Lake Powell Pipeline Project

Final Study Report 21
Wildlife Resources

April 2016

Table of Contents

WILDLIFE RESOURCES STUDY REPORT EXECUTIVE SUMMARY 1
ES.1 Introduction 1
ES.2 Methodology 1
ES.3 Key Results of the Wildlife Resources Impact Analyses 1
ES.3.1 LPP Project Alternatives 1
ES.3.2 No Lake Powell Water Alternative 2
ES.3.3 No Action Alternative 2

CHAPTER 1 INTRODUCTION 1-1
1.1 Introduction 1-1
1.2 Summary Description of LPP Project Alignment Alternatives 1-1
1.2.1 South Alternative 1-1
1.2.2 Existing Highway Alternative 1-8
1.2.3 Southeast Corner Alternative 1-8
1.2.4 Transmission Line Alignments 1-10
1.2.5 Natural Gas Pipeline and Generators Alternative 1-13
1.2.5.1 Natural Gas Transmission Line Connection 1-15
1.2.5.2 Natural Gas Supply Line 1-15
1.2.5.3 Natural Gas Generators 1-15
1.3 Summary Description of No Lake Powell Water Alternative 1-18
1.3.1 WCWCD No Lake Powell Water Alternative 1-19
1.3.1.1 Background 1-19
1.3.1.2 WCWCD No Lake Powell Water Alternative Features 1-19
1.3.2 KCWCD No Lake Powell Water Alternative 1-23
1.4 Summary Description of the No Action Alternative 1-23
1.4.1 WCWCD No Action Alternative 1-23
1.4.2 KCWCD No Action Alternative 1-23
1.5 Identified Issues 1-24
1.6 Impact Topics 1-24

CHAPTER 2 METHODOLOGY 2-1
2.1 Introduction 2-1
2.2 Data Used 2-1
2.3 Assumptions 2-1
2.4 Impact Analysis Methodology 2-2

Table of Contents

2.4.1 Wildlife Habitat 2-2
2.4.2 Wildlife Populations 2-2

CHAPTER 3 AFFECTED ENVIRONMENT 3-1
3.1 Impact Area 3-1
3.2 Overview 3-1
3.3 Wildlife Habitat 3-1
3.3.1 Colorado Plateau Ecological Region and Vegetation Communities 3-5
3.3.1.1 Colorado Plateau Active and Stabilized Dune 3-5
3.3.1.2 Colorado Plateau Big Sagebrush Shrubland 3-7
3.3.1.3 Colorado Plateau Blackbrush-Mormon-tea Shrubland 3-7
3.3.1.4 Colorado Plateau Grassland 3-7
3.3.1.5 Colorado Plateau Greasewood Flat 3-7
3.3.1.6 Colorado Plateau Gypsum Badland 3-7
3.3.1.7 Colorado Plateau Juniper Savanna 3-8
3.3.1.8 Colorado Plateau Lower Montane Riparian Woodland Shrubland 3-8
3.3.1.9 Colorado Plateau Mixed Bedrock Canyon and Tableland 3-8
3.3.1.10 Colorado Plateau Mixed Desert Scrub 3-8
3.3.1.11 Colorado Plateau Mixed Low Sagebrush Shrubland 3-8
3.3.1.12 Colorado Plateau Pinyon-Juniper Woodland 3-8
3.3.1.13 Colorado Plateau Shrub-Steppe 3-8
3.3.1.14 Colorado Plateau Volcanic Rock and Cinder Land 3-9
3.3.1.15 Colorado Plateau Wash 3-9
3.3.2 Mojave Desert Ecological Region and Vegetation Communities 3-9
3.3.2.1 Mojave Desert Active and Stabilized Dune 3-9
3.3.2.2 Mojave Desert Bedrock Cliff and Outcrop 3-9
3.3.2.3 Mojave Desert Blackbrush-Mormon-tea Shrubland 3-9
3.3.2.4 Mojave Desert Creosotebush-White Bursage Desert Scrub 3-10
3.3.2.5 Mojave Desert Grassland 3-10
3.3.2.6 Mojave Desert Lower Montane Riparian Woodland and Shrubland 3-10
3.3.2.7 Mojave Desert Mixed Desert Scrub 3-10
3.3.2.8 Mojave Desert Shrub-Steppe 3-10
3.3.2.9 Mojave Desert Volcanic Rock and Cinder Land 3-10
3.3.2.10 Mojave Desert Wash 3-10
3.3.3 Big Game Crucial Ranges and Migration Routes 3-10

Table of Contents

3.3.3.1 Mule Deer 3-11
3.3.3.2 Desert Bighorn Sheep 3-11
3.3.3.3 Pronghorn 3-12
3.4 Wildlife Populations 3-14
3.4.1 Colorado Plateau Ecological Region Wildlife 3-14
3.4.2 Mojave Desert Ecological Region Wildlife 3-16
3.4.3 Additional Potential Species in the LPP Project Study Area 3-18
3.4.4 Wildlife Species of Cultural Concern to the Kaibab Band of Paiute Indians of Northern Arizona 3-20

CHAPTER 4 ENVIRONMENTAL CONSEQUENCES 4-1
4.1 Significance Criteria 4-1
4.2 Classification of Impacts 4-1
4.2.1 Impacts on Wildlife Habitats 4-1
4.2.2 Impacts on Wildlife Populations 4-1
4.3 South Alternative 4-2
4.3.1 Construction Phase 4-2
4.3.1.1 Wildlife Habitats 4-2
4.3.1.1.1 Colorado Plateau Ecological Region. 4-2
4.3.1.1.2 Mojave Desert Ecological Region. 4-2
4.3.1.1.3 Big Game Seasonal Ranges and Migration Routes 4-3
4.3.1.1.3.1 Mule Deer. 4-3
4.3.1.1.3.2 Desert Bighorn Sheep. 4-4
4.3.1.1.3.3 Pronghorn. 4-4
4.3.1.2 Wildlife Populations 4-4
4.3.1.2.1 Direct Impacts. 4-4
4.3.1.2.2 Indirect Impacts. 4-5
4.3.2 Operations and Maintenance Phase 4-5
4.3.2.1 Wildlife Habitats 4-5
4.3.2.1.1 General Wildlife Habitats. 4-5
4.3.2.1.2 Big Game Seasonal Ranges and Migration Routes 4-5
4.3.2.1.2.1 Mule Deer. 4-5
4.3.2.1.2.2 Desert Bighorn Sheep. 4-6
4.3.2.1.2.3 Pronghorn. 4-6
4.3.2.2 Wildlife Populations 4-6

Table of Contents

4.3.2.2.1 Direct Impacts. 4-6
4.3.2.2.2 Indirect Impacts. 4-6
4.4 Existing Highway Pipeline Alternative 4-6
4.4.1 Construction Phase 4-6
4.4.1.1 Wildlife Habitats 4-6
4.4.1.1.1 Colorado Plateau Ecological Region. 4-6
4.4.1.1.2 Mojave Desert Ecological Region. 4-7
4.4.1.1.3 Big Game Seasonal Ranges and Migration Routes 4-7
4.4.1.1.3.1 Mule Deer. 4-7
4.4.1.1.3.2 Desert Bighorn Sheep. 4-7
4.4.1.1.3.3 Pronghorn. 4-7
4.4.1.2 Wildlife Populations 4-7
4.4.1.2.1 Direct Impacts. 4-7
4.4.1.2.2 Indirect Impacts. 4-7
4.4.2 Operations and Maintenance Phase 4-7
4.4.2.1 Wildlife Habitats 4-7
4.4.2.1.1 General Wildlife Habitats. 4-7
4.4.2.1.2 Big Game Seasonal Ranges and Migration Routes 4-7
4.4.2.2 Wildlife Populations 4-7
4.4.2.2.1 Direct Impacts. 4-7
4.4.2.2.2 Indirect Impacts. 4-7
4.5 Southeast Corner Pipeline Alternative 4-8
4.5.1 Construction Phase 4-8
4.5.1.1 Wildlife Habitats 4-8
4.5.1.1.1 Colorado Plateau Ecological Region. 4-8
4.5.1.1.2 Mojave Desert Ecological Region. 4-8
4.5.1.1.3 Big Game Seasonal Ranges and Migration Routes 4-8
4.5.1.2 Wildlife Populations 4-8
4.5.1.2.1 Direct Impacts. 4-8
4.5.1.2.2 Indirect Impacts. 4-8
4.5.2 Operations and Maintenance Phase 4-8
4.5.2.1 Wildlife Habitats 4-8
4.5.2.1.1 General Wildlife Habitats. 4-8
4.5.2.1.2 Big Game Seasonal Ranges and Migration Routes 4-8
4.5.2.2 Wildlife Populations 4-9

Table of Contents

4.5.2.2.1 Direct Impacts. 4-9
4.5.2.2.2 Indirect Impacts. 4-9
4.6 Transmission Line Alignments 4-9
4.6.1 Construction Phase 4-9
4.6.1.1 Wildlife Habitats 4-9
4.6.1.1.1 Colorado Plateau Ecological Region. 4-9
4.6.1.1.2 Mojave Desert Ecological Region. 4-10
4.6.1.1.3 Big Game Seasonal Ranges and Migration Routes 4-11
4.6.1.1.3.1 Mule Deer. 4-11
4.6.1.1.3.2 Desert Bighorn Sheep. 4-11
4.6.1.1.3.3 Pronghorn. 4-11
4.6.1.2 Wildlife Populations 4-11
4.6.1.2.1 Direct Impacts. 4-11
4.6.1.2.2 Indirect Impacts. 4-11
4.6.2 Operations and Maintenance Phase 4-12
4.6.2.1 Wildlife Habitats 4-12
4.6.2.1.1 General Wildlife Habitats. 4-12
4.6.2.1.2 Big Game Seasonal Ranges and Migration Routes 4-12
4.6.2.2 Wildlife Populations 4-12
4.6.2.2.1 Direct Impacts. 4-12
4.6.2.2.2 Indirect Impacts. 4-12
4.7 Natural Gas Pipeline and Generators Alternative 4-12
4.8 No Lake Powell Water Alternative 4-13
4.8.1 Construction Phase 4-13
4.8.1.1 Wildlife Habitats 4-13
4.8.1.1.1 Colorado Plateau Ecological Region. 4-13
4.8.1.1.2 Mojave Desert Ecological Region. 4-13
4.8.1.2 Wildlife Populations 4-13
4.8.1.2.1 Direct Impacts. 4-13
4.8.1.2.2 Indirect Impacts. 4-13
4.8.2 Operations and Maintenance Phase 4-13
4.8.2.1 Wildlife Habitats 4-13
4.8.2.1.1 General Wildlife Habitats. 4-13
4.8.2.1.2 Big Game Seasonal Ranges and Migration Routes 4-13
4.8.2.2 Wildlife Populations 4-14

Table of Contents

4.8.2.2.1 Direct Impacts. 4-14
4.8.2.2.2 Indirect Impacts. 4-14
4.9 No Action Alternative 4-14

CHAPTER 5 MITIGATION AND MONITORING 5-1
5.1 Wildlife Mitigation Measures 5-1
5.2 South Alternative 5-2
5.2.1 Construction 5-2
5.2.2 Operation and Maintenance 5-2
5.3 Existing Highway Alternative 5-2
5.3.1 Construction 5-2
5.3.2 Operation and Maintenance 5-3
5.4 Southeast Corner Alternative 5-3
5.4.1 Construction 5-3
5.4.2 Operation and Maintenance 5-3
5.5 Transmission Line Alignments 5-3
5.5.1 Construction 5-3
5.5.2 Operation and Maintenance 5-3
5.6 Natural Gas Pipeline and Generators Alternative 5-3
5.6.1 Construction 5-3
5.6.2 Operation and Maintenance 5-3
5.7 No Lake Powell Water Alternative 5-3
5.7.1 Construction 5-3
5.7.2 Operation and Maintenance 5-4
5.8 No Action Alternative 5-4

CHAPTER 6 UNAVOIDABLE ADVERSE IMPACTS 6-1
6.1 South Alternative 6-1
6.1.1 Construction Phase 6-1
6.1.1.1 Wildlife Habitats 6-1
6.1.1.2 Big Game Seasonal Ranges and Migration Routes 6-1
6.1.1.2.1 Mule Deer. 6-1
6.1.1.2.2 Pronghorn. 6-1
6.1.1.3 Wildlife Populations 6-1
6.1.1.3.1 Direct Impacts. 6-1

Table of Contents

6.2 Existing Highway Alternative 6-1
6.2.1 Construction Phase 6-1
6.2.1.1 Wildlife Habitats 6-1
6.2.1.2 Big Game Seasonal Ranges and Migration Routes 6-2
6.2.1.2.1 Mule Deer. 6-2
6.2.1.3 Wildlife Populations 6-2
6.3 Southeast Corner Pipeline Alternative 6-2
6.3.1 Construction Phase 6-2
6.3.1.1 Wildlife Habitats 6-2
6.3.1.2 Big Game Seasonal Ranges and Migration Routes 6-2
6.4 Transmission Line Alignments 6-2
6.4.1 Construction Phase 6-2
6.4.1.1 Wildlife Habitats 6-2
6.4.1.2 Big Game Seasonal Ranges and Migration Routes 6-2
6.4.1.2.1 Mule Deer. 6-2
6.4.1.2.2 Desert Bighorn Sheep. 6-2
6.4.1.2.3 Pronghorn. 6-3
6.4.1.3 Wildlife Populations 6-3
6.5 Natural Gas Pipeline and Generators Alternative 6-3
6.6 No Lake Powell Water Alternative 6-3
6.6.1 Construction Phase 6-3
6.6.1.1 Wildlife Habitats 6-3
6.6.1.2 Big Game Seasonal Ranges and Migration Routes 6-3
6.6.1.3 Wildlife Populations 6-3
6.7 No Action Alternative 6-3

CHAPTER 7 CUMULATIVE IMPACTS 7-1
7.1 South Alternative 7-1
7.2 Existing Highway Alternative 7-1
7.3 Southeast Corner Alternative 7-2
7.4 Transmission Line Alternatives 7-2
7.5 Natural Gas Pipeline and Generators Alternative 7-2
7.6 No Lake Powell Water Alternative 7-2
7.7 No Action Alternative 7-2

Table of Contents

References Cited.....R-1
Abbreviations and Acronyms.....A&A-1
List of Preparers.....LP-1

Appendix A - Noise Buffer Zone Maps
Appendix B - Draft Wildlife Resources Mitigation Plan

Table of Contents

Tables

Table ES-1 Permanent Habitat Disturbance from the LPP Project Alternative Alignments (Acres).....ES-1
Table 1-1 Water Conveyance System Natural Gas Generator Annual Fuel Consumption 1-20
Table 1-2 Available Supplies and Projected Demands Under the No Lake Powell Water and Lake Powell Pipeline Project Alternatives..... 1-23
Table 3-1 Vegetation Communities in the LPP Project Study Area 3-4
Table 3-2 Wildlife Observed in the Colorado Plateau Ecological Region 3-14
Table 3-3 Wildlife Observed in the Mojave Desert Ecological Region 3-17
Table 3-4 Additional Potential Wildlife Species in the LPP Project Study Area 3-19
Table 3-5 Wildlife Species of Cultural Concern to the Kaibab Band of Paiute Indians of Northern Arizona..... 3-21
Table 4-1 Colorado Plateau Habitat Disturbance from the South Alternative and Transmission Line Alternatives..... 4-2
Table 4-2 Mojave Desert Habitat Disturbance from the South Alternative and Transmission Line Alternatives 4-3
Table 4-3 Colorado Plateau Habitat Disturbance from the Existing Highway Alternative..... 4-6
Table 4-4 Colorado Plateau Ecological Region Permanent Aerial Transmission Line Habitat Disturbance (Acres) 4-10
Table 4-5 Mojave Desert Ecological Region Permanent Aerial Transmission Line Habitat Disturbance (Acres) 4-10

Figures

Figure 1-1 Lake Powell Pipeline Proposed Project and Alternative Features 1-2
Figure 1-2 Lake Powell Pipeline Intake and Water Conveyance System..... 1-4
Figure 1-3 Pipeline and Penstock Right-of-Way 1-5
Figure 1-4 Lake Powell Pipeline Hydro System South Alternative..... 1-6
Figure 1-5 Lake Powell Pipeline Hydro System Existing Highway Alternative 1-8
Figure 1-6 Lake Powell Pipeline Hydro System Southeast Corner Alternative 1-10
Figure 1-7 Lake Powell Pipeline Transmission Line Alternatives East..... 1-11
Figure 1-8 Lake Powell Pipeline Transmission Line Alternatives West 1-14
Figure 1-9 Lake Powell Pipeline Natural Gas Pipeline and Generators Alternative West 1-16
Figure 1-10 Lake Powell Pipeline Natural Gas Pipeline and Generators Alternative East 1-17
Figure 1-11 Lake Powell Pipeline, No Lake Powell Water Alternative Primary Infrastructure..... 1-20
Figure 3-1 Lake Powell Pipeline Water Conveyance System Study Area 3-2
Figure 3-2 Lake Powell Pipeline Hydro System Study Area 3-3
Figure 3-3 Ecological Regions 3-6
Figure 3-4 Big Game Seasonal Range Map 3-13

Wildlife Resources Study Report
Executive Summary

ES.1 Introduction

This study report describes the results and findings of an analysis to evaluate wildlife resources impacts along the proposed alternative alignments of the Lake Powell Pipeline Project (LPP Project), the No Lake Powell Water Alternative, and the No Action Alternative. The purpose of the analysis, as defined in the 2008 Wildlife Resources and Habitats Study Plan prepared for the Federal Energy Regulatory Commission (Commission), was to identify potential impacts on wildlife resources and habitats from construction and operations of the alternatives, and identify and document measures to mitigate impacts from the LPP Project as necessary.

ES.2 Methodology

The analysis of impacts on wildlife resources follows methodology identified and described in the Preliminary Application Document, Scoping Document No. 1 and the Wildlife Resources and Habitats Study Plan filed with the Commission.

ES.3 Key Results of the Wildlife Resources Impact Analyses

Significant impacts on wildlife and habitats were defined as substantial disturbances to wildlife habitat or populations that destroy a large area of utilized habitat, disturb or displace a resident population or sub-population, or result in losses of a large number of individuals of the species within the LPP Project study area. Significant impacts would also result from a substantial loss, temporary or permanent, or unavailability of big game critical seasonal range or migration corridors during critical use periods as designated by game management agencies.

ES.3.1 LPP Project Alternatives

Total permanent habitat disturbance from the alternative alignments of the LPP Project are shown in Table ES-1. Because most of the permanent disturbance would occur in habitat already degraded or altered by road or transmission line rights-of-way, grazing or other human activity, it was determined that the disturbance to habitat would not meet the significance criteria.

Table ES-1
Permanent Habitat Disturbance from the LPP Project Alternative Alignments (Acres)

Alternative Alignment	Acres of Permanent Wildlife Habitat Impacts
South	1,619
Existing Highway	1,469
Southeastern Corner	1,611
Transmission Lines	122

Direct permanent disturbance and indirect temporary noise disturbance to wildlife within big game crucial ranges were analyzed for three species: mule deer, pronghorn and desert bighorn sheep. There would be minor permanent noise disturbance to each species, occurring mostly in areas already impacted by infrastructure or in areas with extensive equivalent habitat adjacent to the study area. Temporary noise disturbance (construction noise) would not occur in critical or high value range and could be mitigated by scheduling work outside of critical seasonal use or migration. It was determined that impacts on wildlife use of big game critical seasonal range or migration routes from the alternative alignments of the LPP Project would not be significant.

Wildlife populations would not be significantly impacted by the alternative alignments of the LPP Project. No species or population would be placed at risk and impacts would not exceed the significance criteria.

ES.3.2 No Lake Powell Water Alternative

The No Lake Powell Water Alternative would permanently disturb approximately 3,500 acres of Mojave Desert Region vegetation communities and associated wildlife habitat. The No Lake Powell Water Alternative would have no significant impacts on wildlife habitat and populations.

ES.3.3 No Action Alternative

The No Action Alternative would have no impacts on wildlife habitat and population.

Chapter 1
Introduction

1.1 Introduction

This chapter presents a summary description of the Lake Powell Pipeline (LPP) Project alignment alternatives, the No Lake Powell Water Alternative, and the No Action Alternative. It introduces the area studied for environmental resources. It provides an overview of the proposed LPP Project, including each alignment alternative and locator maps.

The LPP Project would deliver Utah's Colorado River water from Lake Powell to the service areas of Washington County Water Conservancy District (WCWCD) and Kane County Water Conservancy District (KCWCD). The LPP Project action alternatives studied include various pipeline and penstock system configurations. Each action alternative would deliver 86,249 acre-feet of municipal and industrial (M&I) use water to the following southwest Utah water conservancy district service areas:

- WCWCD would receive 82,249 acre-feet annually.
- KCWCD would receive up to 4,000 acre-feet annually.

One of the LPP systems previously studied included a conveyance system for the Central Iron County Water Conservancy District (CICWCD), which would have delivered approximately 13,249 acre-feet annually to the Cedar Valley area. The various alternatives were under study when the CICWCD decided to withdraw from the LPP Project, and this conveyance system is no longer being considered.

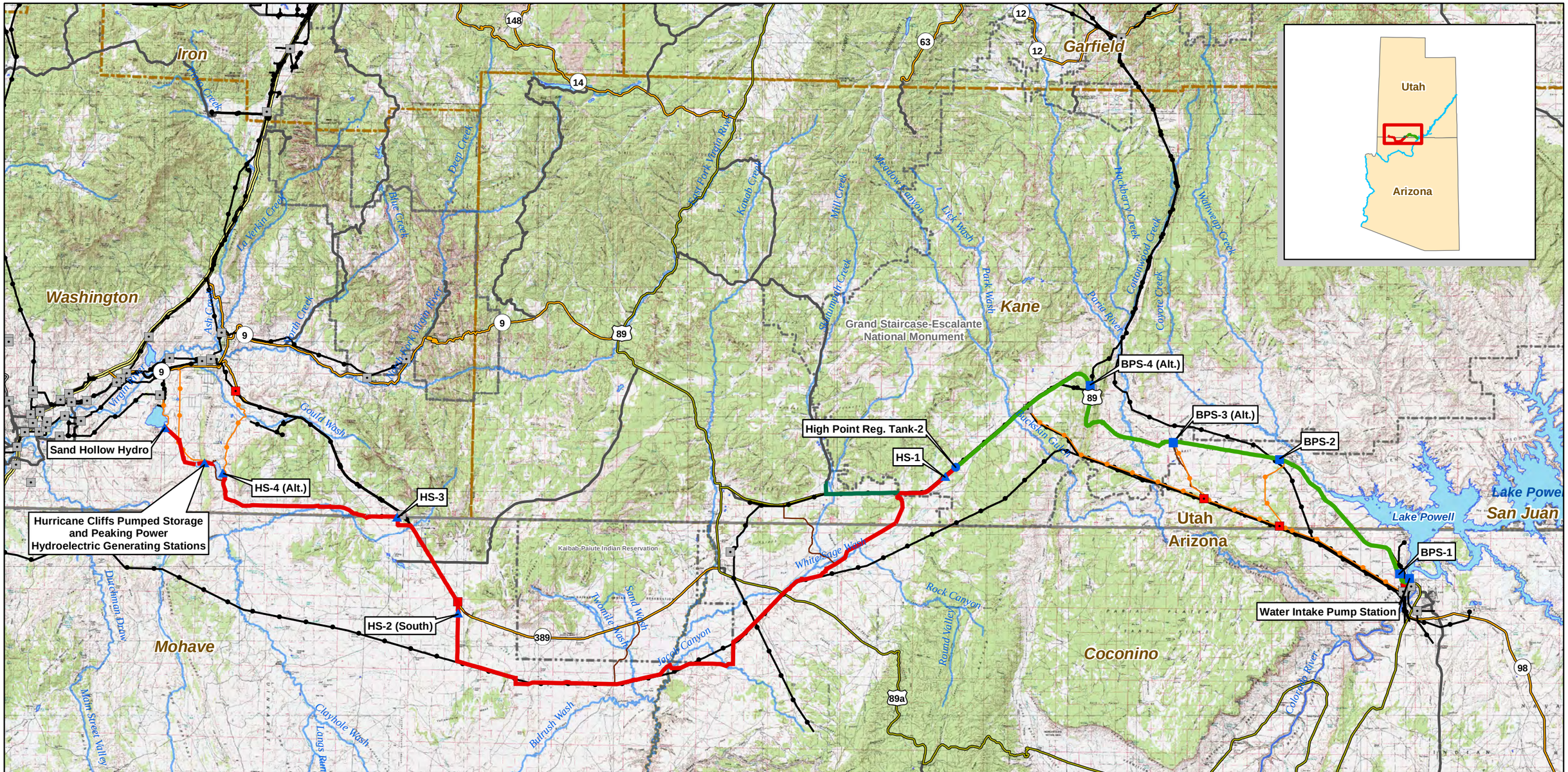
1.2 Summary Description of LPP Project Alignment Alternatives

Three primary pipeline and penstock alignment alternatives are described in this section, along with the electrical power transmission line alignments for providing power to the pump stations and a natural gas supply line alignment alternative. The pipeline and penstock alignment alternatives share common segments between the intake at Lake Powell and delivery at Sand Hollow Reservoir, and they differ spatially in, through and around Kaibab-Paiute Indian Reservation.

