructure development has influenced natural aquatic habitats resulting in decreased soil stability, removing shade, higher water temperatures, decreased oxygen potential, and embeddedness of substrate, which may reduce breeding habitats for a variety of sensitive fish. Introduction of non-native fish has reduced native fish populations through predation, reducing diversity, and increasing competition for available resources.

5.5.13.2 Southern Alternative

The effects of the Southern Alternative, including RMPA Sub-alternatives, could contribute to existing and ongoing loss, fragmentation, and modification of vegetation and terrain that provide potential habitat for sensitive species. Direct and indirect effects of any one past, present, or future action are not likely to affect sensitive species or their habitat to the degree that existing populations would be affected.

Lands managed by the BLM are managed for multiple-resource use. The NPS manages GCNRA and Pipe Spring National Monument in accordance with the NPS Organic Act of 1916, (54 USC 100101 et seq.) as amended, NPS Management Policies, and manages park resources using site-

specific plans and park-wide plans for future use and management. Actions taken by the NPS may include repairing and rehabilitating access roads; managing off-road vehicles, camping areas, trails, commercial air tours, non-native aquatic species; communication sites, dam operations and facilities, vegetation, visitor use and recreation, and preserving cultural and natural resources and interpretation. Habitats crossed by the Southern Alternative are similar to habitats impacted by similar past and present actions and reasonably foreseeable future actions.

Amending the land use plan under RMPA Sub-alternative 1 would allow new land use authorizations within the ACEC when effects to sensitive resources for which the area was designated could be mitigated, which would result in cumulative effects on sensitive species that use riparian habitats associated with the ACEC similar to those previously described. Under RMPA Sub-alternative 2, amending the size of the ACEC would reduce the acreage of the ACEC by 905 acres, which would overlap with important riparian corridors that may be used by other sensitive species.

Effects to sensitive species and associated habitats would be slightly greater along the Southern Alternative because habitat values along the Highway Alternative are already degraded due to the presence of Highways 89 and 389 in Utah and Arizona. The effects associated with construction, operation, and maintenance of the Southern Alternative would be reduced through avoidance and implementation of the EPMS. The potential to mitigate effects to sensitive species and their habitats is high. Effects to habitat in some areas may be more long term because of restoration rates of some components of habitat (e.g., pinyon pine-juniper and blackbrush) and the potential for invasive, non-native species within the ROWs, which would result in adverse effects to sensitive species habitat within the ROWs; therefore, cumulative effects associated with sensitive species habitat would occur in some localized areas within the ROWs. Projects with no federal nexus may not include extensive EPMS and could result in cumulatively more substantial effects than the Proposed Project is likely to have.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to sensitive fish and wildlife resources in combination with other past, present, and reasonably foreseeable future actions.

5.5.13.3 Highway Alternative

Cumulative effects associated with the Highway Alternative would be similar to those described for the Southern Alternative, except for the RMPA.

5.5.14 Threatened and Endangered Species

5.5.14.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to existing and ongoing loss, fragmentation, and modification of habitat for ESA-listed species expected from past, present, and reasonably foreseeable future actions because it would not be constructed.

5.5.14.2 Southern Alternative

The effects of the Southern Alternative, including RMPA Sub-alternatives, could contribute to existing and on-going loss, fragmentation, and modification of habitat for ESA-listed species. The combined incremental effects of all past, present, and reasonably foreseeable future actions could be extensive and occur over the majority of available habitat in the Project Area. Modification and

fragmentation of ESA-listed species habitats could result in shifts in species composition and diversity.

Lands administered by the BLM in the Project Area are managed for multiple-resource use. The NPS manages GCNRA and Pipe Spring National Monument in accordance with the NPS Organic Act of 1916, (54 USC 100101 et seq.) as amended, and NPS Management Policies, and it manages park resources using site-specific plans and park-wide plans for future use and management. Actions taken by the NPS may include repairing and rehabilitating access roads; managing off-road vehicles, camping areas, trails, commercial air tours, non-native aquatic species, communication sites, dam operations and facilities, vegetation, and visitor use and recreation; and preserving cultural and natural resources and providing interpretation. The combined actions contribute to incremental loss, alteration, and fragmentation of foraging, nesting, breeding habitat and refuge and/or escape cover for ESA-listed species and could be more intense if development occurs in areas where specialized habitat types are limited such as riparian corridors. Residential, agricultural, and infrastructure development has influenced natural aquatic habitats resulting in decreased soil stability, removing shade, higher water temperatures, decreased oxygen potential, and embeddedness of substrate which may reduce breeding habitats for ESA-listed fish. Introduction of non-native fish can reduce native fish populations through predation, reducing diversity, and increasing competition for available resources. The Habitat Conservation Plan for Washington County, Utah, for Mojave Desert tortoise established the Red Hills Desert Reserve, which carefully controls uses and prioritizes management for desert tortoise.

Habitats crossed by the Southern Alternative are similar to habitats affected by similar past and present actions and RFFAs. The Proposed Project's contribution to effects associated with the Southern Alternative would be small in comparison to the landscape-scale effects (e.g., wildfire) of past and present actions and RFFAs. Amending the land-use plan under RMPA Sub-alternative 1 would allow new land use authorizations within the ACEC when effects to sensitive resources for which the area was designated could be mitigated, which would result in cumulative effects on ESA-listed species such as southwestern willow flycatcher that use riparian habitats associated with the ACEC similar to those previously described. Under RMPA Sub-alternative 2, amending the size of the ACEC would reduce the acreage of the ACEC by 905 acres, which would overlap with important riparian corridors that may be used by other sensitive species. The effects associated with construction, operation, and maintenance of the Proposed Project could be greatly reduced through avoidance and implementation of the EPMs. The potential to mitigate effects for most ESA-listed species is high. The potential to mitigate effects to occupied or suitable upland habitat is low due to the potential for invasive species such as annual cheatgrass to enter the ROW and the low success rate of restoration activities in desert environments. The potential to mitigate effects within riparian habitats is higher, and restoration activities are more likely to succeed. Even with successful restoration efforts, the ROW would be maintained in a condition that is suitable to the operation and maintenance of the Proposed Project, which may not allow for full restoration of occupied or suitable habitats.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to existing and on-going loss, fragmentation, and modification of habitat for ESA-listed species in combination with other past, present, and reasonably foreseeable future actions.

5.5.14.3 Highway Alternative

Cumulative effects associated with the Highway Alternative would be similar to those described for the Southern Alternative.

5.5.15 Visual Resources

5.5.15.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to visual resources expected from past, present, and reasonably foreseeable future actions because it would not be constructed. Based on projected trends in population increases and development patterns incremental changes to the landscape character of the Project Area would likely result from additional, unrelated highway and road construction, utility corridors, residential and commercial development, vegetation manipulation, and recreational developments and activities. If they are concentrated in already disturbed landscapes, the effects would be less than if located in mostly undeveloped areas.

5.5.15.2 Southern Alternative

The Southern Alternative would result in some contribution to adverse visual resource cumulative effects within the area of analysis when combined with the effects of the past, present, and reasonably foreseeable future actions listed in Appendix C-25, Cumulative Effects. The pipeline follows highway or roads through much of the alignment, resulting in limited cumulative visual effects. The large facilities (BPSs, HSs, and related infrastructure) were located near areas of existing development would result in a small contribution to cumulative visual effects as they would blend with other structures. In locations where these facilities would be constructed in mostly undeveloped landscapes and occur at regular intervals, their size and repetition could result in adverse cumulative visual effects, especially when combined with other visually disharmonious projects. The transmission lines in several locations would be located in proximity to existing lines, thus resulting in a lower contribution to cumulative visual effects.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to visual resources in combination with other past, present, and reasonably foreseeable future actions.

5.5.15.3 Highway Alternative

The Highway Alternative visual resource cumulative effects would be nearly the same as described for the Southern Alternative. One additional cumulative effect could occur when combined with the effects of the Jackson Flat Reservoir project. The visual resource effects of the Highway Alternative near the Jackson Flat Reservoir would have short-term cumulative effects on the characteristic landscape because of changes in line, form, color, and texture introduced as a result of land disturbance caused by both projects. The cumulative effects would diminish over time as the Highway Alternative becomes revegetated near the Jackson Flat Reservoir.