The South Alternative (Proposed Action) extends south around Kaibab-Paiute Indian Reservation. The Existing Highway Alternative follows an Arizona state highway through Kaibab-Paiute Indian Reservation. The Southeast Corner Alternative follows the Navajo-McCullough Transmission Line corridor through the southeast corner of Kaibab-Paiute Indian Reservation. The Electric Transmission Line alignments are common to all the pipeline and penstock alignment alternatives. The Natural Gas Supply Line Alignment Alternative is common to all pipeline and penstock alignment alternatives. The natural gas pipeline alignment would be coincident to the buried waterline and would not have a different alignment, as compared to transmission line alignments. Figure 1-1 shows the overall proposed project from Lake Powell near Page, Arizona to Sand Hollow Reservoir, Utah.

1.2.1 South Alternative

The South Alternative consists of four systems: **Water Intake, Water Conveyance, Hydro,** and **KCWCD** (see Figure 1-1).



Project Pump Station
Project Regulating Tank
Project Hydro Station
Substation
Proposed Substation

Water Conveyance System
Hydro System - South Alternative (Penstock Segment)
KCWCD System
Project Transmission Lines
Existing Transmission Lines

Interstate
US Highway
ST Highway
Hwy
Major Road
Access Roads

Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams

National Park/Monument
GSENM-Boundary
Tribal Lands
State Boundaries
County Boundaries

FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472

N

0 2.5 5 10 15 20 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-1** MWH

Lake Powell Pipeline Proposed Action

The **Water Intake System** would pump Lake Powell water via submerged horizontal tunnels and vertical shafts into the LPP. The intake pump station would be constructed and operated adjacent to the west side of Lake Powell, approximately 2,000 feet northwest of Glen Canyon Dam in Coconino County, Arizona. An enclosed pump station building would house vertical turbine pumps with electric motors, electrical controls, and other equipment at a ground level elevation of 3,745 feet above mean sea level (AMSL).

The **Water Conveyance System** would convey water diverted from Lake Powell at the Intake System through a buried 69-inch diameter pipeline for about 51 miles, parallel with Highway 89 in Coconino County, Arizona and Kane County, Utah, to a buried regulating tank (High Point Regulating Tank-2) along Highway 89 at ground level elevation 5,691 feet AMSL. The pipeline would be a line of connected pipes used for carrying water over a long distance. Figure 1-2 shows the LPP Project Water Intake and Water Conveyance systems. The High Point Regulating Tank-2 would be the LPP Project topographic high point (Figure 1-2). The pipeline would be sited within a utility corridor established by Congress in 1998 that extends 500 feet south and 240 feet north of the Highway 89 centerline on public land administered by Bureau of Land Management (BLM) (U.S. Congress 1998). Figure 1-3 shows the typical 100-foot-wide right-of-way and 20-foot-wide temporary construction easement for the water conveyance system pipeline, adjacent to and away from the highway.

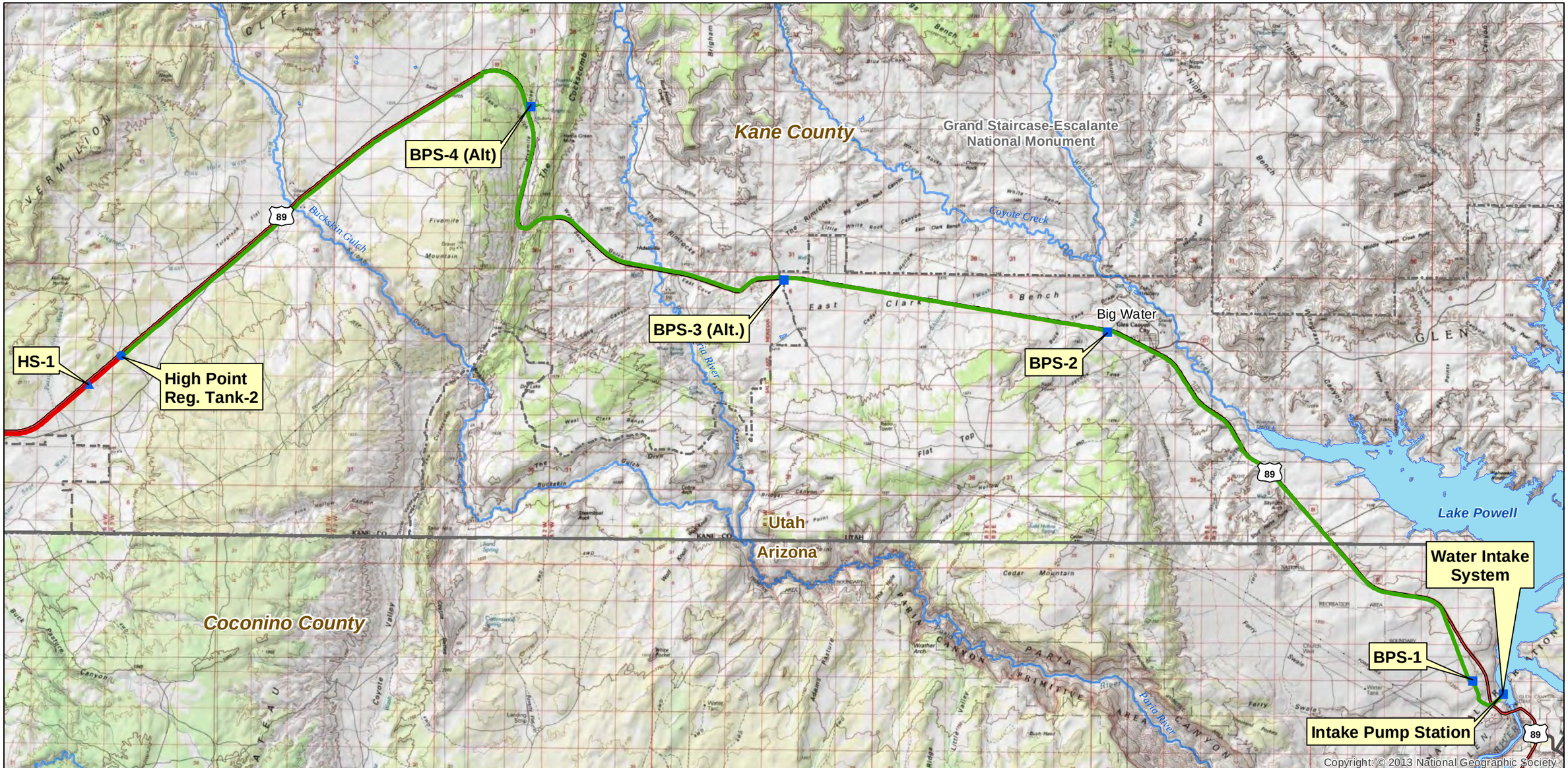
Four booster pump stations (BPS) along the pipeline would pump water to the high point regulating tank. Each BPS would house vertical turbine pumps with electric motors, electrical controls, and other equipment. Additionally, each BPS site would have a buried forebay tank, buried surge tanks, pig retrieval and launching stations, and a surface emergency overflow detention basin. BPS-1 would be located within Glen Canyon National Recreation Area (GCNRA) adjacent to an existing Arizona Department of Transportation maintenance facility, along a segment of abandoned highway, west of Highway 89. The BPS-1 site would cover about six acres and be surrounded by security fencing.

BPS-2 would be on land administered by Utah School and Institutional Trust Lands Administration (SITLA) near Big Water, Utah, on the south side of Highway 89. The BPS-2 site would cover about five acres and be surrounded by security fencing.

BPS-3 (Alt.) would be on land administered by BLM Kanab Field Office, near the east boundary of Grand Staircase-Escalante National Monument (GSENM) on the south side of Highway 89, within the Congressionally-designated utility corridor. The BPS-3 (Alt.) site would cover about five acres and be surrounded by security fencing.

BPS-4 (Alt.) would be located on private land east of Highway 89 and west of the Cockscomb geologic feature (Figure 1-2). The BPS-4 (Alt.) site would cover about six acres and be surrounded by security fencing. The proposed pipeline alignment west of the Cockscomb geologic feature would be situated adjacent to the south boundary of the Congressionally-designated utility corridor.

The proposed pipeline alignment would continue parallel to Highway 89 to the buried High Point Regulating Tank-2 at 5,691 feet AMSL, which would be the topographic high point of the LPP Project (Figure 1-2). The Water Conveyance System would terminate at High Point Regulating Tank-2. The buried High Point Regulating Tank-2 would cover about four acres and be surrounded by security fencing.



- Project Pump Station
- Project Regulating Tank
- Project Hydro Station
- Water Conveyance System
- Hydro System - South Alternative (Penstock Segment)
- KCWCD System
- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road
- Lakes & Reservoirs
- Major Rivers & Streams
- National Park/Monument
- GSENM Boundary
- State Boundaries

FERC Project Number: 12966-001
BLM Serial Numbers: AZA-34941 UTU-85472

N

0 0.5 1 2 3 4 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-2** MWH

Lake Powell Pipeline Intake and Water Conveyance System

Figure 1-3 shows the typical 100-foot-wide right-of-way and 20-foot-wide temporary construction easement for the hydro system penstock adjacent to, and away from, the highway. Four in-line hydro generating stations (HS-1, HS-2 [South], HS-3, and HS-4 [Alt.]), with substations located along the penstock, would generate electricity and help control water pressure in the penstock. Each in-line hydro station would consist of a building housing the generator units, an afterbay reservoir, retention basin, pig retrieval and launching stations, switchyard, and maintenance parking area, all surrounded by perimeter security fencing.

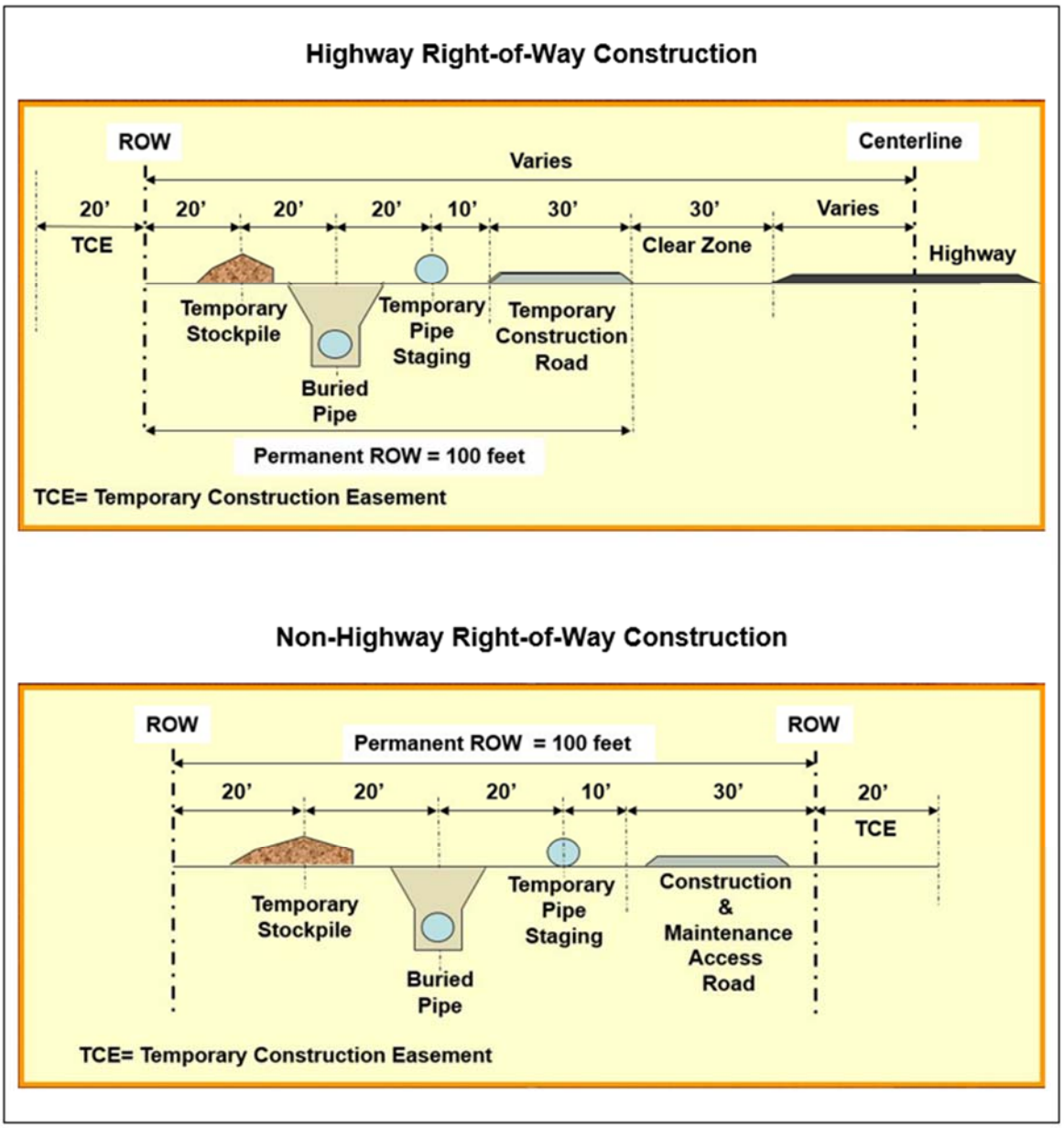


Figure 1-3
Pipeline and Penstock Right-of-Way

The **Hydro System** would convey the water from High Point Regulating Tank-2, at a topographic high point in the LPP Project with ground level elevation 5,691 feet AMSL, for about 87.5 miles through a buried 69-inch diameter penstock in Kane and Washington counties, Utah, and Coconino and Mohave counties, Arizona, to Sand Hollow Reservoir near St. George, Utah (Figure 1-4). A penstock is an enclosed pipe that delivers water to hydroelectric turbines.

A short penstock segment would convey the water to HS-1. This in-line hydro station would generate up to one megawatt (MW) of electricity at a site along Highway 89 within GSENM, and the penstock would continue west along Highway 89 to the GSENM west boundary. The HS-1 site would cover about five acres.

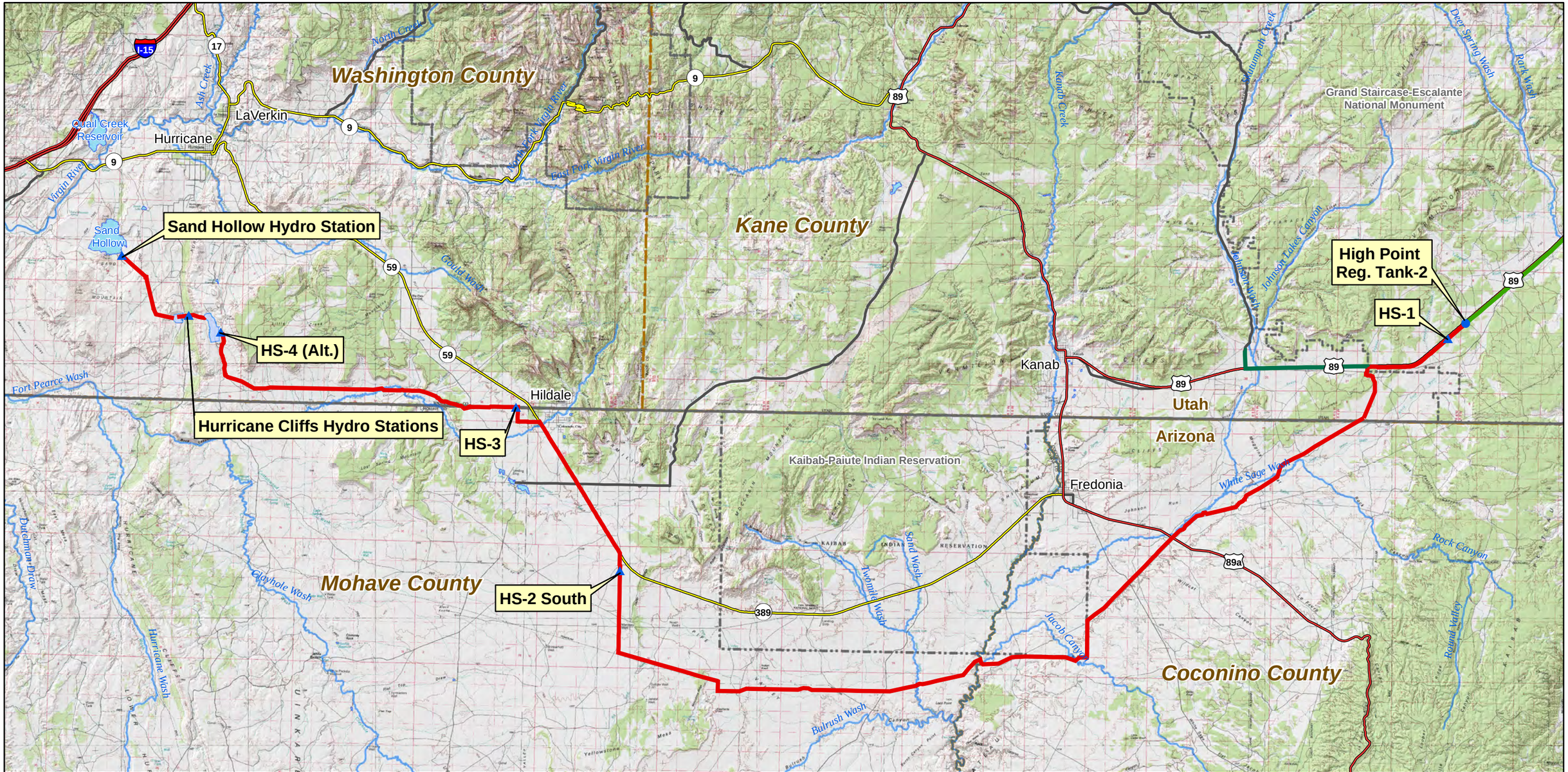
The penstock alignment would turn south from Highway 89 through private land and BLM-administered public lands into White Sage Wash. It would continue across White Sage Wash and then parallel Navajo-McCullough Transmission Line, crossing Highway 89 Alt. and Forest Highway 22 toward the southeast corner of Kaibab-Paiute Indian Reservation. The penstock alignment would run parallel to and south of the Kaibab-Paiute Indian Reservation south boundary, crossing Kanab Creek and Bitter Seeps Wash. It would continue across Moonshine Ridge and Cedar Ridge to Yellowstone Road. At this point, the penstock alignment would run north along Yellowstone Road to Arizona State Route 389 west of Kaibab-Paiute Indian Reservation. HS-2 (South) would be located west of Kaibab-Paiute Indian Reservation on private land east of Yellowstone Road. HS-2 (South) would generate up to one MW of electricity. The HS-2 (South) site would cover about five acres. The penstock alignment would continue northwest along the south side of Arizona State Route 389 past Colorado City to Hildale City, Utah, and HS-3. HS-3 would be located on private land west of Hildale City, Utah, north of and adjacent to Uzona Road. HS-3 would generate up to one MW of electricity. The HS-3 site would cover about five acres. A turnout for future delivery of 13,249 acre-feet of WCWCD's allocation of LPP Project water to Apple Valley would be located immediately west of HS-3.

The penstock alignment would follow Uzona Road west through Canaan Gap and south of Little Creek Mountain, turning north to HS-4 (Alt.) above the proposed Hurricane Cliffs forebay reservoir. HS-4 (Alt.) would be located on about three acres of public land administered by the BLM. HS-4 (Alt.) would generate up to 1.7 MW of electricity and would discharge into the forebay reservoir.

The forebay reservoir would be contained in a valley between two dams (south and north), maintaining active storage of 11,255 acre-feet of water. The forebay reservoir and two dams would cover about 500 acres of public land administered by BLM and would be surrounded by security fencing. A low-pressure tunnel would convey the water to a high-pressure vertical shaft in the bedrock forming the Hurricane Cliffs, connected to a high-pressure tunnel near the bottom of the Hurricane Cliffs. The high-pressure tunnel would connect to a penstock conveying the water to a 35-MW-capacity peaking power hydroelectric generating station and a 300-MW-capacity pumped storage hydroelectric generating station.

The Hurricane Cliffs hydroelectric generating stations and tailrace channel would cover about 50 acres of public land administered by BLM and would be surrounded by security fencing. The tailrace channel would discharge into an afterbay reservoir with 3,551 acre-feet of operating capacity, which is contained by a single dam in the valley below the Hurricane Cliffs. The afterbay reservoir and dam would cover about 200 acres of public land administered by BLM and would be surrounded by security fencing.

Water would be released from the forebay reservoir through the hydro generating system to meet peak power demands. Water would be pumped from the afterbay reservoir into the forebay reservoir during periods of off-peak power demand. The forebay and afterbay reservoirs would not be open to public access because the water levels would fluctuate rapidly during daily operations. A low pressure tunnel would convey the water northwest from the afterbay reservoir to a penstock, continuing to the Sand



Project Pump Station
Project Regulating Tank
Project Hydro Station
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs

Water Conveyance System
Hydro System - South Alternative (Penstock Segment)
KCWCD System
Major Rivers & Streams

Interstate
US Highway
ST Highway
Hwy
Major Road

National Park/Monument
GSENM Boundary
Tribal Lands
State Boundaries
County Boundaries

FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472

N

0 1 2 4 6 8 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-4** MWH

Lake Powell Pipeline Hydro System South Alternative

Hollow Hydro Station, which would generate up to 4.2 MW of electricity. The Sand Hollow Hydro Station would be located on land owned by WCWCD and cover about five acres adjacent to Sand Hollow Reservoir. The LPP Project water would discharge from the Sand Hollow Hydro Station into the existing Sand Hollow Reservoir.

The **KCWCD System** would convey water diverted from Lake Powell through the LPP at the west GSENM boundary for about eight miles through a buried 24-inch diameter pipeline in Kane County, Utah, near the mouth of Johnson Canyon. The pipeline would parallel the south side of Highway 89 across Johnson Wash and then run north for 5000 feet to the mouth of Johnson Canyon (Figure 1-4).

1.2.2 Existing Highway Alternative

The Existing Highway Alternative consists of four systems: **Water Intake, Water Conveyance, Hydro,** and **KCWCD**. The **Water Intake** and **Water Conveyance** systems would be the same as described for the South Alternative. The **Hydro System** would convey water diverted at Lake Powell from High Point Regulating Tank 2 at the LPP Project topographical high point (5,691 feet AMSL) for about 80.5 miles through a buried 69-inch diameter penstock in Kane and Washington counties, Utah, and Coconino and Mohave counties, Arizona, to Sand Hollow Reservoir near St. George, Utah (Figure 1-5). The alternative alignment parallels Highway 89 to the west and south boundary of GSENM and continues along Highway 89 to Lost Spring Gap. Four in-line hydro generating stations (HS-1, HS-2 [Hwy], HS-3, and HS-4 [Alt.]) located along the penstock would generate electricity and help control water pressure in the penstock. The HS-1, HS-3 and HS-4 (Alt.) hydro stations would be the same as described for the South Alternative.

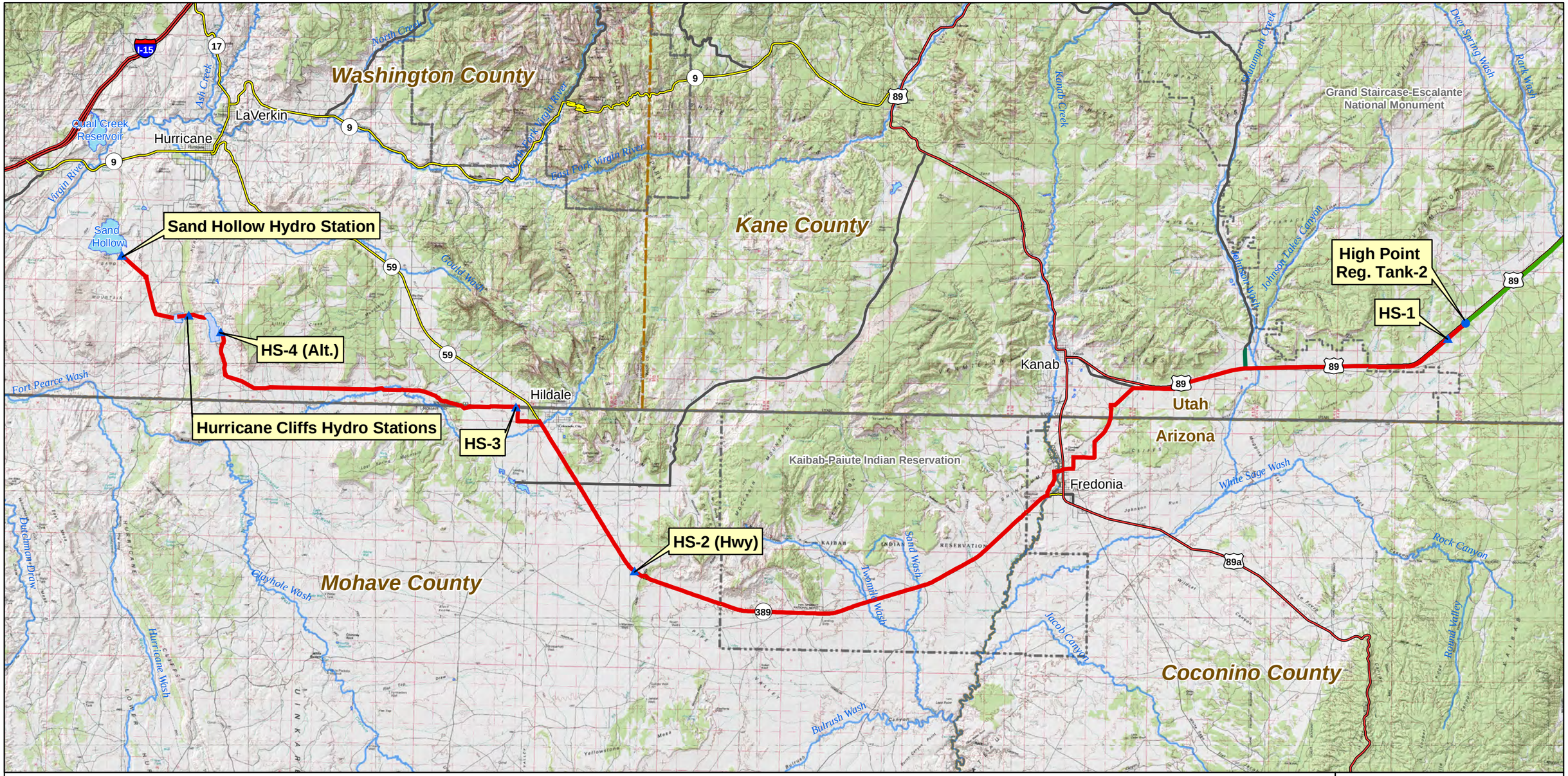
The penstock downstream from the proposed HS-1 would be sited along the south side of Highway 89 within GSENM. The penstock would parallel the south side of Highway 89 west of GSENM, continue past Johnson Wash and follow Lost Spring Gap southwest, crossing Highway 89 Alt. and Kanab Creek in the north end of Fredonia, Arizona. It would continue south, paralleling Kanab Creek to Arizona State Route 389, where it would run west, adjacent to the north side of Route 389 through Kaibab-Paiute Indian Reservation past Pipe Spring National Monument. The penstock would continue along the north side of Arizona State Route 389 through the west half of Kaibab-Paiute Indian Reservation to 1.8 miles west of Cedar Ridge (intersection of Yellowstone Road with Highway 89), where it would then follow the same alignment as the South Alternative to Sand Hollow Reservoir. HS-2 (Hwy) would be sited 0.5 miles west of Cedar Ridge along the north side of Arizona State Route 389. HS-2 (Hwy) would generate approximately 0.8MW of electricity and cover 8.7 acres of private land.

The **KCWCD System** would convey water diverted at Lake Powell from the LPP Project along Highway 89 north along Johnson Canyon Road for 5,000 feet through a buried 24-inch diameter pipeline in Kane County, Utah to the mouth of Johnson Canyon (Figure 1-5).

1.2.3 Southeast Corner Alternative

The Southeast Corner Alternative consists of four systems: **Water Intake, Water Conveyance, Hydro,** and **KCWCD**. The **Water Intake**, **Water Conveyance**, and **KCWCD** systems would be the same as described for the South Alternative.

The **Hydro System** would be the same as described for the South Alternative from High Point Regulating Tank 2 at the LPP Project topographical high point (5,691 feet AMSL) to the east boundary of Kaibab-Paiute Indian Reservation. At the east boundary of Kaibab-Paiute Indian Reservation, the penstock alignment would parallel the north side of the Navajo-McCullough Transmission Line corridor in Coconino County, Arizona, through the southeast corner of the Kaibab-Paiute Indian Reservation for



Project Pump Station
Project Regulating Tank
Project Hydro Station
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs

Water Conveyance System
Hydro System - Existing Highway Alternative (Penstock Segment)
KCWCD System
Major Rivers & Streams

Interstate
US Highway
ST Highway
Hwy
Major Road

National Park/Monument
GSENM Boundary
Tribal Lands
State Boundaries
County Boundaries

FERC Project Number: 12966-001
BLM Serial Numbers: AZA-34941 UTU-85472

N

0 1 2 4 6 8 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-5** MWH

Lake Powell Pipeline Hydro System Existing Highway Alternative

about 3.8 miles. The penstock would then follow the South Alternative alignment south of the south boundary of the Kaibab-Paiute Indian Reservation, continuing to Sand Hollow Reservoir (Figure 1-6). The Southeast Corner Alternative would be about 85.7 miles long from High Point Regulating Tank-2 to Sand Hollow Reservoir.

1.2.4 Transmission Line Alignments

Transmission line alignments have been identified to transmit electric power to pump stations in the Water Intake and Water Conveyance systems, and to transmit electric power generated by hydroelectric stations in the Hydro System. The transmission lines that would serve the Water Intake and Water Conveyance systems are located in the east half of the LPP Project. The transmission lines that would serve the Hydro System are located in the west half of the LPP Project.

The proposed new **Water Intake Transmission Line** would begin at Glen Canyon Substation and run parallel to Highway 89 for about 2,500 feet to a new switch station, cross Highway 89 at the Intake access road intersection, and continue northeast to a new electrical substation on the Intake Pump Station site. This 69 kV transmission line would be 0.9 mile long in Coconino County, Arizona (Figure 1-7).

The proposed new **BPS-1 Transmission Line** would begin at the new switch station located on the south side of Highway 89 and parallel the LPP Project Water Conveyance System alignment to a new electrical substation on the BPS-1 site west of Highway 89. The 69 kV transmission line would be about one mile long in Coconino County, Arizona (Figure 1-7).

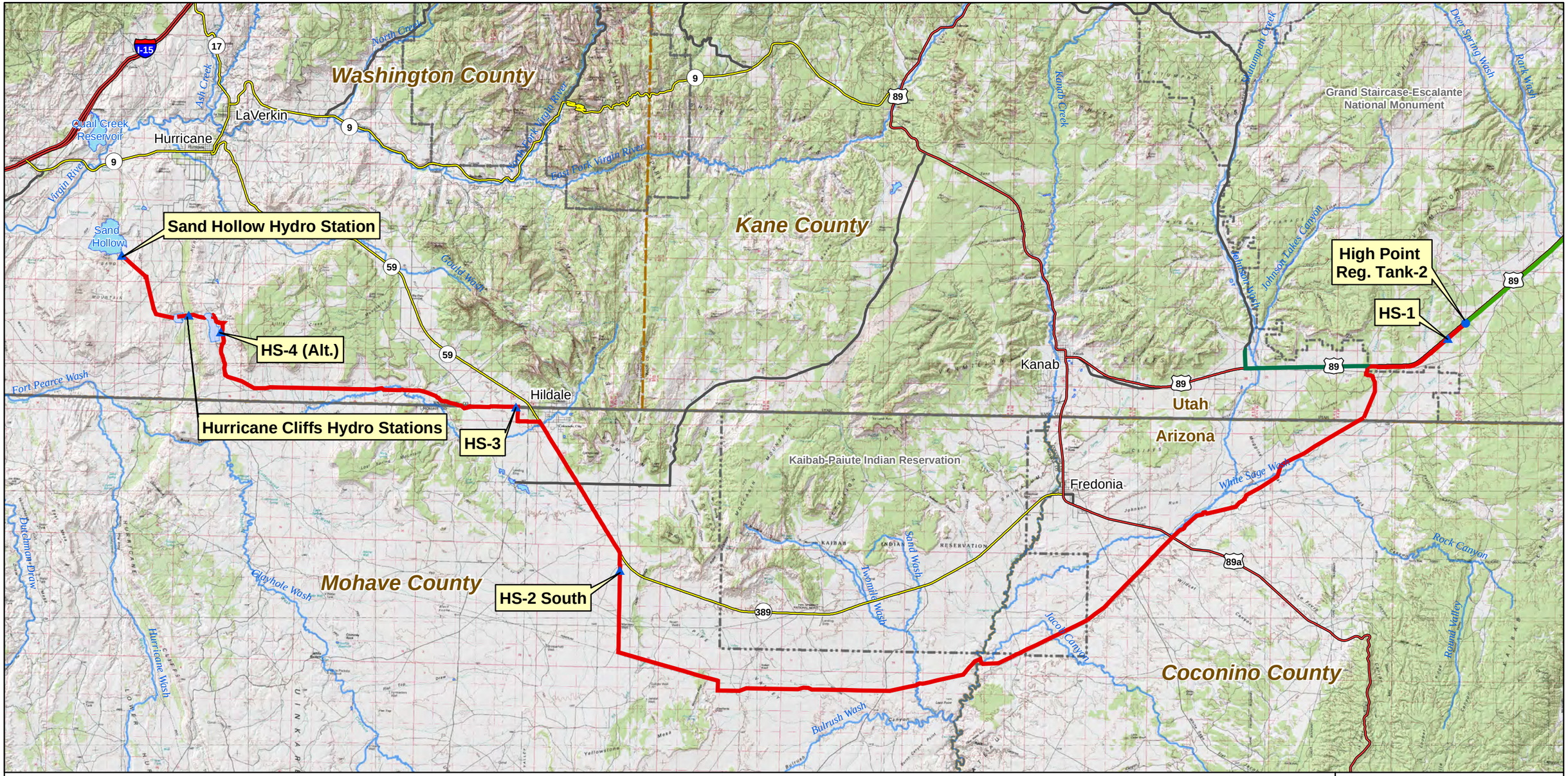
The proposed new **Glen Canyon to Buckskin Transmission Line** would consist of a 230 kV transmission line from the Glen Canyon Substation to the Buckskin Substation, running parallel to the existing 138 kV transmission line. This transmission line upgrade would be about 36 miles long through Coconino County, Arizona, and Kane County, Utah (Figure 1-7).

The existing **Buckskin Substation** would be upgraded as part of the proposed project to accommodate the additional power loads from the new 230 kV Glen Canyon to Buckskin transmission line. The substation upgrade would require an additional five acres of land within GSENM adjacent to the existing substation in Kane County, Utah (Figure 1-7).

The existing **Paria Substation** would be upgraded as part of the proposed project to accommodate the additional power loads to BPS-4 (Alt.). The substation upgrade would require an additional two acres of privately-owned land adjacent to the existing substation in Kane County, Utah (Figure 1-7).

The proposed new **BPS-2 Transmission Line** would consist of a new three-ring switch station along the new 230 kV Glen Canyon to Buckskin Transmission Line, a new transmission line from the switch station to a new substation west of Big Water, and a connection to BPS-2 substation in Kane County, Utah. The new transmission line would parallel an existing distribution line that runs northwest, north, and then northeast to Big Water. This new 138 kV transmission line alignment would be about seven miles long across Utah SITLA-administered land, with a 138 kV connection to a new electrical substation on the BPS-2 site (Figure 1-7).

The proposed new **BPS-3 Alt. Transmission Line South** would consist of a new three-ring switch station along the new 230 kV Glen Canyon to Buckskin Transmission Line, and a new transmission line from the switch station north along an existing BLM road to a new electrical substation on the BPS-3 (Alt.) site near the GSENM east boundary and within the Congressionally-designated utility corridor. This new 138 kV transmission line alignment would be about 5.9 miles long in Kane County, Utah (Figure 1-7).



- Project Pump Station
- Project Regulating Tank
- Project Hydro Station
- Hurricane Cliffs Forebay/Afterbay
- Lakes & Reservoirs
- Water Conveyance System
- Hydro System - Southeast Corner Alternative (Penstock Segment)
- KCWCD System
- Major Rivers & Streams
- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road
- National Park/Monument
- GSENM Boundary
- Tribal Lands
- State Boundaries
- County Boundaries

FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472

N

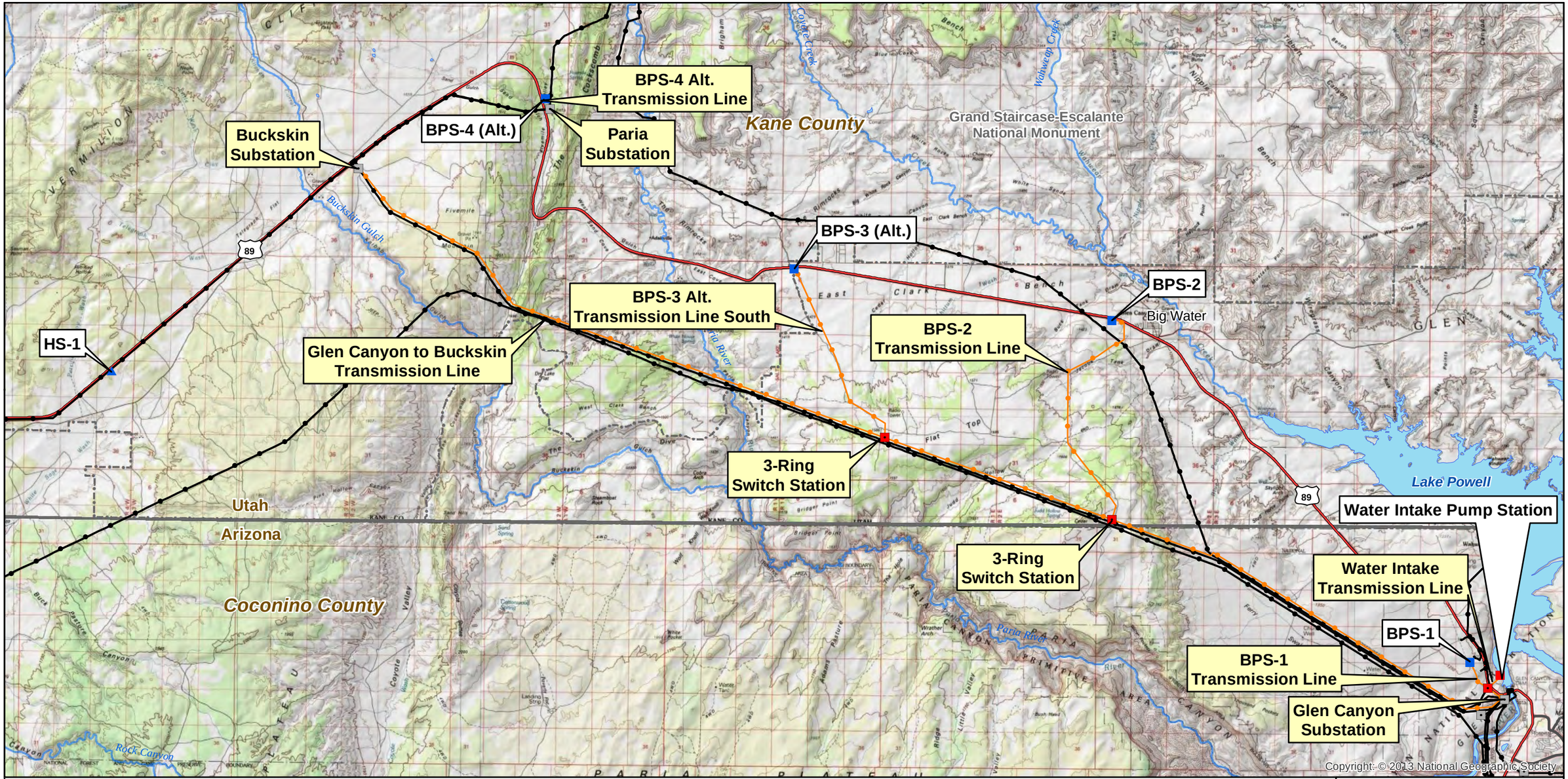
0 1 2 4 6 8 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-6** MWH

Lake Powell Pipeline
Hydro System
Southeast Corner Alternative



Project Intake Pump Station
Project Pump Station
Project Hydro Station
Substation
Proposed Substation
Project Transmission Lines
Existing Transmission Lines
Interstate
US Highway
ST Highway
Hwy
Major Road
Lakes & Reservoirs
Major Rivers & Streams
National Park/Monument
GSENM Boundary
State Boundaries

FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472

0 0.5 1 2 3 4 Miles

N

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-7** MWH

Lake Powell Pipeline Proposed Transmission Lines East

The proposed new **BPS-4 Alt. Transmission Line** would begin at the upgraded Paria Substation and run north to a new electrical substation on the BPS-4 Alternative site. This 69 kV transmission line would be about 0.4 mile long in Kane County, Utah (Figure 1-7).

The proposed new **HS-1 Transmission Line** would begin at the new HS-1 and tie into the existing 69 kV transmission line along Highway 89 from the Buckskin Substation to the Johnson Substation. The HS-1 69 kV transmission line would be about 400 feet long in Kane County, Utah (Figure 1-8).

The proposed new **HS-2 (South) Transmission Line** would connect the HS-2 hydroelectric station and substation along the South Alternative to an existing 138 kV transmission line paralleling Arizona State Route 389. This new 34.5 kV transmission line would be about 0.9 mile long in Mohave County, Arizona (Figure 1-8).

The new **HS-2 (Highway) Transmission Line** alternative would directly connect the HS-2 hydroelectric station and substation along the Existing Highway Alternative to an existing 138 kV transmission line paralleling Arizona State Route 389. This new 34.5 kV transmission line would be about 200 feet long in Mohave County, Arizona.

The proposed new **HS-3 Transmission Line** would connect the HS-3 hydroelectric station and substation to the existing Twin Cities Substation in Hildale City, Utah. The new 12.47 kV transmission line would be about 0.6 mile long in Washington County, Utah (Figure 1-8).

The proposed new **HS-4 (Alt.) Transmission Line** would connect the HS-4 (Alt.) hydroelectric station and substation to an existing transmission line parallel to Utah State Route 59. The new 69 kV transmission line would be about 7.5 miles long in Washington County, Utah (Figure 1-8).

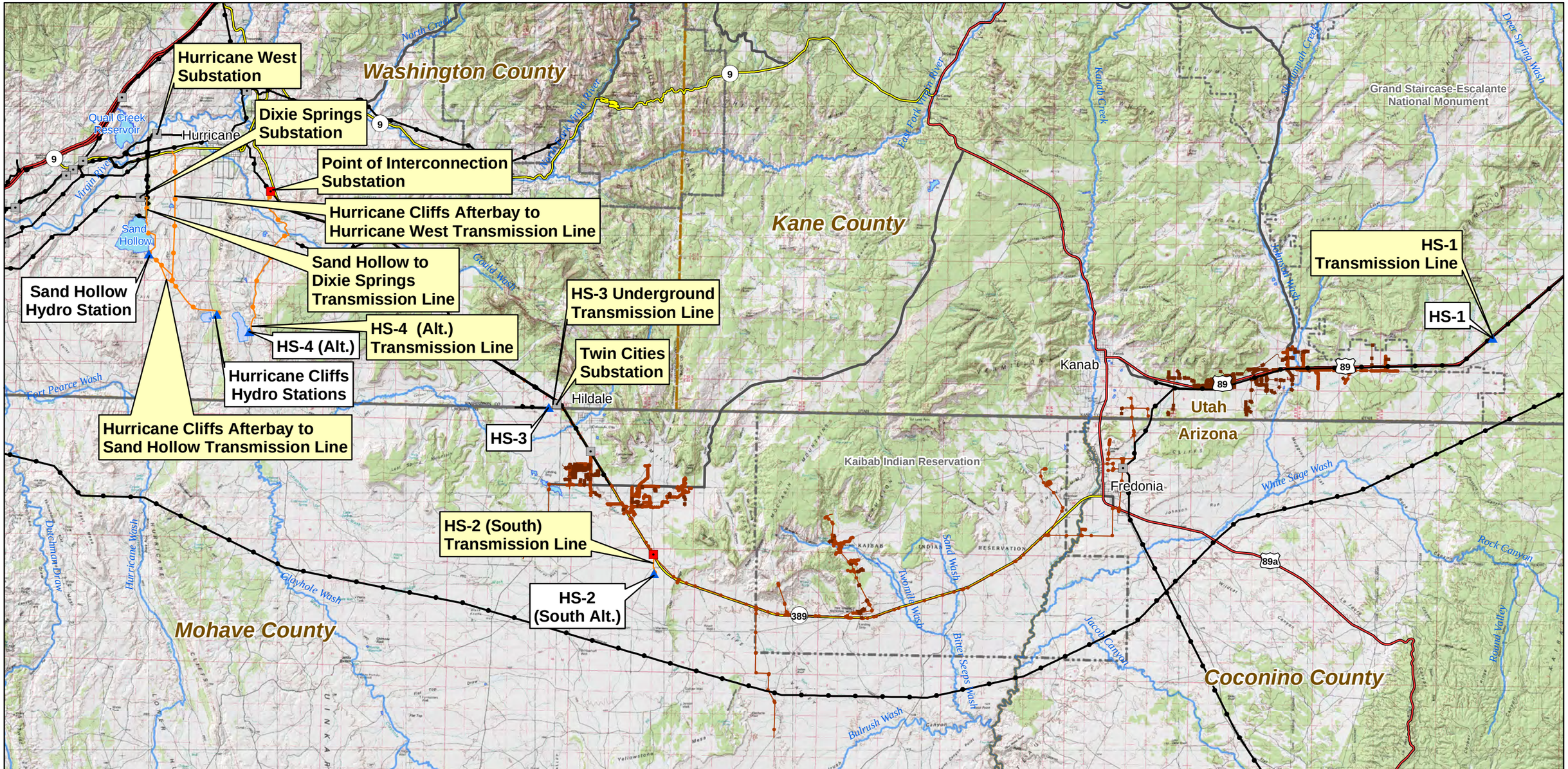
The proposed new **Hurricane Cliffs Afterbay to Sand Hollow Transmission Line** would consist of a new 69 kV transmission line, which would run northwest from the Hurricane Cliffs peaking power plant and substation to the Sand Hollow Hydro substation. This new 69 kV transmission line would be about 4.9 miles long in Washington County, Utah (Figure 1-8).

The proposed new **Hurricane Cliffs Afterbay to Hurricane West Transmission Line** would consist of a new 345 kV transmission line, running from the Hurricane Cliffs pumped storage power plant northwest and then north to the planned Hurricane West 345 kV substation. This new 345 kV transmission line would be about 10.9 miles long in Washington County, Utah (Figure 1-8).