Overall, construction and operation of the Highway Alternative would contribute to the overall cumulative effects to visual resources in combination with other past, present, and reasonably foreseeable future actions.

5.5.16 Cultural Resources

5.5.16.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to adverse cumulative effects to cultural resources expected from past, present, and reasonably foreseeable future actions because it would not be constructed. Cumulative effects from other projects would continue to occur within the 2-mile APE. Permitted land-uses such as, but not limited to, realty actions, mineral exploration/development, livestock grazing, and special-recreation permits, would continue to occur. Depending on the location, allowed uses, such as OHV use, camping, hiking, and sightseeing, as well as unauthorized uses, such as the illegal collection of artifacts, vandalism, and damage to cultural resources, would also continue to occur. These potential adverse effects may include the natural deterioration of cultural resources, and the settling of dust from OHV use on cultural resources, or effects such as the ground-disturbing actions associated with the construction of utility lines. However, because the No Action Alternative would have no effect, it would not contribute to cumulative effects of these other projects.

5.5.16.2 Southern Alternative

In the past, the cultural resources along the Southern Alternative have been affected by the construction of roads, highways, and utilities (e.g., fiber-optic lines). For example, the recently completed South Central Communications - Buckskin to Page Project (2016) runs parallel to the eastern portion of Proposed Project along Highway 89. The new conduit and fiber-optic line was installed with a tractor-mounted cable plow and other heavy equipment. Most of the conduit was plowed in with a typical disturbance width of 1 foot. No new access roads were created as part of the project.

In 2017 South Central Communications also completed an additional fiber-optic line north of Highway 89, on Johnson Canyon and Skutumpah Roads. The construction of these fiber-optic projects, and the authorization of the Proposed Project would add to the overall effects on cultural resources from utility projects in the area of the Proposed Project. Many negative effects from these fiber-optic lines were avoided where the fiber-optic line was constructed in areas of previous surface disturbance (e.g., within the highway prism).

The completed portions of UDOT's Southern Corridor (Parkway) added to the effects on cultural resources in the area. These effects included the data recovery (e.g., archaeological excavation) efforts that were conducted prior to destruction of habitation sites, some of which contained human remains. The completion of the Sand Hollow Regional Pipeline Project resulted in damage to one historic property. Depending on which alternative is selected for the Northern Corridor Highway, approximately two to seven historic properties may be damaged or destroyed.

Land-use planning and water-use projects that do not authorize ground-disturbance and contain provisions to protect and manage cultural resources such as the BIA and BLM - St. George Wastewater Reuse Project do not add to the cumulative effects of the Proposed Project.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to cultural resources in combination with other past, present, and reasonably foreseeable future actions.

5.5.16.3 Highway Alternative

The cumulative effects for this alternative are similar to those described for the Southern Alternative, except for impacts from the Jackson Flat Reservoir. Effects on cultural resources occurred with the construction of the Jackson Flat Reservoir. Completed in 2013, the Jackson Flat Reservoir is a 4,228-acre-foot reservoir that stores non-potable water. This reservoir is located just south of Kanab and just east of Kanab municipal airport in Kane County, Utah. Prior to construction of the reservoir, a series of archaeological excavations were conducted to mitigate the effects on cultural resources. At the Jackson Flat project area, numerous cultural resource sites, including prehistoric (e.g., subsurface pit houses) and historic site types, were negatively affected. A large number of Native American human remains were located during these archaeological excavations. The previous construction of this reservoir and the authorization of the Proposed Project would increase the overall effects on cultural resources in the area of the Proposed Project. These effects include the destruction of cultural resource sites that may contain Native American human remains and important archaeological information.

5.5.17 Ethnographic Resources

5.5.17.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to ethnographic resources expected from past, present, and reasonably foreseeable future actions because it would not be constructed. However, other past, present, and reasonably foreseeable future actions would contribute to cumulative effects on ethnographic resources. These actions may remove prehistoric sites deemed TCPs by Tribes. In addition, every ground-disturbing project removes (at least in the short term) traditional native plants and habitat for wild animals.