The proposed new **Sand Hollow to Dixie Springs Transmission Line** would consist of a new 69 kV transmission line, running from the Sand Hollow Hydro substation around the east side of Sand Hollow Reservoir and north to the existing Dixie Springs Substation. This new 69 kV transmission line would be about 3.4 miles long in Washington County, Utah (Figure 1-8).

1.2.5 Natural Gas Pipeline and Generators Alternative

Natural gas engine-driven generation systems to power electric pumps would be an alternative to powering the LPP Project pump stations by electricity via transmission lines. Recent discussions with Questar Gas Company (local natural gas supplier) indicated that capacity would be available in the Kern River natural gas pipeline, which is located west of St. George, Utah, to supply natural gas for this alternative. Questar Gas Company indicated the company has future plans to extend a high pressure natural gas pipeline from the Kern River line to Hurricane, Utah. The Questar Gas pipeline would be sized to supply natural gas to the LPP Project if it is determined that a single-purpose, dedicated high pressure gas line would be extended to service the LPP pump stations. Based on the preliminary pump selection and fuel requirements, the natural gas supply pipeline would be 12 inches in diameter to provide natural gas supply for the LPP Project pump stations. The pipeline would likely be successively reduced in size as it delivers gas to each of the pump stations.



Project Hydro Station
Substation
Proposed Substation
Project Transmission Lines
Existing Transmission Lines
Existing OH Primary Line
Existing UG Primary Line
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams
Interstate
US Highway
ST Highway
Hwy
Major Road
National Park/Monument
GSENM Boundary
Tribal Lands
State Boundaries
County Boundaries

FERC Project Number:
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BLM Serial Numbers:
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UTU-85472

N

0 1 2 4 6 8 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-8** MWH

Lake Powell Pipeline Proposed Transmission Lines West

1.2.5.1 Natural Gas Transmission Line Connection

The natural gas supply line alternative would connect to the proposed Questar Gas Transmission Line from the existing Kern River line to Hurricane City. The natural gas supply line would connect to the high pressure gas transmission line at a proposed gate station southeast of Sand Hollow Reservoir. The proposed gate station would be located adjacent to the alignment of the extension of the Southern Corridor Highway, which is the existing alignment of Sand Hollow Road east of Sand Hollow Reservoir (Figure 1-9).

1.2.5.2 Natural Gas Supply Line

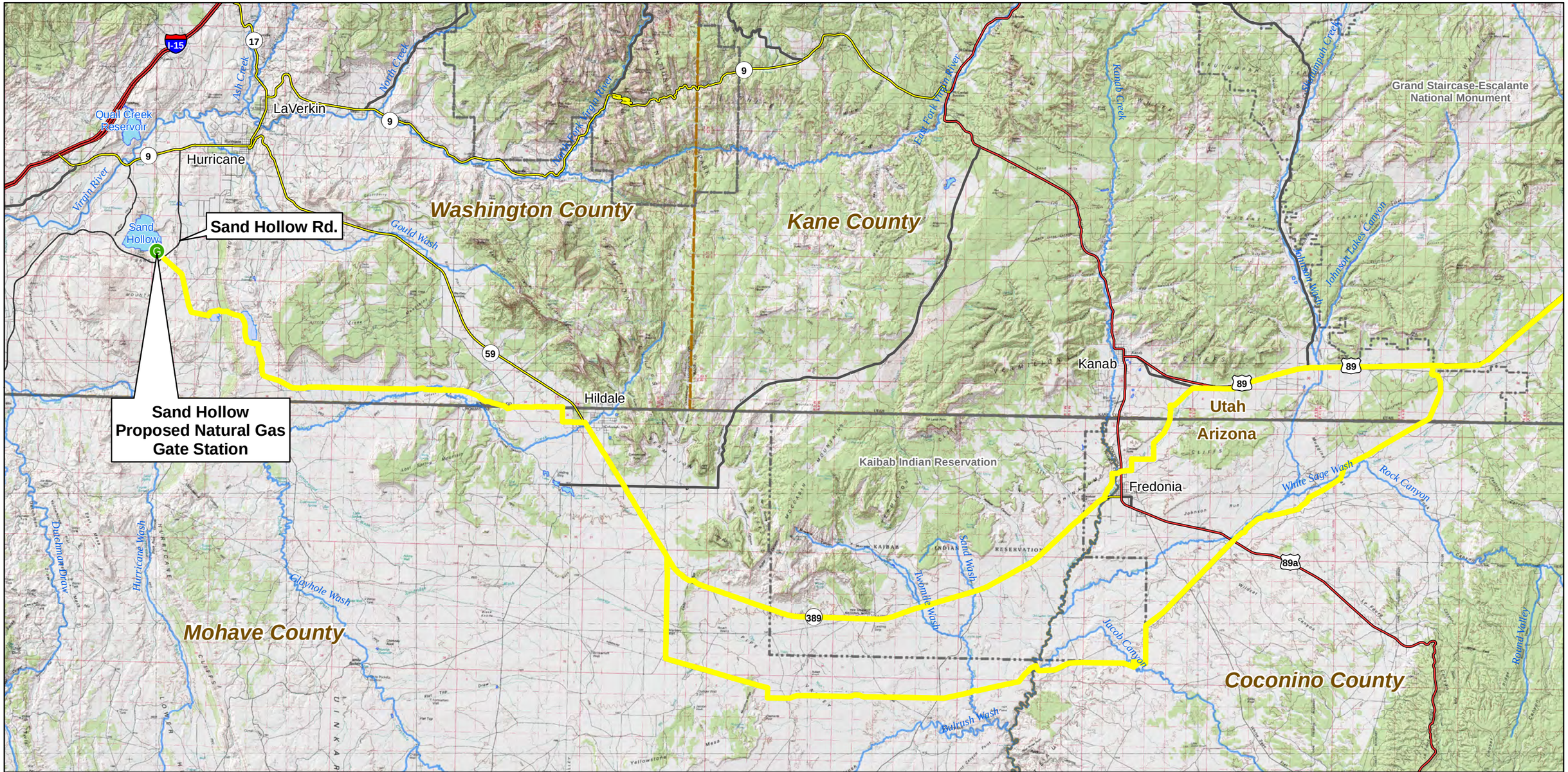
The proposed natural gas supply line would be an intermediate high pressure line and would operate between approximately 250 to 300 psi at the gate station connection. Because of pressure losses in the pipeline it is anticipated that the pressure at each of the LPP pump stations would vary between 50 and 100 psi, which would meet the requirements of the natural gas generators. The pipeline would be constructed of strong carbon steel and have a dielectric coating, such as a fusion bonded epoxy or extruded polyethylene. It would be installed with a minimum four feet of cover and be provided with cathodic protection (a technique that involves inducing an electric current through the pipe to ward off corrosion and rusting). The pipeline would be designed, constructed, tested, and operated at a minimum in accordance with all applicable requirements included in the U.S. DOT regulations in 49 CFR Part 192, “Transportation of Natural Gas and other Gas by Pipeline: Minimum Federal Safety Standards,” and other applicable federal and state regulations.

The natural gas supply line would follow the proposed LPP ROW from the Sand Hollow Gate Station to the intake pump station near Page, Arizona. The line would be about 138.5 miles long and installed a minimum of 10 feet from the edge of the proposed water pipeline in a separately excavated trench within the LPP ROW. Figure 1-9 shows the west alignment of the natural gas supply line as proposed and an alternative alignment along Arizona State Route 389 and through Fredonia, Arizona, parallel to the Existing Highway Alternative alignment, both to the west GSENM boundary. Figure 1-10 shows the east alignment of the natural gas supply line as proposed from the west GSENM boundary to the water intake pump station.

Sectionalizing valves would be required along the natural gas supply line alignment. These valves are safety devices used for emergency shut down or maintenance. The natural gas supply line sectionalizing valves would be required at approximately 20-mile intervals because of the gas line’s remoteness. The main line valve sites would cover a 40-foot by 40-foot area surrounded by a chain link fence within the confines of the permanent LPP pipeline ROW. The valves would be above ground and connected to the buried natural gas supply line. Additionally, pig launching or receiving equipment would be installed within the fenced areas. Pigs are devices that are placed into a natural gas supply line to clean the inside walls or to monitor its internal and external condition. Launching and receiving equipment is connected to the natural gas supply line to enable pigs to be inserted into or removed from the pipeline.

1.2.5.3 Natural Gas Generators

Natural gas generators would be used to supply power to operate the electric pumps at the LPP pump stations. The size of the electric pumps is approximately 18 feet from center to center when configured. The overall pump station building size would be 14 feet wider and 18 feet longer than the pump stations which are powered by electricity from transmission lines.



Natural Gas Gate Station
Natural Gas Supply Line Alignment
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams
Interstate
US Highway
ST Highway
Hwy
Major Road
National Park/Monument
GSENM Boundary
Tribal Lands
State Boundaries
County Boundaries

FERC Project Number:
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BLM Serial Numbers:
AZA-34941
UTU-85472

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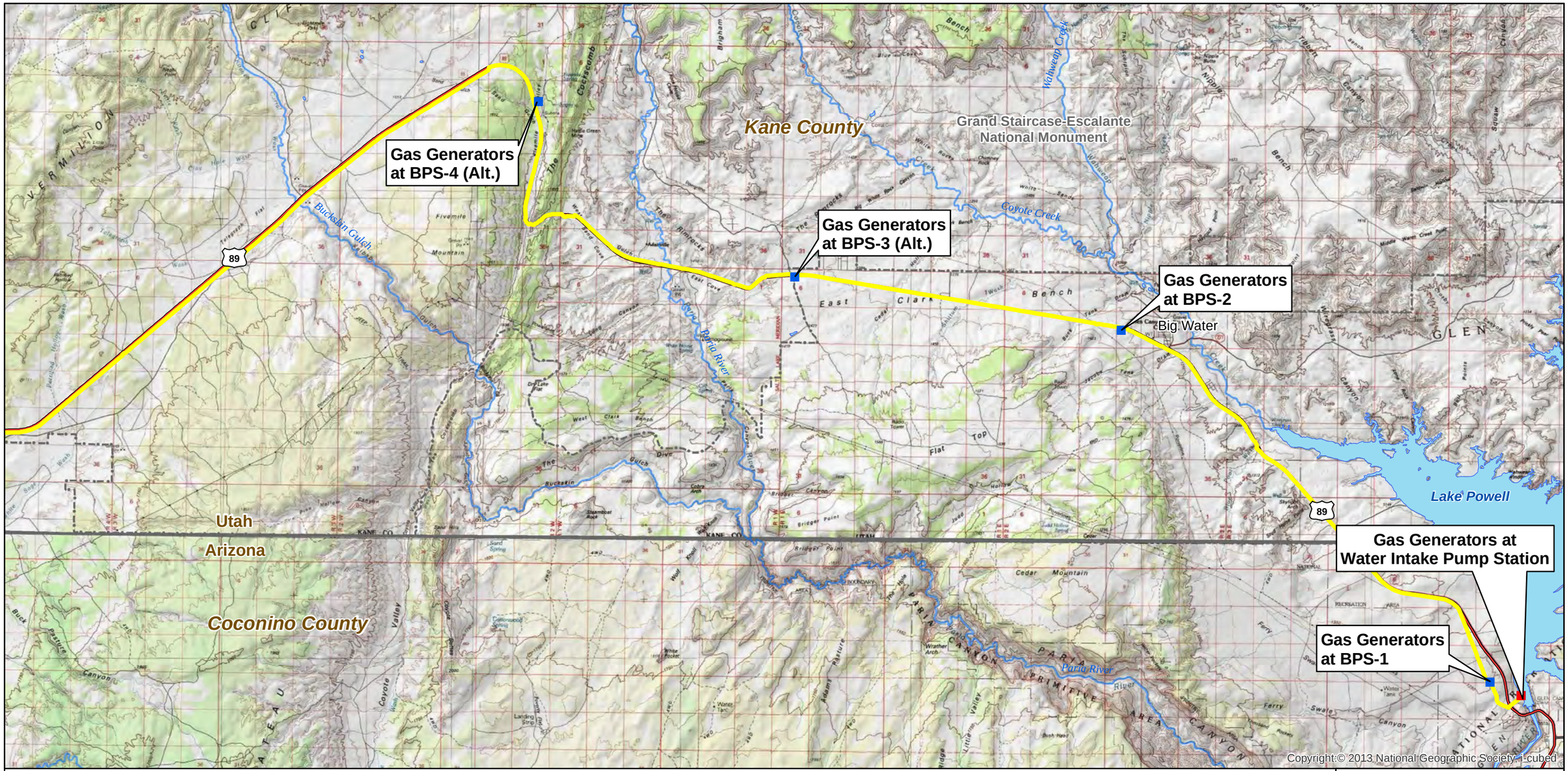
Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-9** MWH

Lake Powell Pipeline
Natural Gas Supply Line and Generators West Alternatives



Project Water Intake Pump Station
Gas Generators at Booster Pump Station
Natural Gas Supply Line Alignment

Interstate
US Highway
ST Highway
Hwy
Major Road

Lakes & Reservoirs
Major Rivers & Streams
National Park/Monument
GSENM Boundary
State Boundaries

FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472

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0 1 2 3 4 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-10** MWH

Lake Powell Pipeline Natural Gas Supply Line and Generators East Alternative

The natural gas generators would be approximately 35 feet long by eight feet wide by nine feet high. The intake pump station building size for the natural gas generators would be approximately 65 feet wide by 170 feet long by 50 feet high, and located adjacent to the pump station electrical room within the five-acre site designated for each pump station. The booster pump station building size for the natural gas generators would be 65 feet wide and 39 feet high, with lengths ranging from 114 feet to 162 feet long. Each natural gas generator would require a 24-inch diameter stack, with guide wires, extending above the building roof to disperse the exhaust gases. The five stacks (four operating natural gas generators plus one standby natural gas generator) at the intake pump station would extend 20 feet above the top of the 55-foot tall building. The stacks at BPS-1, BPS-2, BPS-3 (Alt.), and BPS-4 (Alt.) would extend 61 feet above the top of the buildings to a total height of 100 feet above the ground surface. The natural gas generators at the intake pump station and BPS-4 (Alt.) would require emission control systems to meet air quality standards.

The natural gas generators alternative at the LPP pump stations would require an annual natural gas supply of 2,855,400 million British thermal units (MMBtu). Table 1-1 shows the annual natural gas consumption at the proposed project intake pump station and booster pump stations 1 through 4.

Table 1-1
Water Conveyance System Natural Gas Generator Annual Fuel Consumption

Pump Station	Site Elevation Feet MSL	Number of Pumps	Motor (HP)	Total Motor (kW)	Natural Gas Generator GE Model	# of Units[1]	Emission Control Required	Generator Total kW[2]	Annual Fuel Consumption (MMbtu)[3]
IPS	3,750	5	3000	11,190	JGS 620 F09	4+1	Yes	12,120	729,000
BPS-1	4,111	5	1500	5,595	JGS 620 F09	2+1	No	5,992	364,500
BPS-2	4,311	5	1750	6,530	JGS 620 F09	3+1	No	8,895	425,400
BPS-3 Alt.	4,657	5	2500	9,325	JGS 620 F09	4+1	No	11,652	607,500
BPS-4 Alt.	5,001	5	3000	11,190	JGS 620 F09	5+1	Yes	14,430	729,000
Total		**25**		**43,830**		**18+5**		**53,089**	**2,855,400**

Notes:
[1] Number of operating units plus standby generator
[2] Total generator capacity without standby generator
[3] The annual fuel consumption is based on all pumps operating at rated motor horsepower, 8400 hours/year operation with generators loaded at 87 percent on the average.

1.3 Summary Description of No Lake Powell Water Alternative

The No Lake Powell Water Alternative would involve a combination of developing remaining available surface water and groundwater supplies, developing reverse osmosis treatment of existing low quality water supplies, and eliminating residential outdoor water use in the WCWCD service area. This alternative could provide a total of 86,249 acre-feet of water annually to WCWCD and KCWCD for M&I use without diverting Utah's water from Lake Powell.

1.3.1 WCWCD No Lake Powell Water Alternative

1.3.1.1 Background

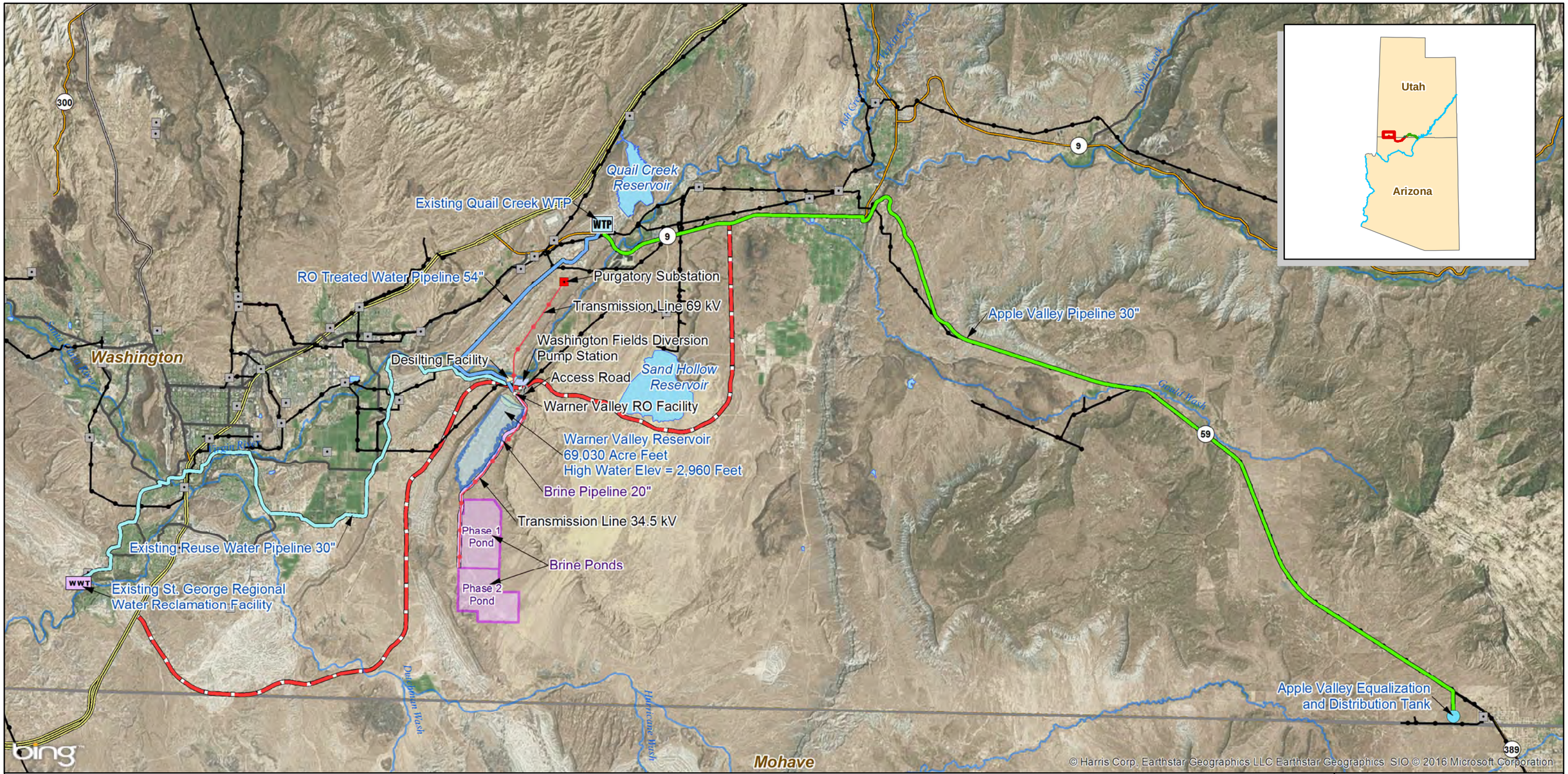
The WCWCD LPP allocation would be 82,249 acre-feet per year, and the WCWCD No Lake Powell Water alternative would need to supply 82,249 acre-feet per year to meet the same future water demands. In addition to the direct supply from Utah's Colorado River water, the water supplied by the LPP Project would provide additional wastewater reuse supply provided that sufficient storage is available.

The No Lake Powell Water Alternative would serve the same population as the LPP Project. WCWCD would implement other future water development projects currently planned by the District, develop additional water reuse/reclamation programs, continue to implement new water conservation measures, and convert additional agricultural water use to M&I use as a result of urban development in agricultural areas through 2028. Remaining planned and future water supply projects include the Ash Creek Pipeline (2,840 acre-feet per year), 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.

Under the No Lake Powell Water Alternative, actions in addition to the currently planned WCWCD projects would be taken to meet the water demand that would have been supplied by the Lake Powell Pipeline, as described below.

1.3.1.2 WCWCD No Lake Powell Water Alternative Features

Beginning in 2025, Washington County residential outdoor potable water use would be permanently re-purposed to indoor potable water use to help meet increasing indoor potable water demands. The WCWCD would develop a reverse osmosis (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 (TDS) concentration, mixed with an additional 19,030 acre-feet per year of reuse water. WCWCD would 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. Figure 1-11 shows the primary conceptual components of the No Lake Powell Water Alternative. Table 1-2 summarizes available supplies and projected demands under the No Lake Powell Water Alternative and the LPP Project alternatives.



WTP Quail Creek WTP (Existing)
WWT St. George Regional Water Reclamation Facility (Existing)
Substation
Substation (Future)
Warner Valley Transmission Line
Existing Transmission Lines
Desilting Facility
RO WTP
Washington Fields Diversion Pump Station
Lakes & Reservoirs
Brine Evaporation Ponds
Access Road
Apple Valley Pipeline 30"
Brine Pipeline 20"
Existing Reuse Water Pipeline 30"
RO Treated Water Pipeline 54"
Major Rivers & Streams
Interstate
US Highway
ST Highway
Hwy
Major Road
Southern Corridor Highway
State Boundaries
County Boundaries

FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472

N

0 0.75 1.5 3 4.5 6 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-11** MWH

No Lake Powell Water Alternative Primary Infrastructure

Table 1-2 Available Supplies and Projected Demands Under the No Lake Powell Water and Lake Powell Pipeline Project Alternatives		
	No Lake Powell Water Alternative	**Lake Powell Pipeline Project Alternative**
Existing Supplies	67,677	67,677
Planned Projects	13,670	13,670
Lake Powell Pipeline Project	0	82,249
RO Treatment of Virgin River and Reuse Water	57,883	0
Agricultural Conversion	0[1]	10,080
Reuse	17,100[2]	36,130
2060 Total Supply	156,330	209,806
2060 Total Demand	133,119[3]	185,285
Surplus in 2060	**23,211**	**24,521**

Notes:
[1]Agricultural conversion water included in RO treatment.
[2]19,030 acre-feet per year additional reuse included in RO treatment.
[3]Demand reduced 52,166 acre-feet per year from elimination of residential outdoor watering.

1.3.1.2.1 Re-Purposing Potable Water Use. The No Lake Powell Water Alternative would permanently eliminate residential outdoor potable water use in Washington County, re-purposing the portion of potable water used for residential outdoor watering to indoor potable use. Projections of future water use through 2060 account for population growth, climate change (projected 6 percent reduction of Virgin River flows by 2050 [Reclamation 2014]), and water conservation (35 percent reduction in per capita water use from 2000 to 2060). Potable water in Washington County is consumed for residential indoor and outdoor uses, commercial uses, institutional uses, and industrial uses. These potable water uses would total 130,245 acre-feet per year by 2052, the year the LPP Project water is anticipated to be fully utilized (UDWRe 2015). Gradually eliminating residential outdoor potable water use starting in 2025 would provide the growing population with potable water for indoor use through 2045; however, re-purposing residential outdoor potable water use to indoor use would not increase the water supply and would have to be accompanied by adding another water supply to meet the growing demand. Re-purposing residential outdoor potable water use to indoor potable use would require converting traditional residential outdoor landscapes and uses to either landscaping requiring no irrigation or desert landscapes compatible with the local climate. Residential water users would be responsible for converting their traditional outdoor landscapes to non-irrigated or desert landscapes. If no additional water supply was added in Washington County after 2025 and potable water use continued to meet residential indoor and outdoor purposes, then the projected population would completely utilize the potable water supply of 72,842 acre-feet per year by 2028.