5.5.17.2 Southern Alternative

From the tribal perspective, cumulative effects began with the influx of Spanish and Euro-American settlers and continue to this day. Disease, warfare, and reservation life have reduced the tribes to a shadow of their former selves, both in population and knowledge of the past. However, the tribal communities are resilient and continue to balance new disruptions and maintain the essence of their identity. Because community identity is a living entity, it shifts over time and due to circumstance.

The Proposed Project is just one of myriads of other projects in southern Utah and northern Arizona. Each project may remove a few prehistoric sites, as does private development. Each of these sites have been deemed TCPs by the tribes. Therefore, every project potentially contributes to cumulative effects. In addition, every ground-disturbing project removes traditional native plants and habitat for wild animals.

The Southern Alternative, in particular, has more cumulative long-term adverse effects than the Highway Alternative due to its crossing of the Kanab Creek TCD. This will have a greater adverse cumulative effect on tribal identity than most projects due to the sensitivity of the area, and the potential for future projects to be placed in the same alignment. While no additional projects are known, amending the RMPA to allow for future projects jeopardizes tribal sacred sites and will impair community identity.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to ethnographic resources in combination with other past, present, and reasonably foreseeable future actions.

5.5.17.3 Highway Alternative

The Highway Alternative would contribute less to the adverse, long-term cumulative impacts associated with Tribal identity than the Southern Alternative, though the historical impacts from past projects described for the Southern Alternative are the same. This alternative does not cross the Kanab Creek TCD, so it has less of a cumulative impact on the Kaibab Band of Paiute Indians. While there are important sites and ethnographic resources along this route, those are comparatively less important than the Kanab Creek TCD. Further, this route protects the Kanab Creek TCD from future impacts by not setting a precedent of crossing this important area.

Overall, construction and operation of the Highway Alternative would contribute to the overall cumulative effects to ethnographic resources in combination with other past, present, and reasonably foreseeable future actions.

5.5.18 Indian Trust Assets

5.5.18.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to ITAs expected from past, present, and RFFAs because it would not be constructed. Some of these other actions have resulted in adverse effects on ITAs, including adverse effects on fishing and hunting rights, adverse visual effects on reservation lands, adverse short-term construction noise on reservation lands, and adverse effects on traditional plant resources.

5.5.18.2 Southern Alternative

Based on the proposed ROW, the Southern Alternative will have no effect on ITAs, and thus will not contribute any additional cumulative effects to ITAs.

5.5.18.3 Highway Alternative

The Highway Alternative would interfere with the use, value, occupancy, character, and enjoyment through adverse effects on fish and wildlife where fishing and hunting rights exist. The Highway Alternative would also have short-term visual effects on the reservation. The pipeline construction would create a visual corridor devoid of vegetation during construction. Once construction is completed, however, the pipeline corridor would be restored and revegetated, so visual contrasts would disappear over time. In addition, the LPP corridor would become substantially unnoticeable over time because it would be parallel to an existing paved highway where disturbance has already occurred. Construction noises would have a temporary effect on the enjoyment of the reservation. Permits to maintain the pipeline would encumber the reservation for decades along the proposed LPP ROW. The Highway Alternative would also impair resource use on the reservation during construction. Traditional plant resources within the construction corridor would be disturbed, and revegetation efforts could take years to achieve full growth. Some of the other past, present, and reasonably foreseeable future actions described in the section above for the No Action Alternative have contributed to adverse effects on ITAs that will combine with the adverse effects from the Proposed Project to create a greater cumulative effect on ITAs.

Overall, construction and operation of the Highway Alternative would contribute to the overall cumulative effects to ITAs when combined with other past, present, and reasonably foreseeable future actions.

5.5.19 Socioeconomics

5.5.19.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to the cumulative effects to socioeconomics expected from past, present, and RFFAs, as it would not be constructed. Those effects would primarily be from the construction activities from those actions. If those actions (or other trends) lead to substantial additional population growth in the region, under the No Action Alternative, the Proposed Project would not contribute to the beneficial effect of meeting water needs, which could be at least partially met if other water supply projects are implemented.