1.3.1.2.2 Reverse Osmosis Water Treatment. Washington County's additional future water supply under the No Lake Powell Water Alternative would be dependent on two water sources: 1) Virgin River water diverted at the Washington Fields Diversion; and 2) reuse water from an expanded St. George Regional Water Reclamation Facility. WCWCD would develop a RO advanced water treatment facility near Washington Fields Diversion in Washington County, Utah. The RO facility would be designed to treat 50,000 acre-feet of de-silted water per year diverted from the Virgin River at Washington Fields Diversion. St. George Regional Wastewater Reclamation Facility would provide an additional 19,030 acre-feet of water per year to be treated at the RO facility. The RO facility would be necessary to remove the high concentrations of TDS present in both the Virgin River and the effluent from the St. George Regional Wastewater Reclamation Facility. The reuse facility has a current capacity of approximately 7,800 acre-feet per year, with a future design capacity of 11,760 acre-feet per year. An additional 7,830 acre-feet per year of future wastewater reclamation capacity would need to be added to meet the

total reuse water requirement of 19,030 acre-feet per year for RO processing inflow. The RO process would separate the TDS from the water, resulting in two products: 1) a treated water product; and 2) a brine product consisting of highly concentrated salts. A two-stage RO process would be applied to the brine solution to recover additional water and reduce the brine volume for enhanced evaporation. The RO-treated water product would be pH-adjusted to neutral pH, dosed with sodium silicate, mixed with conventionally-treated water from the Quail Creek Water Treatment Plant, and disinfected for distribution throughout the WCWCD service area. The RO advanced water treatment facility would process up to 64,313 acre-feet per year and produce up to 57,883 acre-feet per year of water suitable for M&I potable indoor use. The two-stage RO process would remove 90 percent of the TDS. The remaining 10 percent rejection (6,430 acre-feet per year) of brine by-product from the RO treatment process would require evaporation and disposal meeting State of Utah water quality regulations. The RO water treatment plant would process approximately 64,313 acre-feet per year of inflow water from Warner Valley Reservoir storage to meet the 2052 water demand under the No Lake Powell Water Alternative.

The RO water treatment plant processes would consist of pressurized, parallel ultra-filtration units, an influent storage tank with acid added to adjust the pH, pressurized cartridge filtration to remove additional particles from the water, high pressure pumping to pass the water through the parallel RO membrane units, a product water storage tank with saturated lime solution added to adjust the pH of the treated product water prior to disinfection and distribution as potable water, and brine storage tanks in series with the two-stage RO process units for further brine reduction. These water treatment processes would be housed in a water treatment building with electrical, mechanical, chemical storage and metering, heating/air conditioning/ventilation, and SCADA systems. A seven-mile long buried 54-inch diameter pipeline would convey the product water from a pump station at the RO water treatment plant to the Quail Creek Water Treatment Plant. The RO water treatment plant would add RO membrane units in phases as necessary to meet the growing water demand. The RO water treatment plant would be powered by electricity, requiring a 2.8-mile long 69-kV power transmission line from the proposed Purgatory Substation.

The concentrated brine product (6,430 acre-feet per year) would be pumped from the brine tanks through a pipeline to an evaporation apron, spray system and double-lined pond, and then pumped into spray headers over a series of double-lined ponds with leak detection and recovery systems. The enhanced evaporation ponds would be located south of Warner Valley Reservoir and would cover approximately 2,000 acres, developed in two phases. A buried brine conveyance pipeline approximately 4.4 miles long would convey the concentrated brine to the enhanced evaporation ponds. A 4.4-mile long 34.5-kV power transmission line would be extended from the RO water treatment plant to the enhanced evaporation ponds to provide electricity for the pumps spraying the brine solution. The brine solids would be evaporated for approximately 25 years in the Phase 1 ponds, and then dried, collected and disposed in an approved solid waste landfill. The Phase 2 enhanced evaporation ponds would be used during the following 25 years to continue evaporating the brine by-product. Additional infrastructure would be required as part of this alternative, including a de-silting facility, pump stations, pipelines, switch stations and substations, blending and storage tanks, and other associated earthwork.

1.3.1.2.3 Secondary Water Storage in Warner Valley Reservoir. WCWCD would develop the Warner Valley Reservoir to store diverted Virgin River water and reuse water from the St. George Regional Water Reclamation Facility, which would be delivered as inflow to the RO advanced water treatment facility. Warner Valley Reservoir would be located south-southwest of the Washington Fields Diversion. An earth-fill embankment with a clay core and rock-riprap facing would be constructed across the north entrance to the natural valley. The reservoir would have a maximum active storage volume of 69,030 acre-feet and would cover approximately 1,130 acres, including the earth-fill embankment. A large pump station would be constructed at the Washington Fields Diversion to pump the diverted Virgin River water into the Warner Valley Reservoir. The pump station would be powered by electricity via the 69-kV transmission line from the Purgatory Substation to the RO water treatment plant. The reservoir would store Virgin River water diverted at the Washington Fields Diversion (50,000 acre-feet per year) mixed with St. George Regional Water Reclamation Facility effluent (19,030 acre-feet per year), accounting for annual average evaporation (4,717 acre-feet per year), to produce up to 57,883 acre-feet of RO product water (assuming 90 percent recovery). The brine product from RO treatment would total approximately 6,430 acre-feet per year.

1.3.1.2.4 Water Distribution to Apple Valley. The largest remaining contiguous land area available for development in Washington County would be in Apple Valley. WCWCD would develop a pump station and 28-mile long pipeline to deliver 13,249 acre-feet per year of potable water from the Quail Creek Water Treatment Plant near Hurricane City to the Apple Valley area to meet future residential and commercial water demands.

1.3.2 KCWCD No Lake Powell Water Alternative

The KCWCD No Lake Powell Water Alternative would rely on existing water supplies, water conservation measures resulting in reduced water use, and future water development projects consisting of new groundwater production. Reliable water supplies (projected to be 2,170 acre-feet per year in 2035) for the area served by KCWCD (Kanab City and Johnson Canyon), adjusted for projected stream flow reductions (4.2 percent in 2035) resulting from climate change and a planning reserve (10 percent), would be exceeded by projected M&I water demands by 27 acre-feet per year within the KCWCD service area in 2035. KCWCD projected potable water demand in 2060 would be 3,435 acre-feet per year, with a potable water deficit of 1,334 acre-feet per year. Additional groundwater in the Kanab Creek drainage basin could be developed to provide up to 6,615 acre-feet per year of potable water within the aquifer's estimated safe yield. The quality of this water would likely require advanced water treatment. The developed groundwater from the Kanab Creek drainage basin would be pumped and conveyed through an eight-mile long pipeline to the Johnson Canyon drainage basin. The Johnson Canyon drainage basin comprises the potable water supply service area served by KCWCD in the area that could be served by the LPP Project.

1.4 Summary Description of the No Action Alternative

No new intake, water conveyance or hydroelectric features would be constructed or operated under the No Action Alternative. FERC would not issue a license for the LPP Project. The Utah Board of Water Resources' Colorado River water rights consisting of 86,249 acre-feet per year would not be diverted from Lake Powell and would continue to flow into the lake until the water is used for another State of Utah purpose.

1.4.1 WCWCD No Action Alternative

Under the No Action Alternative, WCWCD would complete the Ash Creek Project, planned groundwater development and continue to implement planned conservation programs. Wastewater reuse would be utilized to the maximum extent storage allows. Existing and future water supplies totaling 72,840 acre-feet per year potable and 8,505 acre-feet per year secondary would meet projected M&I water demand within the WCWCD service area through approximately 2028, exhausting all water planning reserves. Each supply source would be phased in to meet the M&I potable and secondary water demand associated with the forecasted population.

The No Action Alternative would not provide WCWCD with any reserve water supply (e.g., water to meet annual shortages because of drought, emergencies, and other losses). The No Action Alternative would not provide adequate water supply to meet projected water demands beyond 2028. There would be a projected water shortage of approximately 102,903 acre-feet per year in 2060 within the WCWCD service area under the No Action Alternative.

1.4.2 KCWCD No Action Alternative

KCWCD would use existing water supplies to meet potable water demands through 2035. Reliable water supplies are projected to be 2,101 acre-feet per year in 2060.

The No Action Alternative would not provide KCWCD with any reserve water supply (e.g., water to meet annual shortages because of drought, emergencies, and other losses). The No Action Alternative would not provide adequate water supply to meet projected water demands beyond 2035. There would be a projected water shortage of approximately 1,334 acre-feet per year in 2060 within the KCWCD service area under the No Action Alternative.

1.5 Identified Issues

The following wildlife and habitat issues were raised during the public and agency scoping and informational process:

- What would be the impact of the LPP Project on wildlife habitats and species in the study area?
- What would be the impact of the LPP Project on big game critical seasonal ranges and migration routes?

1.6 Impact Topics

The following impact topics are analyzed in this study report:

- Wildlife habitats
- Wildlife populations
- Big game critical seasonal ranges and migration routes

Chapter 2
Methodology

2.1 Introduction

This study report analyzes general wildlife and their habitats. Federally listed threatened, endangered and candidate species, and species of federal, state and agency concern are analyzed in Study Report 13, Special Status Wildlife Species and Habitats (UBWR 2016a). This chapter describes the data used in the analysis, assumptions used in the analysis and impact analysis methodology.

2.2 Data Used

The analysis of wildlife and habitat used data described in Final Study Report 15, Vegetation Communities (UBWR 2016b) and observations of wildlife made by vegetation surveyors during their field work. Additional wildlife data were used from the Utah Division of Wildlife Resources (UDWLR) Conservation Data Center (UDWLR 2010), the Utah GIS Portal (AGRC 2010, UDWLR 2016), the Arizona Game and Fish Department Natural Heritage Program Data Management System (AGFD 2010), NatureServe (NatureServe 2010), Kaibab Band of Paiute Indians, Wildlife Species of Cultural Concern, and standard field guides for wildlife species (National Geographic Field Guide to the Birds of North America 2006, Mammals of North America [Kays and Wilson 2002]). Utah critical winter wildlife habitat data were obtained from AGRC (AGRC 2010); Arizona critical habitats were obtained from the Arizona Bureau of Land Management Geographic Information Systems (GIS) website (BLM 2010). Impacts were analyzed for the LPP Project study area as defined in the LPP Project Study Area Map Book and associated GIS data.

Analysis of construction and facility operation noise impacts used data from Study Report 7, Noise (UBWR 2016c), and methodology previously described in the Utah Lake Drainage Basin Water Delivery System (ULS) Wildlife Resources and Habitat Technical Report (CUWCD 2005). The noise analysis is contained in Appendix A.

2.3 Assumptions

The analysis used the following assumptions of noise impacts on individual animals and wildlife habitat:

- Highways are equivalent to linear sound sources.
- Construction sites are equivalent to point sound sources.
- The noise threshold for possible effects on wildlife is 60 decibels (dBA). Noise levels between 60 to 70 dBA would have minor negative impact on individual animals, 70 to 80 dBA would have moderate negative impact, and over 80 dBA would have high negative impact.
- Construction noise would not affect areas that are predominantly urban in character and those areas can be eliminated from potential noise impacts on individual animals and wildlife habitat.

The analysis used the following assumptions of construction disturbance on individual animals and wildlife habitat.

- Vegetation communities immediately outside of the vegetation survey area would generally be similar to the contiguous surveyed communities and would be available for dispersal of wildlife species away from construction disturbance.

- Habitats temporarily disturbed by pipeline construction would be revegetated with native plant species and seed material and would regain some habitat value after two to three growing seasons.

2.4 Impact Analysis Methodology

2.4.1 Wildlife Habitat

Vegetation communities mapped in Final Study Report 15 (UBWR 2016b) were spatially analyzed with Geographic Information Systems (GIS) to determine the area of each major ecological region impacted by permanent habitat removal, temporary construction disturbance revegetated to pre-existing conditions, habitat values reduced by temporary noise impacts and impacts from operational and maintenance activities. Details of the methodology used to determine noise impacts are found in Final Study Report 7 – Noise; maps of areas subject to noise impacts on individual animals are shown in Appendix A. Where noise impacts from two or more features overlapped, they were clipped to prevent "double counting."

Maps showing wildlife critical winter range or migration corridors were also spatially analyzed by GIS for impacts on these noise levels by LPP Project construction, operations and maintenance activities.

Wildlife habitat on the Kaibab-Paiute Indian Reservation was surveyed in conjunction with the vegetation communities and special status plant species field surveys, and are addressed in the Final Special Status Wildlife Species and Habitats Study Report.

2.4.2 Wildlife Populations

Observations of wildlife recorded on data sheets during vegetation community mapping were compiled by major ecological region (Colorado Plateau and Mojave Desert). After review of the vegetation community spatial data and community descriptions, it was determined that the mosaic of individual vegetation communities and overlap of vegetation species and structure between communities would make analysis of wildlife populations at the vegetation community level exceedingly complex.

Recorded wildlife observations were used if they met the following criteria:

- Global Positioning System (GPS) data associated with an observation were sufficient to place the observation within one of the major ecological regions crossed by the study area, based on Final Study Report 15, Vegetation Communities, Appendix B, Map B-3, Ecological Regions (UBWR 2016b). GPS boundaries used for analysis were as follows: Colorado Plateau Ecological Region – east of Universal Transverse Mercator (UTM) 2951000E (generally the Hurricane Cliffs); and Mojave Desert Ecological Region – west of UTM 2951000E and south of UTM 4128000N. Google Earth was used to establish the general boundaries of the ecological regions. If GPS parameters were not recorded for an observation, it was not included in the analysis unless there was additional specific location information (e.g., "Reservation Survey," "Kane County") sufficient to place the observation within an ecological region.

- Wildlife observations were identified sufficiently in the field notes to determine genus and species. General observations, such as "lizard" or "rattlesnake," were not used unless species range maps or descriptions of habitat utilized indicated that only one such species occurs in the ecological regions crossed by the study area.

- Wildlife sign, including carcasses, cast antlers, distinctive ground markings (e.g., tracks, burrows) or other evidence (e.g., typical middens) were included when sufficient to identify a genus or species.

Wildlife species lists were augmented with species potentially present in ecological regions, but not observed. Common wildlife species in the study area were derived from sources listed in Section 2.2, including range maps and occurrence data.

Impacts on wildlife species were analyzed by general habitats utilized and changes in those habitats that would be caused by construction or operation and maintenance of LPP Project features and facilities. Impacts on populations from loss or fragmentation of habitat were evaluated in terms of minimum home range requirements and migration patterns, where known. Some species may require a critical area of contiguous habitat; other species are able to utilize a wider range of habitats or habitats that are not contiguous. Indirect impacts on wildlife populations caused by activities associated with construction and operation or maintenance of the LPP Project were determined based on best professional judgment. Direct and indirect impacts were quantified and compared to significance criteria to determine significant impacts.

Potential impacts on wildlife populations on the Kaibab-Paiute Indian Reservation are included in the Final Special Status Wildlife Species and Habitats Study Report.

Chapter 3
Affected Environment

3.1 Impact Area

The impact area (or study area) includes the following:

- Corridors (approximately 120 feet wide) along the areas directly affected by construction of pipelines and associated features (e.g., pressure valves and drains), access roads, new or upgraded transmission lines and associated features (e.g., transformers, switch stations), pump stations and associated features (e.g., parking, forebays, afterbays), generation stations and associated features (e.g., parking, transformers, switch stations), construction staging areas, and reservoirs and associated features (e.g., dikes, overflows)

- Areas affected by noise and human activity that may impact wildlife habitat values or wildlife population behavior or migration patterns

- Streams and rivers and associated riparian vegetation that could have alterations in flow from baseline conditions under operations of the LPP Project

Figures 3-1 and 3-2 show the overall study area for the LPP Project alternatives. Maps of noise impact areas are contained in Appendix A. Detailed maps of project features and facilities are contained in Chapter 1.

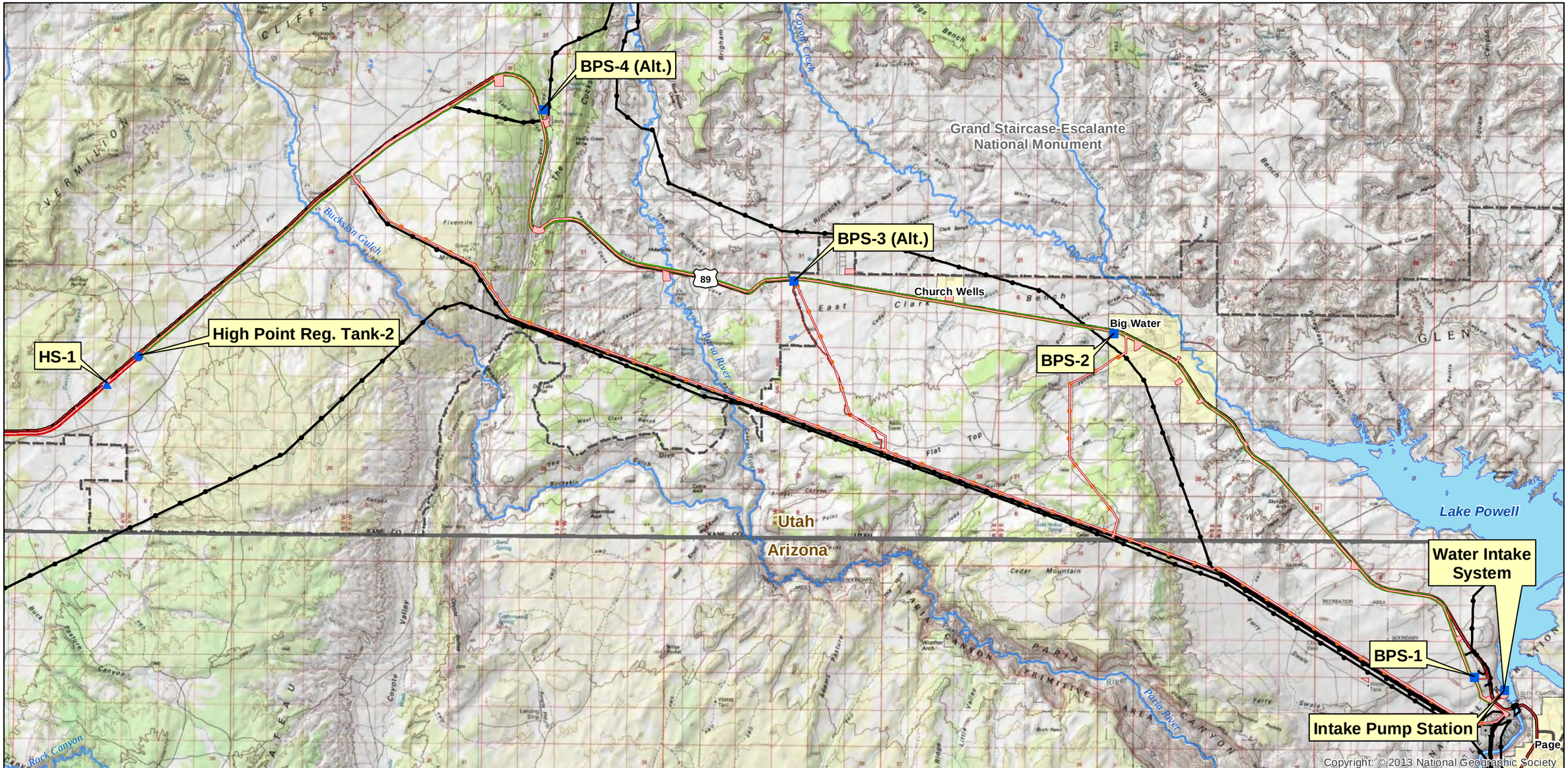
3.2 Overview

Plant communities, local topography, elevation, proximity to water, soil type, disturbance from human activities and livestock grazing generally characterize wildlife habitats and values in the study area. The 240 miles of pipeline and penstock alignments in the study area and 80 miles of transmission line corridors in the study area traverse a wide range of vegetation communities that provide wildlife habitats for a broad range of potential wildlife species. Approximately 14 percent of the alternative corridors are within or adjacent to developed areas, existing highway ROWs, access roads, transmission line ROWs or other disturbed areas that have reduced habitat and wildlife values (UBWR 2016b).

3.3 Wildlife Habitat

Final Study Report 15 – Vegetation Communities (UBWR 2016a) describes 34 plant communities in the study area. The vegetation communities are defined by two major ecological regions: the Colorado Plateau Ecological Region and the Mojave Desert Ecological Region.

Each major ecological region is subdivided into “ecological systems” that are equivalent to definable vegetation communities (UBWR 2016b). A total of 18,275.2 acres were surveyed. Detailed descriptions and maps of these communities are included in Final Study Report 15 – Vegetation Communities and will not be duplicated here. The vegetation mapping survey included 300- or 600-foot corridors surrounding features of the LPP Project; the wider corridor was surveyed in areas with greater potential for sensitive plant species, based on soil type and geologic substrate.



250 ft Study Area
Project Pump Station
Project Regulating Tank
Project Hydro Station
Substation
Water Conveyance System
Hydro System - Proposed Action
KCWCD System
Hydro System, Existing Highway Alternative
Hydro System, Southeast Corner Alternative
Project Transmission Line
Interstate
US Highway
ST Highway
Hwy
Major Road
Existing Transmission Lines
Lakes & Reservoirs
Major Rivers & Streams
National Park/Monument
GSENM Boundary
State Boundaries
Cities

FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472

N

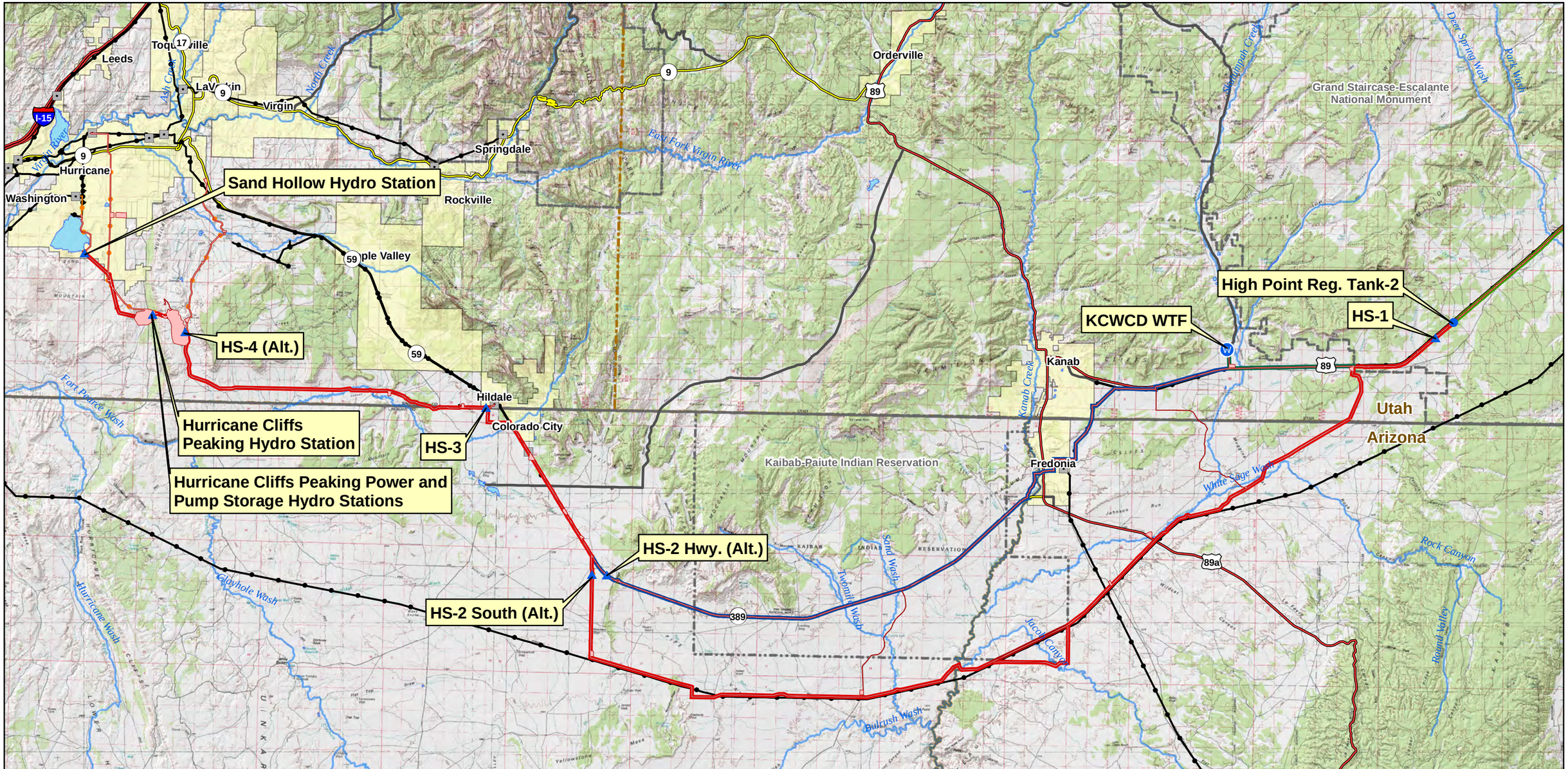
0 0.5 1 2 3 4 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 3-1** MWH

Lake Powell Pipeline Water Conveyance System Study Area



250 ft Study Area
Water Treatment Facility
Project Pump Station
Project Regulating Tank
Project Hydro Station
Water Conveyance System
Hydro System - Proposed Action
KCWCD System
Hydro System, Existing Highway Alternative
Hydro System, Southeast Corner Alternative
Interstate
US Highway
ST Highway
Hwy
Major Road
National Park/Monument
GSENM Boundary
Tribal Lands
State Boundaries
Cities
County Boundaries
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams
Substation
Project Transmission Line
Existing Transmission Lines

FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472

N

0 1.25 2.5 5 7.5 10 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 3-2** MWH

Lake Powell Pipeline Hydro System Study Area

The survey area, including corridor widths, is shown on Map 2-1 of Final Study Report 15 – Vegetation Communities. For the purposes of this report, the vegetation communities are considered potential wildlife habitats. The vegetation communities are not uniform segments along the project corridors, but are a mosaic of communities, both longitudinally and transversely in the corridors (see UBWR 2016b, Appendix E for detailed mapping of the vegetation communities in the survey area). The vegetation communities are listed with surveyed acreages in Table 3-1, are shown in Figure 3-3 and are briefly summarized in the following sections. Big game seasonal crucial ranges and migration routes are considered separately. UDWLR designates crucial seasonal ranges based on habitat values rather than vegetation community type (AGRC 2010).

Table 3-1
Vegetation Communities in the LPP Project Study Area

Vegetation Community Type	Acreage in Study Area
Colorado Plateau Ecological Region	
Colorado Plateau Active and Stabilized Dune	615.3
Colorado Plateau Big Sagebrush Shrubland	3069.2
Colorado Plateau Blackbrush-Mormon-tea Shrubland	1260.3
Colorado Plateau Grassland	547.1
Colorado Plateau Greasewood Flat	184.1
Colorado Plateau Gypsum Badland	662.5
Colorado Plateau Juniper Savanna	30.5
Colorado Plateau Lower Montane Riparian Woodland and Shrubland	82.8
Colorado Plateau Mixed Bedrock Canyon and Tableland	464.1
Colorado Plateau Mixed Desert Scrub	3671.2
Colorado Plateau Mixed Low Sagebrush Shrubland	69.9
Colorado Plateau Pinyon-Juniper Woodland	1774.2
Colorado Plateau Shrub Steppe	1858.9
Colorado Plateau Volcanic Rock and Cinder Land	37.3
Colorado Plateau Wash	159.3
Total	**14,486.6**
Mojave Desert Ecological Region	
Mojave Desert Active and Stabilized Dune	106.4
Mojave Desert Bedrock Cliff and Outcrop	25.8
Mojave Desert Blackbrush-Mormon-tea Shrubland	80.5
Mojave Desert Creosotebush-White Bursage Desert Scrub	307.4
Mojave Desert Grassland	39.4
Mojave Desert Lower Montane Riparian Woodland and Shrubland	2.9
Mojave Desert Mixed Desert Scrub	249.7
Mojave Desert Shrub-Steppe	200.5
Mojave Desert Volcanic Rock and Cinder Land	139.4
Mojave Desert Wash	11.3
Total	**1163.3**
Grand Total	**15,649.9**

Source: Lake Powell Pipeline Draft Vegetation Communities Study Report, Utah Board of Water Resources, 2016b.

Several incidental land classes were also described in the vegetation community survey, including quarries (2.0 acres), reservoirs (1.9 acres), ruderal (disturbed herbaceous) vegetation (697.8 acres) and stock ponds (8.6 acres). These areas generally have reduced wildlife habitat value, although quarries, reservoirs and stock ponds may serve as potential water sources in a generally arid environment and may provide wildlife habitats in riparian vegetation at their margins.

Developed lands in the surveyed study area totaled 247.3 acres. Developed roads included 236.3 acres of paved roads, 154.7 acres of graded roads, and 78.5 acres of unimproved roads. Invasive upland vegetation totaled 970.5 acres. These areas were not considered significant wildlife habitat for impact analysis.

All reduced value habitat and non-habitat areas including 182.8 acres of agricultural lands, totaled 2,580.8 acres, approximately 14.2 percent of the vegetation survey area.

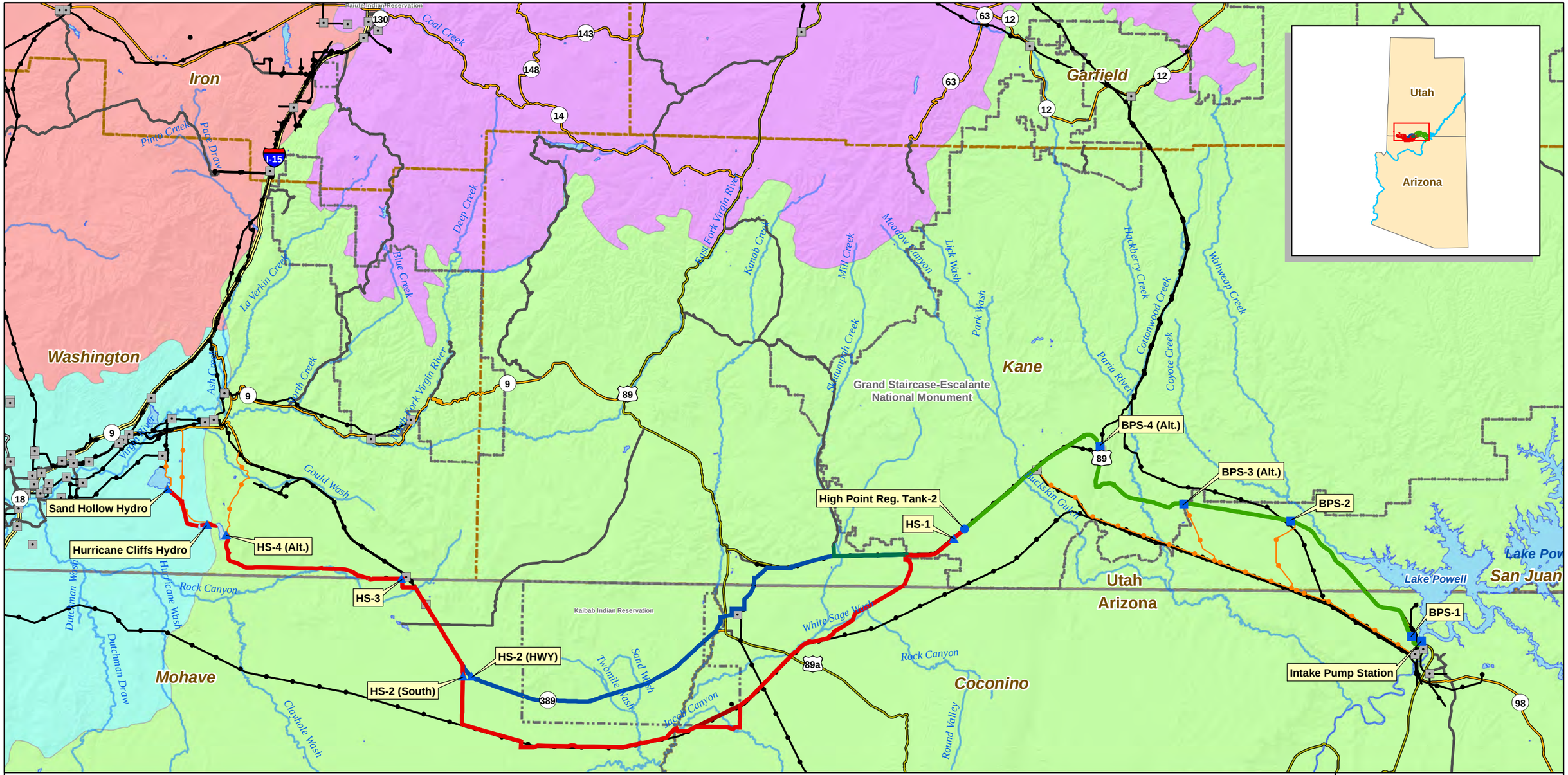
3.3.1 Colorado Plateau Ecological Region and Vegetation Communities

The Colorado Plateau Ecological Region covers all of the LPP Project study area in Kane County, Utah, most of the study area in Washington County, Utah, and all the study area in Coconino and Mohave Counties, Arizona. The Colorado Plateau includes all of the LPP Project Water Intake System, Water Conveyance System, and Hydro System and electrical transmission lines from Lake Powell to the top of the Hurricane Cliffs. The elevation of the Colorado Plateau in the project study area ranges from approximately 3,740 feet AMSL to 5,695 feet AMSL. Average rainfall ranges from 6.5 inches annually in Page, Arizona, to 13.6 inches annually in Kanab, Utah.

The Colorado Plateau region comprises 93.7 percent of the total vegetation community survey area and contains 15 vegetation communities described briefly in the following sections (UBWR 2016b).

3.3.1.1 Colorado Plateau Active and Stabilized Dune

The active and stabilized dune community is predominantly found within the eastern portion of the Colorado Plateau Region. Four exceptions include the following: an occurrence along Highway 389 west of Mount Trumbull Road, two areas along Highway 89 with one just west of Fredonia and a second just east of Pipe Springs National Monument, and a single occurrence west of Yellowstone Road. Sand sagebrush (*Artemisia filifolia*) and Nevada jointfir (*Ephedra nevadensis*) are the dominant species associations. This ecological system is most frequently a sparse shrubland, shrubland, or dwarf shrubland.



Ecoregion

- Colorado Plateau
- Great Basin
- Mojave Desert
- Utah High Plateaus

- Project Pump Station
- Project Regulating Tank
- Project Hydro Station
- Substation
- Project Transmission Line
- Existing Transmission Lines

- Water Conveyance System
- Hydro System - Proposed Action
- KCWCD System
- Hydro System, Existing Highway Alternative
- Hydro System, Southeast Corner Alternative
- Hurricane Cliffs Forebay/Afterbay
- Lakes & Reservoirs
- Major Rivers & Streams

- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road

- National Park/Monument
- Tribal Lands
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UTU-85472

0 2.5 5 10 15 20 Miles

N

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 3-3** MWH

Ecological Regions

3.3.1.2 Colorado Plateau Big Sagebrush Shrubland

As the second largest Colorado Plateau community in the area, comprising 21 percent of the Colorado Plateau region, the big sagebrush shrubland community is found predominantly within the central portion of the Colorado Plateau region. Occurrences were documented from the Cockscomb in the east to Gould Wash in the west. The areas of greatest concentration for big sagebrush shrubland are from approximately 3 miles east of Kanab along Highway 89 to the Cockscomb for the northern proposed pipeline alignment, and from the east edge of the Kaibab-Paiute Indian Reservation west to where the southern alignment joins Highway 89. Additional areas of higher concentration include just west of Colorado City and along the Honeymoon trail south of Highway 59. This ecological system is primarily shrubland or sparse understory shrubland with big sagebrush (*Artemisia tridentata*) as the dominant species association.

3.3.1.3 Colorado Plateau Blackbrush-Mormon-tea Shrubland

The blackbrush-Mormon-tea shrubland occupies three distinct areas within the Colorado Plateau Region. Within the western portion of the Colorado Plateau region blackbrush-Mormon-tea shrubland is a dominant ecological system. High concentrations were documented south of Highway 59 along the Honeymoon Trail, along the east and southern edges of the forebay, and continuing east to just west of Canaan Gap. Further east, occurrences were documented along Arizona State Route 389 at the intersection with Yellowstone Road, along Yellowstone Road to the south, and just east of Yellowstone Road along the proposed pipeline corridor. The remaining occurrences documented were within the eastern portion of the Colorado Plateau Region. This ecological system is commonly shrubland or dwarf-shrubland; occasionally sparse shrubland; and rarely wooded shrubland, shrub herbaceous vegetation or herbaceous vegetation. Blackbrush (*Coleogyne ramosissima*) with Mormon tea (*Ephedra nevadensis*), forbs and grasses are the most common plant associations.

3.3.1.4 Colorado Plateau Grassland

This grassland community is found scattered throughout the central portion of the Colorado Plateau Region. This community is primarily herbaceous vegetation or shrub herbaceous vegetation and rarely a mosaic of sparse vegetation and herbaceous vegetation. It has generally been overgrazed. Indian ricegrass (*Achnatherum hymenoides*) is the most common plant association.

3.3.1.5 Colorado Plateau Greasewood Flat

The greasewood flat community is found sporadically throughout the Colorado Plateau Region. It had been documented from as far east as the Paria River to Short Creek near Canaan Gap (west of Colorado City). The greatest concentration of the greasewood flat community occurred near Fredonia. Here it was documented on both the east and west sides of Highway 89, where the proposed pipeline crosses the highway. Greasewood (*Sarcobatus vermiculatus*) is a “halophyte” adapted to alkaline or saline soils. This community is frequently a shrubland, occasionally a sparse shrubland, and rarely shrub herbaceous vegetation in a complex with shrubland dominated by greasewood.

3.3.1.6 Colorado Plateau Gypsum Badland

The gypsum badland community is found in three distinct reaches within the region. From east to west, the first area is located along both the northern and southern proposed pipeline corridors from the Kanab and Fredonia area east for approximately 16 miles, including areas along Eight Mile Gap. The second area is located from Kanab Creek in Fredonia west to the Pipe Springs National Monument turnoff along Highway 389. The third area is located south of Highway 59 along the Honeymoon Trail. Gypsum badlands are most commonly comprised of sparse shrublands and shrublands; occasionally sparse vegetation; woodlands; and dwarf shrublands with numerous plant associations, none of which is dominant.

3.3.1.7 Colorado Plateau Juniper Savanna

Juniper savanna is found in two distinct areas within the Colorado Plateau Region. The first occurrence is centrally located, approximately 3 miles west of the Pipe Springs National Monument turnoff along Highway 389; the second and most easterly occurrences are located west of the Cedar Mountains along both the proposed pipeline corridor and the transmission line corridor. Within the LPP Project study area, this community is variously a sparse woodland, wooded shrubland, and wooded herbaceous vegetation dominated by little Utah juniper (*Juniperus osteosperma*).

3.3.1.8 Colorado Plateau Lower Montane Riparian Woodland Shrubland

This community is found scattered throughout the Colorado Plateau Region. It is most often found adjacent to rivers, creeks, washes, and vegetated stock ponds. It is commonly shrubland; occasionally sparse shrubland; and rarely woodland, forest, shrub herbaceous vegetation, or sparse vegetation. Tamarisk (*Tamarix* spp.) is the most common species.

3.3.1.9 Colorado Plateau Mixed Bedrock Canyon and Tableland

This community had a greater number of occurrences within the eastern portion of the project area along the pipeline corridor. It is comprised of sparse vegetation; occasionally shrubland; infrequently sparse woodland; and rarely sparse dwarf shrubland, wooded dwarf shrubland, sparse shrubland, woodland, wooded shrubland, or dwarf shrubland. Crispleaf buckwheat (*Eriogonum corymbosum*) was the most common plant association.

3.3.1.10 Colorado Plateau Mixed Desert Scrub

Mixed desert scrub is found throughout the Colorado Plateau region and has the largest area – 25 percent – of the Colorado Plateau survey area. It is most commonly a shrubland and less commonly a dwarf shrubland or sparse shrubland. Fourwing saltbush (*Atriplex canescens*) and broom snakeweed (*Gutierrezia sarothrae*) are the most common plant associations.

3.3.1.11 Colorado Plateau Mixed Low Sagebrush Shrubland

This small community is found within the central portion of the Colorado Plateau Region. Occurrences were documented on either side of Buckskin Gulch along Highway 89, along the southern pipeline corridor from Highway 89A to Mount Trumbull Road, and along Mount Trumbull Road. Mixed low sagebrush shrubland is frequently a shrubland, sparse shrubland or dwarf shrubland. Black sagebrush (*Artemisia nova*) dominates.

3.3.1.12 Colorado Plateau Pinyon-Juniper Woodland

As the fourth largest Colorado Plateau community in the area, comprising 12 percent of the Colorado Plateau region, the pinyon-juniper woodland is found scattered throughout the Colorado Plateau Region. From east to west, occurrences are concentrated south of Highway 59 along the Honeymoon Trail adjacent to the forebay area, west of Colorado City along the proposed pipeline corridor, southeast of Colorado City scattered along Highway 389 to Pipe Springs, and along both Highway 89 and the transmission line to the south from the Kanab area to immediately east of Cedar Mountain. It is most commonly a woodland, less commonly a sparse woodland, and occasionally a sparse understory woodland. Little Utah juniper (*Juniperus osteosperma*) dominates the plant associations.

3.3.1.13 Colorado Plateau Shrub-Steppe

As the third most common community in the Colorado Plateau region, with 13 percent of the surveyed area, the Colorado Plateau shrub-steppe occurred in three distinct areas within the region; the majority of these are

centrally located. Very few occurrences were documented east of the Cockscomb. The vast majority were found along the southern pipeline corridor from the Johnson's Wash area to Yellowstone Road and along Highway 389 from Fredonia to Yellowstone Road. The third area is west of Colorado City from Canaan Gap to the forebay and north to Highway 59. It is most frequently a dwarf shrubland, shrubland, sparse dwarf shrubland, or shrub herbaceous vegetation. It has numerous plant associations, of which broom snakeweed (*Gutierrezia sarothrae*) is the most common.

3.3.1.14 Colorado Plateau Volcanic Rock and Cinder Land

All occurrences of this small community were documented south of Highway 59 along the Honeymoon Trail and within the northern area of the forebay, just west of the Honeymoon Trail. It is variously comprised of shrubland, shrub herbaceous vegetation, herbaceous vegetation, and probably wooded shrubland. Eastern Mojave buckwheat/ redstem filaree (*Eriogonum fasciculatum*/*Erodium cicutarium*) is the most common plant association.

3.3.1.15 Colorado Plateau Wash

Over 40 individual washes were documented across the proposed pipeline and transmission line corridors within the Colorado Plateau Region. Many were too small to be mapped on the 1:3,780 scale aerial imagery most commonly used in the LPP Project study area. Thus, the occurrence of this community represents washes wide enough to be accurately delineated; across a 300-foot or 600-foot corridor, this is equal to an average minimum mapping area of 0.3 acres. Washes include shrubland; occasionally sparse shrubland or sparse vegetation; and rarely dwarf shrubland, woodland or sparse woodland with over 12 shrubs and trees as dominant species.

3.3.2 Mojave Desert Ecological Region and Vegetation Communities

The Mojave Desert Ecological Region in the LPP Project study area is located entirely within Washington County, Utah, and contains the Hydro System Hurricane Cliffs afterbay, penstock alternatives to the Sand Hollow Hydro Station and associated electrical transmission lines. The elevation of the Mojave Desert in the project study area ranges from approximately 3,380 feet AMSL to 3,770 feet AMSL. Average rainfall is 8.3 inches annually in St. George, Utah.

The Mojave Desert region comprises 6 percent of the vegetation survey area and contains seven vegetation communities described briefly in the following sections.

3.3.2.1 Mojave Desert Active and Stabilized Dune

The fifth largest community comprises 9 percent of the area in the Mojave Desert region and is found along the southeast edge of Sand Hollow Reservoir and near the entrance to the proposed afterbay. It is typically a shrubland and rarely a sparse shrubland in the creosotebush (*Larrea tridentata*) alliance. Sand sagebrush (*Artemisia filifolia*) is the most common alliance.

3.3.2.2 Mojave Desert Bedrock Cliff and Outcrop

This small community is found in the proposed afterbay of the project area. It is either sparse shrubland or sparse vegetation with blackbrush (*Coleogyne ramosissima*) dominant.

3.3.2.3 Mojave Desert Blackbrush-Mormon-tea Shrubland

This community occurs in two areas within the Mojave Desert region of the project area. The community occurs along the west side of the proposed afterbay. It is either shrubland or sparse shrubland with blackbrush (*Coleogyne ramosissima*) dominant.

3.3.2.4 Mojave Desert Creosotebush-White Bursage Desert Scrub

This community is widespread throughout the Mojave Desert region and has the largest area (25 percent) of the vegetation survey in the region. It is most commonly associated with relatively flat upland habitats and is commonly a shrubland and less commonly a sparse shrubland. Creosotebush (*Larrea tridentate*) dominates.

3.3.2.5 Mojave Desert Grassland

This community is found west of the proposed afterbay. It is exclusively herbaceous vegetation comprised of big galleta grass (*Pleuraphis rigida*).

3.3.2.6 Mojave Desert Lower Montane Riparian Woodland and Shrubland

This small community is found near Sand Hollow Reservoir and in an area associated with agricultural water usage. It is commonly sparse shrubland and occasionally woodland, shrubland, or shrub herbaceous vegetation dominated by tamarisk (*Tamarix* spp.).

3.3.2.7 Mojave Desert Mixed Desert Scrub

The second largest community in the Mojave Desert region (22 percent of surveyed area) is found throughout the Mojave Desert region near the afterbay reservoir site and between Sand Hollow Reservoir and the Hurricane Cliffs. It is comprised of shrubland and dwarf shrubland and rarely sparse dwarf shrubland. The most common alliance is broom snakeweed (*Gutierrezia sarothrae*).

3.3.2.8 Mojave Desert Shrub-Steppe

This community is found predominantly south of Utah State Route 9 within the City of Hurricane between Interstate 15 and the Hurricane Cliffs. It is commonly dominated by herbaceous vegetation with less than 10 percent shrub cover. The creosotebush/big galleta association (*Larrea tridentate / Pleuraphis rigida*) is the most common.

3.3.2.9 Mojave Desert Volcanic Rock and Cinder Land

This community is found scattered throughout the Mojave Desert region in association with rock outcrops and rock lands. It is either herb or shrub dominated, generally with blackbrush (*Coleogyne ramosissima*) or creosotebush (*Larrea tridentata*).

3.3.2.10 Mojave Desert Wash

The few occurrences of this community represent washes wide enough to be accurately delineated; they are located just west of the Hurricane Cliffs, approximately 7 miles south of the city of Hurricane, in association with the afterbay. It is a shrubland consisting of Apache plume (*Fallugia paradoxa*).

3.3.3 Big Game Crucial Ranges and Migration Routes

UDWLR has established areas that are crucial seasonal ranges for mule deer, desert bighorn sheep and pronghorn—species that occur in the LPP Project study area. UDWLR classifies seasonal ranges on the basis of distribution, abundance, forage availability and availability to the animals. “Crucial habitat” is defined as “sensitive use areas that, because of limited abundance and/or unique qualities, constitute irreplaceable crucial requirements for high interest wildlife.” Additional areas are recognized as important seasonal migration routes, especially for mule deer. Figure 3-4 shows the designated crucial seasonal ranges for these species contained in GIS files in the Utah GIS Portal (AGRC 2010) and in the Arizona Game and Fish Division Heritage Data

Management System (AGFD 2010), which contains “crucial” and “high value” seasonal big game ranges in Arizona. Crucial ranges for these three species are discussed in the following sections.