5.5.19.2 Southern Alternative

The Southern Alternative would contribute to cumulative effects to regional socioeconomics, if the construction period coincided with the construction period of other reasonably foreseeable actions. Those effects would be temporary and beneficial from construction employment and associated expenditures.

Overall, construction and operation of the Southern Alternative would contribute to the overall cumulative effects to socioeconomics in combination with other past, present, and reasonably foreseeable future actions.

5.5.19.3 Highway Alternative

Cumulative effects for the Highway Alternative would be similar to those described for the Southern Alternative.

5.5.20 Environmental Justice

5.5.20.1 No Action Alternative

Under the No Action Alternative, the Proposed Project would not contribute to cumulative effects to EJ populations expected from past, present, and reasonably foreseeable future actions because it would not be constructed. With the No Action Alternative, cumulative effects on EJ populations that have resulted from several of the past and present projects listed in Appendix C-25, Cumulative Effects, would continue to occur. Several of the reasonably foreseeable future actions would likely contribute to adverse, disproportionate effects on EJ populations. These effects are primarily the result of construction projects that have caused permanent damage to locations that are culturally significant to local tribal groups or that consist of other adverse social effects, adverse visual effects, and lower property values. However, because the Proposed Project would not be implemented under the No Action Alternative, it would not make any additional contribution to the adverse cumulative effects on EJ caused by these other projects.

5.5.20.2 Southern Alternative

The Southern Alternative would contribute to cumulative effects on EJ populations from past, present, and reasonably foreseeable future actions. Construction and operation of the Proposed Project under the Southern Alternative would cause noise impacts and other damage to locations that are culturally significant to local tribal groups, and would cause visual effects and potentially lead to lower property values in some locations that may disproportionately affect EJ populations. Construction and operation of some of the other past, present and reasonably foreseeable actions have or will cause permanent damage to locations that are culturally significant to local tribal groups, contribute to visual effects, and lower property values that have or may have disproportionate effects on EJ populations.

Overall, construction and operation of the Southern Alternative would contribute to the overall disproportionate cumulative effects to EJ populations in combination with other past, present, and reasonably foreseeable future actions.

5.5.20.3 Highway Alternative

Cumulative effects for the Highway Alternative would be similar as those described for the Southern Alternative, except that under this alternative the disproportionate adverse effects on culturally significant natural landscape features of the Tribe would be less given the location of the pipeline route under this alternative.

Overall, construction and operation of the Highway Alternative would contribute to the overall disproportionate cumulative effects to EJ populations in combination with other past, present, and reasonably foreseeable future actions, but to a lesser degree than for the Southern Alternative.

5.6 Summary of Cumulative Effects by Alternative

5.6.1 No Action Alternative

The Proposed Project would not be constructed in this alternative and, therefore, there would be no additional contribution from the Proposed Project to cumulative effects for any resource. However, other past, present, and reasonably foreseeable future actions would contribute to effects for nearly all resources, with the level of effects varying by resource.

5.6.2 Action Alternatives

For nearly all resources, the total cumulative effect from constructing and operating the Southern and Highway Alternatives would be similar. Table 5.6-1 summarizes the cumulative effects for the Southern and Highway Alternatives.

Table 5.6-1 Summary of Cumulative Effects by Alternative

Resource	Southern Alternative	Highway Alternative
Geology and Soils	Would contribute to cumulative effects	Similar cumulative effect
Noise and Vibration	Would contribute to cumulative effects	Similar cumulative effect
Land Use	Would contribute to cumulative effects	Similar cumulative effect
Special Designations	Would contribute to cumulative effects	Would contribute to cumulative effects, without contributing effect to the ACEC
Recreation	Would contribute to cumulative effects	Similar cumulative effect
Hydrology	Would contribute to cumulative effects	Same cumulative effect
Water Quality	Would contribute to cumulative effects	Similar cumulative effect
Aquatic Invasive Species	Would contribute to cumulative effects	Same cumulative effect
Vegetation Communities	Would contribute to cumulative effects	Similar cumulative effect
Wetland and Riparian	Would contribute to cumulative effects	Similar cumulative effect
Special Status Plants	Would contribute to cumulative effects	Similar cumulative effect
Sensitive Species - Fish and Wildlife	Would contribute to cumulative effect, with contribution slightly greater along the Southern Alternative because habitat values along the Highway Alternative are already degraded due to the presence of Highways 89 and 389 in Utah and Arizona	Would contribute to cumulative effects
Threatened and Endangered Species	Would contribute to cumulative effects	Similar cumulative effect
Visual Resources	Would contribute to cumulative effects	Similar cumulative effect; with additional contribution when combined with the effects of the Jackson Flat Reservoir project
Cultural Resources	Would contribute to cumulative effects	Similar cumulative effect
Ethnographic Resources	Greater contribution to cumulative effects due to crossing of the Kanab Creek TCD	Would contribute to cumulative effects
Indian Trust Assets	Would not contribute any additional cumulative effects to ITAs	Would contribute to cumulative effects
Socioeconomics	Would contribute to cumulative effects	Similar cumulative effect
Environmental Justice	Would contribute to cumulative effects	Would contribute to cumulative effects, though with lesser impacts to the Tribe