3.3.3.1 Mule Deer

Mule deer seasonal habitat is shown in Figure 3-4. Utah mule deer crucial winter range lies west of the Cockscomb and south of Highway 89 and on Little Creek Mountain (AGRC 2010). There is a recognized major migration route for the Paunsaugunt mule deer herd that migrates across Highway 89 between the Cockscomb and Kanab, Utah (Highway 89 mileposts 36 to 49). This herd has been characterized as a premium species population and an important sportsman resource. The herd is subject to high traffic-related mortality on Highway 89, and motorist warning signs have been installed in high-use deer-crossing locations. Wildlife fencing and improved wildlife undercrossings of Highway 89 are installed along migration routes across GSENM. The fence and wildlife undercrossings represent a major investment by Utah Department of Transportation, GSENM, UDWLR and several other partners. The fence and crossings are designed to minimize wildlife vehicle collisions while maintaining connectivity between mule deer summer and winter ranges.

Mule deer are also a wildlife species of cultural concern to the Kaibab Band of Paiute Indians within northern Arizona. Mule deer habitat is found within the Kaibab-Paiute Indian Reservation.

Arizona mule deer crucial winter range is located just south of the Utah border from the Coyote Valley to Highway 89A, including the Buckskin Mountain area, and south of the Kaibab-Paiute Indian Reservation on both sides of Kanab Creek Canyon (AGFD 2010). High-quality year-round mule deer habitat is located on the Paria Plateau, east of the Kaibab-Paiute Indian Reservation both north and south of Highway 89A, and from the Yellowstone Mesa north along the Cedar Ridge to the Cottonwood Point Wilderness, crossing Arizona State Route 389 (AGFD 2010).

3.3.3.2 Desert Bighorn Sheep

Utah desert bighorn sheep year-round crucial range is shown in Figure 3-4. Utah bighorn sheep crucial winter range is located north of Highway 89 in the Glen Canyon highlands and Fourmile and Jack Riggs Benches areas, and crosses the highway at the Cockscomb, extending south through the Paria Canyon – Vermillion Cliffs Wilderness onto the Paria Plateau in Arizona. Another area of year-round crucial range is located on top of the Vermillion Cliffs and Canaan Mountain in Utah (AGRC 2010).

Desert bighorn sheep are a wildlife species of cultural concern to the Kaibab Band of Paiute Indians within northern Arizona. No desert bighorn sheep habitat was classified within the Existing Highway or the Southeast Corner Alternatives within the Kaibab-Paiute Indian Reservation.

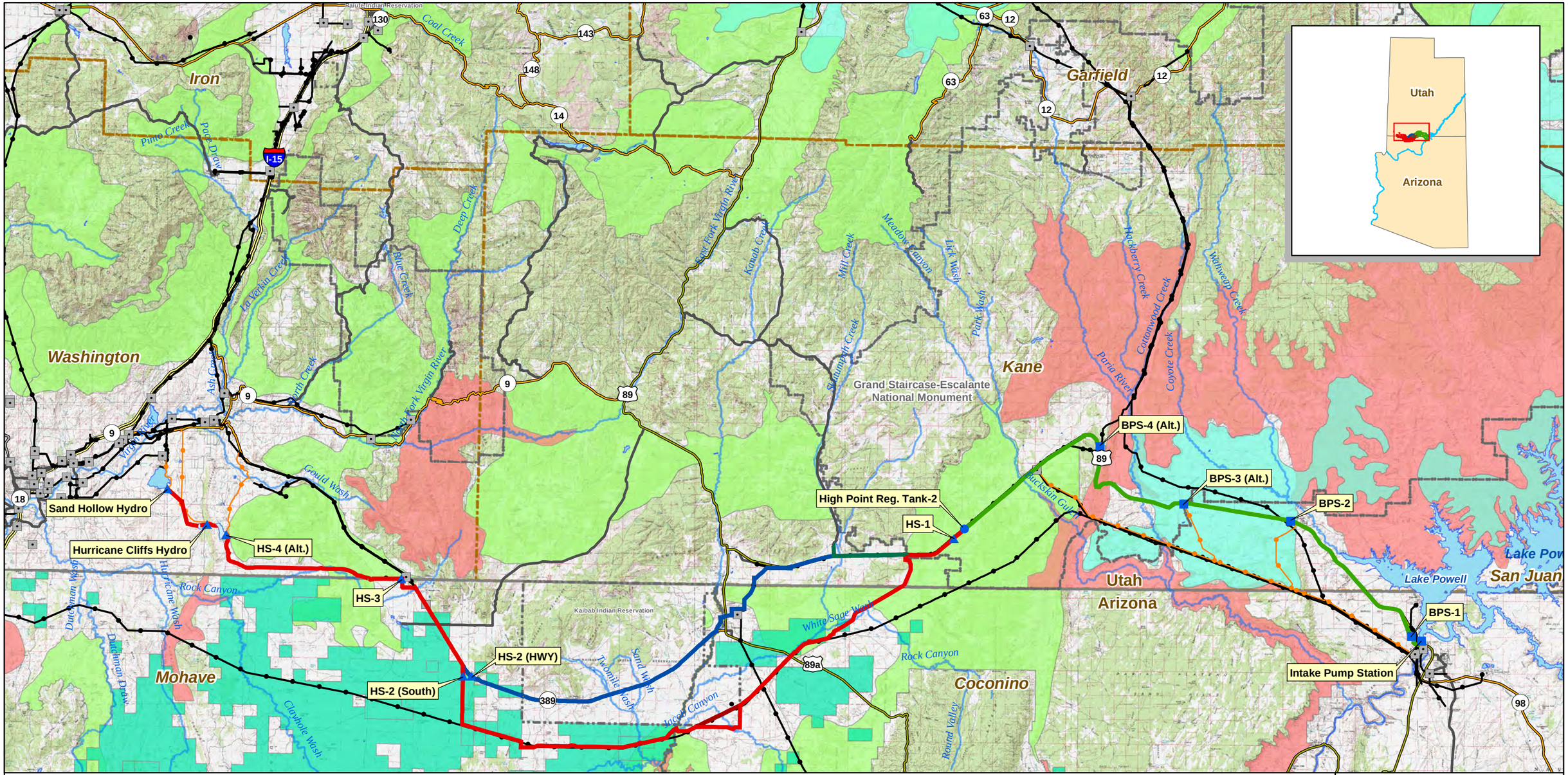
Arizona bighorn sheep habitat is located on the rim of the Vermilion Cliffs on the Paria Plateau and in Kanab Creek Canyon south of the Kaibab-Paiute Indian Reservation (AGFD 2010). There are approximately 62,030 acres of suitable habitat along the Vermilion Cliffs, which AGFD identifies as the Paria Canyon - Vermilion Cliffs Habitat Area. The Vermilion Cliffs National Monument Resource Management Plan (BLM 2007) allocated 57,070 acres of this site as the Vermilion Cliffs Wildlife Habitat Management Area; this management area was established in order to manage the habitat for the benefit of desert bighorn sheep. Bighorn sheep prefer rough, rocky terrain with slopes greater than 20 percent, in order to escape predators. The sheep are rarely found far from this escape cover. The rough and convoluted terrain in this management area provides excellent bighorn sheep habitat. As stated above, bighorn sheep occasionally come onto the Paria Plateau for foraging and water and for traveling across the plateau to access other suitable habitat areas.

3.3.3.3 Pronghorn

Pronghorn seasonal range is shown in Figure 3-4. There is no crucial pronghorn seasonal range close to the LPP Project study area; there is “high value” year-round pronghorn range on the East Clark Bench on both sides of Highway 89 between Big Water and the Paria River in Utah (AGRC 2010).

Pronghorn (antelope) are also a wildlife species of cultural concern to the Kaibab Band of Paiute Indians within northern Arizona. Pronghorn antelope may occur proximate to the Existing Highway or the Southeast Corner Alternatives within the Kaibab-Paiute Indian Reservation.

Arizona does not define “crucial” pronghorn seasonal range; however, “high quality” pronghorn habitat “with problems” is located south of the Kaibab-Paiute Indian Reservation and west of Kanab Creek and in the Yellowstone Mesa area near the southwest corner of the Reservation (AGFD 2010).



FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 3-4** MWH

Big Game Seasonal Range Map

3.4 Wildlife Populations

A broad range of wildlife species inhabits the ecological regions crossed by the LPP Project study area. Wildlife observed during vegetation communities mapping in each region are listed in tables and additional representative species not observed are presented for each region.

3.4.1 Colorado Plateau Ecological Region Wildlife

Table 3-2 lists wildlife observed in the Colorado Plateau Ecological Region during vegetation communities mapping (UBWR 2016b).

Table 3-2
Wildlife Observed in the Colorado Plateau Ecological Region

Page 1 of 3

Common Name	**Scientific Name**
Mammals	
American badger	*Taxidea taxus*
Antelope squirrel	*Ammospermophilus* spp.
Black-tailed jackrabbit	*Lepus californicus*
Bobcat	*Lynx rufus*
Chipmunk	*Tamias* spp.
Cottontail rabbit	*Sylvagius* spp.
Coyote	*Canis laterans*
Elk	*Cervus elaphus*
Jackrabbit	*Lepus* spp.
Mule deer	*Odocoileus hemionus*
Pronghorn	*Antilocapra americana*
Rock squirrel	*Spermophilus variegatus*
Woodrat (packrat)	*Neotona* spp.
Birds	
American robin	*Turdus migratorius*
Ash-throated flycatcher	*Myiarchus cinerascens*
Bewick's wren	*Thryornanes bewicki*
Black-chinned hummingbird	*Archilochus alexandri*
Black-throated gray warbler	*Dendroica nigrescens*
Black-throated sparrow	*Amphispiza bilineata*
Bluebird	*Sailia* spp.
Blue-gray gnatcatcher	*Polioptila caerulia*
Brewer's sparrow	*Spizella breweri*
Brown-headed cowbird	*Molothrus ater*
Canyon wren	*Catherpes mexicanus*
Chipping sparrow	*Spizella passerina*
Common poorwill	*Phalaenoptilus nuttalii*
Common raven	*Corus corvax*

Table 3-2
Wildlife Observed in the Colorado Plateau Ecological Region

Common Name	**Scientific Name**
Cooper's hawk	*Accipiter cooperii*
Costa's hummingbird	*Calypte costae*
*Curve-billed thrasher	*Toxostoma curvirostre*
Gambel's quail	*Callipepia gambelii*
Gray flycatcher	*Empidonax wrightii*
Birds	
Greater roadrunner	*Geococcyx californianus*
Great-tailed grackle	*Quiscalus mexicanus*
Green-tailed towhee	*Pipilo chorurus*
Grey vireo	*Vireo vicinior*
Horned lark	*Erenophila alpestris*
House finch	*Carpodacus mexicanus*
House sparrow	*Passer domesticus*
Killdeer	*Charadrius vociferous*
Lark sparrow	*Chondestes grammacus*
Lesser goldfinch	*Carduelis psaltria*
Loggerhead shrike	*Lanius ludovicianus*
Lucy's warbler	*Vermivora luciae*
Mourning dove	*Zenaida macroura*
Northern mockingbird	*Mimus polyglottos*
Northern rough-winged swallow	*Steigidopteryx serripennis*
"Oriole"	*Icterus spp.*
Osprey	*Pandion haliaetus*
Phainopepla	*Phainopepla nitens*
Red-tailed hawk	*Buteo jamacensis*
Red-winged blackbird	*Agelaius phoeniceus*
Rock wren	*Salpinctes obsoletus*
Say's phoebe	*Sayorra saya*
Song sparrow	*Melospiza melodia*
Spotted towhee	*Pipilo maculatus*
Turkey vulture	*Cathartes aura*
Violet-green swallow	*Tachycineta thalassina*
"Vireo"	*Vireo* spp.
Western grebe	*Aechmophorus occidentalis*
Western kingbird	*Tyrannus verticalis*
Western scrub jay	*Aphelocoma californica*
Western tanager	*Piranga ludoviciana*
White-crowned sparrow	*Zonotrichia leucophyrus*
Wild turkey (Merriam's)	*Meleagris gallopavo merriami*
Yellow warbler	*Dendroica petichia*

Table 3-2
Wildlife Observed in the Colorado Plateau Ecological Region

Page 3 of 3

Common Name	**Scientific Name**
Yellow-headed blackbird	*Xanthocephalus*
Reptiles	
Coachwhip	*Masticophis flagellum*
Common ground snake	*Sonora semiannulata*
*Common lesser earless lizard	*Holbrookia maculate*
Common sagebrush lizard	*Sceloporus graciosus*
Common sideblotched lizard	*Uta stansburiana*
Desert spiny lizard	*Sceloporus magister*
*Eastern collared lizard	*Crotaphytus collaris*
Gopher snake	*Pituophis catenifer*
Greater short-horned lizard	*Phrynosoma hernandesi*
Horned lizard	*Rhynosomia* spp.
Long-nosed leopard lizard	*Gambelia wislizenii*
Reptiles	
Mountain short-horned lizard	*Phrynosoma hernandesi*
"Rattlesnake"	*Crotalus spp.*
Striped whipsnake	*Masticophis taeniatus*
*Western fence lizard	*Sceloporus occidentalis*
Western patch-nosed snake	*Salvadora hexalepis*
Western rattlesnake	*Crotalus viridis*
Western skink	*Eumeces skiltonianus*
Whiptail	*Aspidoscelis* spp.

Note:
*Curved billed thrasher possibly misidentified as a Bendire's Thrasher (*Toxostoma bendirei*); Eastern collared lizard *(Crotaphytus collaris)* possibly misidentified Great Basin Collard lizard (*Crotaphytus bicinctores);* Common lesser earless lizard (*Holbrookia maculate*) possibly misidentified Zebra-tailed (*Callisaurus draconoides*); Western fence lizard *(Sceloporus occidentalis)* possibly misidentified common sagebrush lizard (*Sceloporus graciosus*); Costa's hummingbird *(Calypte costae)* possibly misidentified as Black-chinned Hummingbird *(Archilochus alexandri).*

Representative wildlife species that were not observed in the Colorado Plateau Ecological Region are listed in Table 3-4.

3.4.2 Mojave Desert Ecological Region Wildlife

Table 3-3 lists wildlife observed in the Mojave Desert Ecological Region during vegetation communities mapping (UBWR 2016b).

Table 3-3
Wildlife Observed in the Mojave Desert Ecological Region

Page 1 of 2

Common Name	**Scientific Name**
Mammals	
American raccoon	*Procyon lotor*
Antelope squirrel	*Ammospermophila* spp.
Black-tailed jackrabbit	*Lepus californicus*
Cottontail rabbit	*Sylvagius* spp.
Jackrabbit	*Lepus* spp.
Birds	
Ash-throated flycatcher	*Myiarchus cinerascens*
Black-chinned hummingbird	*Archilochus alexandri*
Black-throated sparrow	*Amphispiza bilineata*
Blue-gray gnatcatcher	*Polioptila caerulia*
Brewer's sparrow	*Spizella breweri*
Brown-headed cowbird	*Molothrus ater*
Canyon wren	*Catherpes mexicanus*
Common poorwill	*Phalaenoptilus nuttalii*
Common raven	*Corus corvax*
Gambel's quail	*Callipepia gambelii*
Gray flycatcher	*Empidonax wrightii*
Greater roadrunner	*Geococcyx californianus*
Green-tailed towhee	*Pipilo chorurus*
Grey vireo	*Vireo vicinior*
House Finch	*Carpodacus mexicanus*
Birds	
House sparrow	*Passer domesticus*
Killdeer	*Charadrius vociferous*
Lark sparrow	*Chondestes grammacus*
Lesser goldfinch	*Carduelis psaltria*
Mourning dove	*Zenaida macroura*
Northern mockingbird	*Mimus polyglottos*
Northern rough-winged swallow	*Steigidopteryx serripennis*
Red-tailed hawk	*Buteo jamacensis*
Red-winged blackbird	*Agelaius phoeniceus*
Rock wren	*Salpinctes obsoletus*
Say's phoebe	*Sayorra saya*
Song sparrow	*Melospiza melodia*
Violet-green swallow	*Tachycineta thalassina*
"Vireo"	*Vireo* spp.

Table 3-3 Wildlife Observed in the Mojave Desert Ecological Region Page 2 of 2	
Common Name	**Scientific Name**
Western grebe	*Aechmophorus occidentalis*
Western kingbird	*Tyrannus verticalis*
Western tanager	*Piranga ludoviciana*
White-crowned sparrow	*Zonotrichia leucophyrus*
White-throated swift	*Aeronautes saxatalis*
Yellow warbler	*Dendroica petichia*
Yellow-headed blackbird	*Xanthocephalus*
Reptiles	
Collared lizard	*Crotaphytus* spp.
Common king snake	*Lampropeltis getula*
Common sideblotched lizard	*Uta stansburiana*
Gopher snake	*Pituophis catenifer*
Horned lizard	*Rhynosomia* spp.
Rattlesnake	*Crotalus* spp.
Sidewinder	*Crotalus cerastes*
Western fence lizard	*Sceloporus occidentalis*
Western rattlesnake	*Crotalus viridis*
Whiptail	*Aspidoscelis* spp.

Representative wildlife species that were not observed in the Mojave Desert Ecological Region are listed in Table 3-4.

3.4.3 Additional Potential Species in the LPP Project Study Area

Table 3-4 lists wildlife species that were not observed during the vegetation communities' field survey, but are potentially present in the LPP Project study area (indicated by "X"). This list is not intended to be comprehensive; it includes species representative of the ecological regions. Species would occur in appropriate habitats within the ecological regions and, for migratory species, during appropriate seasons. Species are not necessarily limited to one ecologic region; potential occurrence of listed species in multiple regions is indicated in the table. If a species was observed in one ecological region but is potential in other regions, it is included in the table (indicated by "O").

Table 3-4
Additional Potential Wildlife Species in the LPP Project Study Area

Common Name	Scientific Name	Colorado Plateau	Mojave Desert
Mammals			
Allen's big-eared bat	*Idinycteris phyllatis*	X	X
American badger	*Taxidea taxix*	O	X
American black bear	*Ursus americanus*	X	X
American raccoon	*Procyon lotor*	X	O
Arizona woodrat	*Neotoma devia*		X
Big brown bat	*Eptescius fuscus*	X	X
Big free-tailed bat	*Nyctinomops macrotis*	X	X
Bobcat	*Lynx rufus*	O	X
California myotis	*Myotis californicus*	X	X
Common gray fox	*Urocyon cinereaargenteus*	X	X
Coyote	*Canis laterans*	O	X
Deer mouse	*Peromyscis spp.*	X	X
Desert shrew	*Notiosorex crawfordi*	X	X
Kangaroo rat	D*ipodomys* spp.	X	X
Little brown myotis	*Myotis lucifugus*	X	X
Long-legged myotis	*Myotis volans*	X	X
Long-tailed weasel	*Mustela frenata*	X	X
North American porcupine	*Erethizon dorsalis*	X	X
Red fox	*Vulpes*	X	
Striped skunk	*Mephitus*	X	X
Western spotted skunk	*Spigale gracilus*	X	X
Yuma myotis	*Myotis yumaensis*	X	X
Birds			
American crow	*Corvis bracyrhynchos*	X	
American kestrel	*Falco sparverius*	X	X
Black-capped chickadee	*Poecile atricapillus*	X	X
Brewer's blackbird	*Euphagus cyanocephalus*	X	X
Cooper's hawk	*Accipiter cooperii*	O	X
Downy woodpecker	*Picoides pubescens*	X	X
European starling	*Sturnus vulgaris*	X	X
Great horned owl	*Bubo virginianus*	X	X
Hairy woodpecker	*Picoides villosus*	X	X
House wren	*Troglodytes aedon*	X	X
Mallard	*Anas platyrhynchos*	X	X
Nighthawk	*Chordeiles* spp.	X	X

Table 3-4
Additional Potential Wildlife Species in the LPP Project Study Area

Page 2 of 2

Common Name	Scientific Name	Colorado Plateau	Mojave Desert
Birds			
Northern flicker	*Colaptes auratus*	X	X
Plumbeous vireo	*Vireo plumbeus*	X	
Sharp-shinned hawk	*Accipiter striatus*	X	X
Swainson's hawk	*Buteo swainsoni*	X	X
Western screech-owl	*Megascops kennicotti*	X	X
White-breasted nuthatch	*Sitta carolinensus*	X	X
Reptiles			
Desert glossy snake	*Arizona elegans philipi*		X
Eastern racer	*Coluber constrictor*	X	X
Night snake	*Hypsiglena torquata*	X	X
Terrestrial garter snake	*Thamnophis elegans*	X	X
Western banded gecko	*Coleonyx variegatus*		X
Amphibians			
Tiger salamander	*Ambystoma tigrinum*	X	X
Pacific tree frog	*Pseudacris regilla*		X
Northern leopard frog	*Rana pipiens*	X	X
Canyon tree frog	*Hyla arenicolor*	X	X
Great Basin spadefoot	*Spea intermontana*	X	X

Notes:
X = Wildlife species potentially present in the LPP Project study area (not observed during vegetation communities field surveys
O = Wildlife species observed in one ecological region within LPP Project study area and potentially could occur in other ecological regions

3.4.4 Wildlife Species of Cultural Concern to the Kaibab Band of Paiute Indians of Northern Arizona

Table 3-5 lists wildlife species of cultural concern to the Kaibab Band of Paiute Indians of northern Arizona. Wildlife habitat within the Kaibab-Paiute Indian Reservation lies within the Colorado Plateau Ecological Region. Wildlife species of cultural concern to the Kaibab Band of Paiute Indians are also included in Tables 3-2 and 3-4.

UDWRe consulted with the Kaibab Band of Paiute Indians and received a list of wildlife species of concern to the Tribe. The Kaibab Band of Paiute Indians recognize the "Tribe's Sovereign Right to govern its Wildlife Resource, and also recognizes the Spiritual, Cultural and Economic value of the Wildlife Resources its use by its members and all others, the Tribal Council, recognizes those resources are irreplaceable Tribal Assets and that unregulated use of the Wildlife Resources of the Tribe would threaten the Political Integrity, Economic Security, Spiritual, Cultural, Health and Welfare of the Tribe. . . . The Tribe intends that Tribal Members and their spouses shall be afforded the greatest possible freedom to use and enjoy these resources consistent with the Preservations and improvement of these resources for future generations. To preserve the Indian respect for life in all forms and to perpetuate this attitude, both in Traditional Manner of hunting, fish and game and the approach to conservation of these most precious resources" (http://www.kaibabpaiute-nsn.gov/Wildlife.html). Permission was granted by the

Kaibab Band of Paiute Indians to conduct multiple sensitive wildlife surveys and habitat assessments on the Kaibab-Paiute Indian Reservation within proposed LPP alignments. Field surveys for Kaibab Band of Paiute Indians sensitive species were conducted on over 2,000 acres of the Kaibab-Paiute Indian Reservation. Results of the survey were presented to the Tribal Council on June 18, 2009.

Table 3-5
Wildlife Species of Cultural Concern to the Kaibab Band of Paiute Indians of Northern Arizona

Mule Deer	Lizards
Rabbits	Gophers
Cottontails	Owls
Chipmunks	Mourning Doves
Coyotes	Crickets
Fox	Grasshoppers
Badgers	Bighorn sheep
Squirrels (Flying and Nonflying)	Buffalo
Eagles	Woodpeckers
Mice/Rats	Antelope
Porcupine	Bobcats - Lynx
Bats	Mountain Lions
Crows/Ravens	Ducks
All Snakes (i.e., Rattle, Blow)	All Hawks
Condors	Prairie Dogs
Skunks	Frogs
Raccoons	

Chapter 4
Environmental Consequences

4.1 Significance Criteria

There are no regulatory guidelines for wildlife population or habitat loss or impacts, and the significance criteria are based on past experience with similar projects and best professional judgment.

The following criteria were used to determine significant impacts on wildlife and habitats:

- Project activities resulting in substantial disturbance to wildlife habitat or populations. A substantial disturbance is one that destroys a large area of utilized habitat, disturbs or displaces a resident population or sub-population, or results in losses of a large number of individuals of the species within the LPP Project study area. Disturbance may arise from direct construction impacts on habitat or indirectly by noise or human activity that would reduce wildlife habitat values. Substantial disturbance is based on the status, population dynamics, behavior, habitat availability and quality for each species group (e.g., game or non-game species) relative to the type, intensity and duration of a specific impact. Species that are locally common or have a high reproductive potential and ability to recolonize previously disturbed sites rapidly would have less potential impacts than species with small populations, limited habitats, low reproductive potential or limited ability to disperse out of or back into previously disturbed habitats.