Key:

ACEC = Kanab Creek Area of Critical Environmental Concern

ITA = Indian Trust Asset

TCD = traditional cultural district

Tribe = Kaibab Band of Paiute Indians

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7 Acronyms

°C	degrees Celsius
°F	degrees Fahrenheit
AAC	Arizona Administrative Code
AADT	Average Annual Daily Traffic
ACEC	Kanab Creek Area of Critical Environmental Concern
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey (ACS)
ADOT	Arizona Department of Transportation
AIS	aquatic invasive species
APE	Area of Potential Effect
APLIC	Avian Power Line Interaction Committee
ASDL	Arizona State Development Land
ATP	ability to pay
ATV	all-terrain vehicle
AZ	Arizona
AZGFD	Arizona Game and Fish Department
AZ-SGCN	Arizona Species of Greatest Conservation Need
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BLM-AZ	Bureau of Land Management - Arizona
BLM-UT	Bureau of Land Management - Utah
BPS	booster pump station
CA	Conservation Agreement
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cfs	cubic feet per second
Council	National Invasive Species Council
CRC	Colorado River Compact of 1922
CRSP	Colorado River Storage Project
CRSS	Colorado River Simulation System
CWA	Clean Water Act
dBA	A-weighted decibels
DCP	Drought Contingency Plan
DEIS	Draft Environmental Impact Statement
DNF	Direct Natural Flow
DO	Director's Order
E.O.	Executive Order
EIS	Environmental Impact Statement
EJ	environmental justice
EMF	electric and magnetic fields
EPA	U.S. Environmental Protection Agency
EPM	environmental protection measures
ESA	Endangered Species Act

ETS	electrical transmission system
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHWA	Federal Highway Administration
FLPMA	Federal Land Policy and Management Act
FR	Federal Register
ft	feet or foot
GCNRA	Glen Canyon National Recreation Area
HPTP	Historic Property Treatment Plans
HS	hydrostation
HWY	Highway
IDC	interest during construction
IMPLAN	Economic Impact Analysis for Planning (modeling software)
Interim Guidelines	2007 Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lakes Powell and Mead
Interior	U.S. Department of Interior
IPaC	Information from Planning and Conservation
ITA	Indian Trust Asset
kaf	thousand acre feet
KCWCD	Kane County Water Conservancy District
KEPA	Kanab Escalante Planning Area
KFO	Kanab Field Office
KIR	Kaibab Indian Reservation
KOP	key observation point
kV	kilovolts
LOS	level of service
LPP	Lake Powell Pipeline (Proposed Project)
LROC	Long-Range Operating Criteria
M&I	municipal and industrial
maf	million acre feet
MLFF	modified low fluctuating flows
mm	millimeter
n	sample size
N/A	not applicable
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NHPA	National Historic Preservation Act
NHRP	National Register of Historic Places
NOI	Notice of Intent
NPS	National Park Service
NRCS	Natural Resources Conservation Service
O&M	operation and maintenance
OHV	off-highway vehicle
OM&R	operation, maintenance and replacement
ORV	off-road vehicle
Outgrants	permits, leases, and easements

POD	Plan of Development
Reclamation	Bureau of Reclamation
RFFAs	reasonably foreseeable future actions
RMP	Arizona Strip Field Office Resource Management Plan
RMPA	Arizona Strip Field Office Resource Management Plan Amendment
RO	reverse osmosis
ROD	Record of Decision
ROW	Right-of-way
RRU	Recreation and Resource Utilization Zone
RV	recreational vehicle
SGFO	St. George Field Office
SHPO	State Historic Preservation Office
SHSP	Sand Hollow State Park
SITLA	Utah School and Institutional Trust Lands Administration
SPAC	Southern Paiute Advisory Committee
SR	State Route
SRMA	Special Recreation Management Area
TCD	traditional cultural district
TCP	traditional cultural property
TH	trailhead
THPO	Tribal Historic Preservation Office
Tribe or Tribal	Kaibab Band of Paiute Indians (or pertaining to)
UBWR	Utah Board of Water Resources and/or Project Proponent
UDOT	Utah Department of Transportation
UDWRe	Utah Division of Water Resources
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USFWS-BGEPA	United States Fish and Wildlife Service - Bald and Golden Eagle Protection Act
USGS	U.S. Geological Survey
UT	Utah
UT-SGCN	Utah Species of Greatest Conservation Need
UV	ultraviolet
VAU	visual assessment unit
VRDSM	Virgin River Daily Simulation Model
VRI	Visual Resource Inventory
VRM	Visual Resource Management
WCWCD	Washington County Water Conservancy District
WRA	Western Resource Advocates
WSA	Wilderness Study Area

8 List of Preparers

Table 8-1 identifies key staff involved in the preparation of the DEIS organized by agency.

Table 8-1 Staff Involved in DEIS Preparation by Agency

Name	Office	Project Role/Specialty
Bureau of Reclamation		
Rick Baxter	Provo Area Office	Project Lead
Jared Baxter	Provo Area Office	NEPA Lead
Peter Crookston	Provo Area Office	Interdisciplinary Team Lead
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John Mann	Provo Area Office	Water Rights
Preston Feltrop	Provo Area Office	Aquatic Invasive Species, General Fish and Wildlife
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Steve Piper	Technical Service Center	Socioeconomics
Tom Davidowicz	Provo Area Office	Vegetation, Wetland and Riparian, Special Status Plants
Zachary Nelson	Provo Area Office	Government-to-Government Lead, Ethnographic, Indian Trust Assets
Bureau of Land Management		
Shered Mullins	Utah State Office	BLM Technical Team Lead
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Allysia Angus	Grand Staircase-Escalante National Monument	Visual Resources
Christine Fletcher	Utah State Office	Section 7 Lead, Endangered Species Act, Sensitive Species
Julie Suhr Pierce	Utah State Office	Environmental Justice
Lorraine Christian	Arizona Strip Field Office	Special Designations
Nate Thomas	Utah State Office	Section 106 Lead, Cultural Resources
Bureau of Indian Affairs		
Charles (Chip) Lewis	Western Region Regional Office	BIA Technical Team Lead
U.S. Fish and Wildlife Service		
George Weekley	Utah Ecological Services Field Office	USFWS Technical Team Lead
National Park Service		
Erin Janicki	Glen Canyon Head Quarters Office	NPS Technical Team Lead
Kaibab Band of Paiute Indians		
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Table 8-1 Staff Involved in DEIS Preparation by Agency (continued)

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Leslie Kirchler-Owen	Chicago Office	E & E Project Manager, Transportation
Erin Lynch	Portland Office	Water Quality
Jon McClurg	Boulder Office	E & E Project Director
Bryan McHenry	Chicago Office	Cumulative Effects
Zachary Michalk	Salt Lake City Office	Transportation
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Galileo Project, LLC		
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Jennifer Lanthier	Tempe Office	PMAC Project Deputy
Stantec		
Joshua Cowden	Colorado Office	GIS Lead

Key:

BIA = Bureau of Indian Affairs

BLM = Bureau of Land Management

GIS = Geographic Information System

NEPA = National Environmental Policy Act of 1969

NPS = National Park Service

PMAC = Project Management Assistance Contractor

USFWS = U.S. Fish and Wildlife Service

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