- Project activities that would cause a substantial loss (temporary or permanent) or unavailability of big game crucial seasonal range or migration corridors during crucial use periods (as designated by game management agencies).

4.2 Classification of Impacts

Potential impacts from construction, operation and maintenance of LPP Project features and facilities are described in the following sections.

4.2.1 Impacts on Wildlife Habitats

- **Permanent Impacts:** Habitat would be permanently removed by replacement with constructed features such as pipelines and accessories (e.g., valves, drains), pump stations, hydro generating stations, regulating tanks, reservoirs, hard surface or graded roads, parking areas, transmission line tower pads and electrical substations.

- **Temporary Impacts:** Habitat disturbed during construction would be restored and revegetated. Some habitat would be revegetated with a different plant structure, that is, shrubland or woodland converted to grassland/forbs over a pipeline. In general for the LPP Project, because vegetation communities are relatively patchy, this would create a softer ecotone (boundary between two habitats) as opposed to an abrupt “hard” ecotone such as a highway corridor cleared through a dense forest.

4.2.2 Impacts on Wildlife Populations

- **Direct Impacts:** Impacts resulting from mortality of individual animals from construction by crushing, road kills, loss of nests, death of eggs or nestlings or abandonment of nests before young are fledged or able to forage independently (mammals).

- **Indirect Impacts:** Impacts resulting from changes in land use patterns or levels of human activity, noise, disruption of home ranges or migration routes, or alterations in the carrying capacity of habitats. Indirect

impacts from construction would be less on nocturnal species because construction would be done during daylight hours.

4.3 South Alternative

The South Alternative would involve constructing, operating and maintaining the features and facilities described in Chapter 1, Section 1.2.1 and shown in Figures 1-1, 1-2 and 1-4. Pipelines (water delivery system and penstocks) would have a 100-foot permanent disturbance corridor over the length of the features, a 20-foot-wide temporary construction easement for the water conveyance system pipeline adjacent to and away from the highway (total 20-foot temporary disturbance corridor), and 30-foot temporary construction disturbance corridors on either side of the permanent disturbance area (total 60-foot temporary disturbance corridor). Footprints of booster pump stations, hydro generation stations, regulating tanks, forebays and afterbays, and access roads associated with those features are included in the permanent disturbance area. Construction staging areas would be temporarily disturbed and revegetated after construction is completed. To avoid "double counting," the footprints of staging areas within either permanent or temporary disturbance areas are not included in the habitat disturbance tables in the following sections; the footprints of staging areas outside of project feature disturbance areas are included in the habitat disturbance tables as temporary impacts.

4.3.1 Construction Phase

4.3.1.1 Wildlife Habitats

Wildlife habitat disturbance areas are analyzed by major ecological region. Areas that do not provide significant habitat values (developed areas, ruderal vegetation, invasive vegetation, paved and graded roads and quarries) are quantified and deducted from overall habitat impacts to reflect the net wildlife habitat disturbance impact.

4.3.1.1.1 Colorado Plateau Ecological Region. The estimated Colorado Plateau habitat area disturbed by construction of the South Alternative and the Transmission Line Alternative is shown in Table 4-1.

Table 4-1
Colorado Plateau Habitat Disturbance from the South Alternative and Transmission Line Alternatives

Overall Impacts		Non-habitat Area Impacts	Net Habitat Area Impacts
Permanent Impacts (acres)	1,529.2	223.6	1,305.6
Temporary Impacts (acres)	2,389.9	189.7	2,200.2
Total (acres)	**3,919.1**	**413.3**	**3,505.8**

The net permanent habitat impact of 1,306 acres would not be significant because of the extensive area of equivalent or better-quality habitat immediately adjacent to the construction corridor. Staging areas would add 613 acres to the temporary disturbance area. The area of temporary impacts would be restored and revegetated and would regain some of its habitat values within two or three growing seasons. Temporary impacts would not exceed the significance criteria.

4.3.1.1.2 Mojave Desert Ecological Region. The estimated Mojave Desert habitat area disturbed by construction of the South Alternative and the Transmission Line Alternative is shown in Table 4-2.

Table 4-2 Mojave Desert Habitat Disturbance from the South Alternative and Transmission Line Alternatives			
Overall Impacts		**Non-habitat Area Impacts**	**Net Habitat Area Impacts**
Permanent Impacts (acres)	321.1	7.9	313.2
Temporary Impacts (acres)	344.6	40.3	304.3
Total (acres)	**665.7**	**48.2**	**617.5**

The net permanent habitat impact of 313.2 acres within the Mojave Desert habitat would not be significant because of the extensive area of equivalent or better-quality habitat immediately adjacent to the construction corridor. Staging areas would add 129.1 acres to the temporary disturbance area. The area of temporary impacts would be restored and revegetated and would regain some of its habitat values within two or three growing seasons. Complete revegetation and habitat restoration would take a number of years following construction disturbance. Temporary impacts would not exceed the significance criteria.

4.3.1.1.3 Big Game Seasonal Ranges and Migration Routes. Big game seasonal ranges and migration routes are analyzed by species in the following sections.

4.3.1.1.3.1 Mule Deer. The South Alternative water delivery pipeline and penstock corridors would cross crucial mule deer winter range and cross a known migration route of the Paunsaugunt mule deer herd along Highway 89 west of the Cockscomb (Figure 3-4). The pipeline corridors through the mule deer range would be approximately 35.5 miles in length; approximately 135 acres of habitat would be permanently disturbed, and an equivalent area would be temporarily disturbed, restored and revegetated. Construction along Highway 89 between mileposts 36 and 49 in the migration corridor should occur outside of the periods of high use by the herd, from March 1 through April 30 and from October 1 through November 31; in that case, disruption of the migration habitat would not exceed the significance criteria. Construction of the penstock through the migration route would be placed as far from Highway 89 as possible so that it would not interfere with potential future construction of wildlife crossings or underpasses intended to reduce existing mule deer mortality on Highway 89. The Paunsaugunt mule deer herd crucial winter range extends along Highway 89 from milepost 31 to 50. Pipeline and penstock construction during the period May 1 through September 30 would avoid impacts on the deer herd crucial winter habitat. In that case, noise impacts would not exceed the significance criteria.

Approximately 4.7 miles of the penstock corridor would cross Arizona mule deer crucial winter range south of the Kaibab-Paiute Indian Reservation (Figure 3-4). About 34 acres of this habitat would be permanently disturbed, and about 34 acres would be temporarily disturbed, restored and revegetated. These areas of disturbance would not exceed the significance criteria. During construction, the area within the noise impact area would have temporary reduced habitat values (Appendix A, Figure A-2); construction should be scheduled outside of the high-use season. In that case, noise impacts would not exceed the significance criteria.

A 9.5-mile access road would be constructed between the penstock construction corridor and Highway 89 east of Fredonia through the Muggins Flat area (Figure 3-4); 0.7 miles of this road would be new construction, totaling about 1.2 acres of permanent disturbance. About 8.8 miles would be upgrades of existing dirt roads. This road crosses approximately 5 miles of Arizona crucial winter mule deer range.

Approximately 7.1 miles of penstock corridor would cross crucial mule deer winter range in Utah between Hildale City and the Canaan Gap; permanent habitat disturbance would be approximately 26 acres with temporary disturbance of an equivalent area. There is 65.6 acres of temporary disturbance from construction staging areas in

crucial winter mule deer range. During construction, the area within the noise impact area would have temporary reduced habitat values (Appendix A, Figure A-2); if possible, construction utilizing this road should be scheduled outside of the high-use season. In that case, impacts would not exceed the significance criteria.

4.3.1.1.3.2 Desert Bighorn Sheep. The South Alternative would cross year round crucial bighorn sheep range in the area of the Cockscomb (Figure 3-4). The area is not identified as a specific migration corridor, but it provides continuity of habitat between Utah and Arizona for bighorn sheep. All LPP Project features would be constructed within or adjacent to the Highway 89 ROW and would cause temporary additional disturbance in the bighorn sheep seasonal range (Appendix A, Figure A-1) for a period of up to one year. However, it is unlikely that this added disturbance would materially impact sheep migration patterns or exceed the significance criteria.

LPP Project features do not cross Arizona bighorn sheep habitat (Figure 3-4); there would be no impacts on seasonally important Arizona bighorn sheep range.

4.3.1.1.3.3 Pronghorn. There is crucial pronghorn winter range on the East Clark Bench on both sides of Highway 89 between Big Water and the Paria River in Utah; approximately 14.8 miles of the Water Delivery System pipeline corridor would be placed within the Highway 89 ROW through this area (Figure 3-4). Approximately 108 acres of crucial pronghorn range would be permanently disturbed, although its proximity to the highway would make it unlikely that this habitat would be a significant resource for pronghorns. There would be two pipeline construction staging areas totaling 14.3 acres in potential crucial pronghorn habitat; both would be placed within existing developed lands and would not impact crucial pronghorn seasonal range.

High-quality pronghorn habitat “with problems” is located in Arizona south of the Kaibab-Paiute Indian Reservation west of Kanab Creek and on Yellowstone Mesa (Figure 3-4). The Hydro System penstock would be constructed across these areas. The penstock corridor would cross approximately 1.1 miles of the eastern habitat area, and a 25-acre construction staging area would also be located in this area. An existing dirt road would be upgraded, extending north from the pipeline corridor across the eastern habitat area for approximately 0.9 miles. The penstock would cross approximately 3.3 miles of high-quality habitat near Yellowstone Mesa and a 28-acre construction staging area would also be located in that area. Permanent habitat disturbance would be approximately 40 acres; this would not be significant because of the extensive area of equivalent habitat adjacent to the Project study area.

Permanent habitat disturbance would not be significant because of the extensive area of equivalent habitat adjacent to the Project study area. Although there would be temporary human activity and noise disturbance that would reduce habitat values in the described areas during construction (Appendix A, Figures A-1, A-2), impacts would not meet the significance criteria. Construction staging areas would be restored and revegetated and would regain some of their habitat values within two or three growing seasons. Coordination with the UDWLR should be performed to schedule construction outside of pronghorn high use periods in the construction corridors.

4.3.1.2 Wildlife Populations

4.3.1.2.1 Direct Impacts. The estimated area of net permanent habitat impacts (1,306 acres) is small relative to the available surrounding habitat area; much of the construction corridor is located in or adjacent to areas of existing land use or disturbance that would reduce its habitat value. Construction could cause mortality of some small mammals and reptiles that would not be able to disperse from the site. Most mammals, birds and larger reptiles would disperse from construction sites, and direct mortality would not be expected. Small animals could fall into open trenches and be buried by placement of fill or concrete. Clearing of trees and other vegetation could cause mortality of bird eggs or nestlings if performed during the nesting season; construction corridors should be cleared outside of the nesting and fledging period. Flooding of newly created reservoirs could drown small animals that would be unable to disperse from the area of inundation.

Procedures to avoid and minimize these impacts are described in Chapter 5, Mitigation and Monitoring. It would be unlikely that any wildlife population would be placed at risk or that direct impacts on wildlife populations or species would meet the significance criteria. A Draft Wildlife Resources Mitigation Plan is included as Appendix B.

4.3.1.2.2 Indirect Impacts. Most wildlife species would disperse from temporary construction and noise disturbances into abundant adjacent habitats. It is estimated that the active construction impact on any given point along a pipeline corridor would be about 10 work days (with a noise/activity buffer of 1,250 feet [equal to 70 dBA] in front of and behind the construction site—total 2,500 feet [see Appendix A]—and estimated construction progress of 250 feet per day). After restoration and revegetation, temporarily disturbed areas would regain some habitat value in two or three growing seasons. It is possible that some wildlife populations could be impacted if adjacent habitats were not suitable or were already at carrying capacity and that some small terrestrial species could be permanently displaced from their home ranges, but it would be unlikely that these impacts would place any population at risk or exceed the significance criteria.

4.3.2 Operations and Maintenance Phase

4.3.2.1 Wildlife Habitats

4.3.2.1.1 General Wildlife Habitats. It is anticipated that LPP Project pumping stations and hydro generating stations would be operated using electronic Supervisory Control and Data Acquisition (SCADA) systems, minimizing disturbance from human presence and traffic noise. Onsite visits to these facilities are estimated to take place weekly. Human presence at the large intake facility would likely be on a daily basis. Except for hydro stations on top of the Hurricane Cliffs, all of these facilities would be located proximate to existing highways, and human visitation activity would not cause sufficient additional disturbance during operations to raise impacts to the level of the significance criteria. Occasional maintenance surveys along pipeline corridors would not cause significant disturbance.

Restored and revegetated pipeline corridors would not act as barriers to movement or migration of wildlife populations, and after revegetation is complete in two or three growing seasons, home ranges would not be significantly impacted. Some revegetated areas may have higher-quality habitat than existed before disturbance, and long-term impacts could be positive, although the magnitude of those positive impacts cannot be estimated.

Recreational activities (all-terrain or off-road vehicle use) could increase on maintenance roads along revegetated pipeline corridors, and direct (road kill) and indirect (noise and activity) impacts are possible, but the level of impacts would not likely place any population at risk or exceed the significance criteria. Access controls at road heads could minimize potential impacts.

Infrequent releases of water from water delivery system pipeline or hydro system penstock may be required for periodic maintenance, most likely during January in some years to ephemeral drainages. The specific locations of drains in either feature are pending final engineering design and are therefore not available.

4.3.2.1.2 Big Game Seasonal Ranges and Migration Routes

4.3.2.1.2.1 Mule Deer. High Point Regulating Tank-2 and Hydro Station HS-1 would be constructed near the migration crossing of the Paunsaugunt mule deer herd (Figure 3-4). Maintenance activities at these facilities would be only occasional and would occur during the daytime, when deer would not likely be actively migrating; there would be no significant impacts from operations and maintenance. Recreational access road impacts would be the same as described in Section 4.3.2.1.1.

4.3.2.1.2.2 Desert Bighorn Sheep. Desert bighorn sheep year-round crucial range crosses the project study area at the Cockscomb (Figure 3-4). Recreational access road impacts would be the same as described in Section 4.3.2.1.1.

4.3.2.1.2.3 Pronghorn. There are no pump stations or hydro stations near pronghorn high-quality range; rare maintenance surveys would take place on pipeline access roads near pronghorn range in Arizona. Impacts from these surveys would be minor and not significant. Recreational access road impacts would be the same as described in Section 4.3.2.1.1.

4.3.2.2 Wildlife Populations

4.3.2.2.1 Direct Impacts. Minor mortality of small terrestrial species would be possible from maintenance surveys along pipelines, but the impacts would not exceed the significance criteria.

4.3.2.2.2 Indirect Impacts. Occasional maintenance surveys and activities along the pipelines could cause temporary disturbance of wildlife, but the impacts would not be significant. Recreational access road impacts would be the same as described in Section 4.3.2.1.1.

4.4 Existing Highway Pipeline Alternative

The Existing Highway Pipeline Alternative would involve constructing, operating and maintaining the features and facilities described in Chapter 1, Section 1.2.2 and shown in Figure 1-5. It would be similar to the South Alternative, except that the penstock would be constructed in the Highway 389 ROW instead of south of the Kaibab-Paiute Indian Reservation.

4.4.1 Construction Phase

4.4.1.1 Wildlife Habitats

4.4.1.1.1 Colorado Plateau Ecological Region. The estimated Colorado Plateau area disturbed by construction of the Existing Highway Alternative and transmission line alignments is shown in Table 4-3.

Table 4-3
Colorado Plateau Habitat Disturbance from the Existing Highway Alternative

Overall Impacts		Non-habitat Area Impacts	Net Habitat Area Impacts
Permanent Impacts (acres)	1,429.3	273.7	1,155.6
Temporary Impacts (acres)	2,255.1	208.0	2,047.1
Total (acres)	**3,684.4**	**481.7**	**3,202.7**

The net permanent wildlife habitat impacts of 1,155.6 acres would not be significant because of the extensive area of equivalent or better-quality habitat immediately adjacent to the construction corridor. Staging areas would add 488.0 acres to the temporary disturbance area. The area of temporary impacts would be restored and revegetated and would regain some of its habitat values within two or three growing seasons. Temporary impacts would not exceed the significance criteria.

The Existing Highway Alternative alignment includes approximately 239.42 acres of temporary disturbance and 199.49 acres of permanent disturbance within the Kaibab-Paiute Indian Reservation, all within the Colorado Plateau Ecological Region.

4.4.1.1.2 Mojave Desert Ecological Region. Impacts would be the same as described in Section 4.3.1.1.2.

4.4.1.1.3 Big Game Seasonal Ranges and Migration Routes

4.4.1.1.3.1 Mule Deer. Impacts in Utah would be essentially the same as described in Section 4.3.1.1.3.1 and would not be significant. The penstock corridor would cross about 1.8 miles of Arizona crucial mule deer winter range; permanent disturbance would be about 13.3 acres and would cross 16.46 miles of the Kaibab-Paiute Indian Reservation in the Arizona State Route 389 ROW. This impact would not be significant because of the extensive adjacent habitat of equivalent value.

4.4.1.1.3.2 Desert Bighorn Sheep. Impacts would be the same as described in Section 4.3.1.1.3.2 and would not be significant.

4.4.1.1.3.3 Pronghorn. Impacts on the East Clark Bench would be the same as described in Section 4.3.1.1.3.3 and would not be significant. There would be no impacts from construction of pipelines, staging areas or access roads in Arizona pronghorn range, including the Kaibab-Paiute Indian Reservation.

4.4.1.2 Wildlife Populations

4.4.1.2.1 Direct Impacts. Direct impacts would be the same as described in Section 4.3.1.2.1, except the net permanent impacts would occur on 1,156 acres.

4.4.1.2.2 Indirect Impacts. Indirect impacts would be the same as described in Section 4.3.1.2.2.

4.4.2 Operations and Maintenance Phase

4.4.2.1 Wildlife Habitats

4.4.2.1.1 General Wildlife Habitats. Operations and maintenance impacts would be occasional and similar to those described in Section 4.3.2.1.1. Impacts would not exceed the significance criteria.

4.4.2.1.2 Big Game Seasonal Ranges and Migration Routes. Impacts would be the same as described in Section 4.3.2.1.2 and would not be significant.

4.4.2.2 Wildlife Populations

4.4.2.2.1 Direct Impacts. Impacts would be the same as described in Section 4.3.2.2.1 and would not be significant.

4.4.2.2.2 Indirect Impacts. Impacts would be the same as described in Section 4.3.2.2.2 and would not be significant.

4.5 Southeast Corner Pipeline Alternative

The Southeast Corner Pipeline Alternative would involve constructing, operating and maintaining the features and facilities described in Chapter 1, Section 1.2.3 and shown in Figure 1-6. This alternative would be the same as the South Alternative, except that the penstock would be constructed across the southeast corner of the Kaibab-Paiute Indian Reservation.

4.5.1 Construction Phase

4.5.1.1 Wildlife Habitats

4.5.1.1.1 Colorado Plateau Ecological Region. The only difference between the South Alternative and the Southeast Corner Alternative would be shortening of the penstock corridor by approximately 1.4 miles. This would reduce the net permanent habitat disturbance area by 8.0 acres to a total of 1,298 acres, and would reduce the temporary habitat disturbance area by 21.6 acres to a total of 2,179 acres. Permanent habitat disturbance area includes 45.13 acres within the Kaibab-Paiute Indian Reservation. The difference in net total disturbance area is less than 1 percent between the alternatives. This difference would not be material and impacts would be the same as described in Section 4.3.1.1.1, except where the two alignments diverge since the Southeast Corner Alternative would follow the existing 500-kV transmission line where disturbance has occurred in the past.

4.5.1.1.2 Mojave Desert Ecological Region. Impacts would be the same as described in Section 4.3.1.1.2.

4.5.1.1.3 Big Game Seasonal Ranges and Migration Routes. Impacts would be the same as described in Section 4.3.1.1.3.

4.5.1.2 Wildlife Populations

4.5.1.2.1 Direct Impacts. Direct impacts in construction areas would be similar to those described in Section 4.3.1.2.1.

4.5.1.2.2 Indirect Impacts. Indirect impacts in construction areas would be similar to those described in Section 4.3.1.2.2.

4.5.2 Operations and Maintenance Phase

4.5.2.1 Wildlife Habitats

4.5.2.1.1 General Wildlife Habitats. Operations and maintenance impacts would be occasional and similar to those described in Section 4.3.2.1.1. Impacts would not exceed the significance criteria.

4.5.2.1.2 Big Game Seasonal Ranges and Migration Routes. Operations and maintenance impacts would be occasional and similar to those described in Section 4.3.2.1.2. Impacts would not exceed the significance criteria.

4.5.2.2 Wildlife Populations

4.5.2.2.1 Direct Impacts. Impacts would be the same as described in Section 4.3.2.2.1, except the net permanent impacts would occur on 1,298 acres and would not be significant.

4.5.2.2.2 Indirect Impacts. Impacts would be the same as described in Section 4.3.2.2.2 and would not be significant.

4.6 Transmission Line Alignments

The Transmission Line Alignments would involve constructing, operating and maintaining the features and facilities described in Chapter 1, Section 1.2.4 and shown in Figures 1-7 and 1-8.

4.6.1 Construction Phase

All of the aerial transmission lines to be constructed are high-voltage lines, with voltages ranging from 34.5 kV (one line) to 345 kV (one line). Approximately 79.5 miles of new transmission lines would be constructed. Most of the aerial lines would be 138 kV (two lines) or 69 kV (seven lines). A potential new overhead transmission line totaling 0.6 mile of 12.47 kV would be constructed from HS-3 to Hildale City. Aerial transmission line towers would consist of 75- to 100-foot-tall single poles or H-towers. Foundations for the poles would be constructed by ground crews, and the towers would be delivered to each foundation by helicopter for installation. Pole foundations would be approximately 8 by 8 feet square and spaced 450 feet apart (12 per mile). Total permanent tower base disturbance would be approximately 0.02 acres per line mile. Each new transmission line would have a double track 10-foot-wide access road constructed parallel to the line; new lines would use existing access road alignments where possible. Total permanent disturbance for new or upgraded access roads would be approximately 1.2 acres per line mile; total permanent disturbance for transmission lines would be approximately 1.22 acres per line mile. Conductors would be pulled by equipment within the ROW and would not require additional disturbance area for installation.

A transmission line ROW requires an area cleared of trees sufficient to protect the conductor wires from hazards from falling trees and arcing. The required distance of clearing from the centerline of the ROW is variable because of the variable sag of conductors between support poles, the greatest sag occurring at the midpoint between support poles. Conductor sag is greater with higher loads and during hot weather. Conductors also sway laterally due to wind pressure. Any trees within the conductor cross-section of the line that would potentially contact or arc to the conductors at maximum sag, load and sway would be removed from the ROW; certain tall “danger trees” outside of the ROW would also be removed if there were risks to the conductors if the trees fell. In general, for a 75-foot-tall support tower pole line, vegetation over 25 feet in height would be required to be cleared to a distance of 50 feet from the center line only in the region surrounding maximum sag. Because of the patchy distribution of trees along most of the new transmission lines and varying topography, it is not possible to estimate the necessary area of ROW clearing.

New switch stations and substations would be constructed, and existing substations would be upgraded to handle the increased line voltages. Upgraded substations would require about 5 acres of additional permanent land disturbance outside of the existing substation footprint. New switch stations and substations would require a footprint of approximately 5 acres of permanent land disturbance.

4.6.1.1 Wildlife Habitats

4.6.1.1.1 Colorado Plateau Ecological Region. The estimated permanent habitat disturbance area in the Colorado Plateau Ecological Region from overhead transmission lines is shown in Table 4-4.

Table 4-4 Colorado Plateau Ecological Region Permanent Aerial Transmission Line Habitat Disturbance (Acres)			
Transmission Lines	**Access Roads**	**Sub-stations**	**Total**
1.2	72.4	25	98.6

The new HS-3 Transmission Line would be constructed along existing suburban roads and would not measurably impact wildlife habitat.

Under any of the scenarios, the permanent impact would not be significant because of the extensive area of equivalent or better-quality habitat immediately adjacent to the construction corridor.

ROW clearing would impact a small part of the transmission line corridors because most of the dune, grassland, shrubland, steppe and savannah habitat in the Colorado Plateau Ecological Region does not have vegetation at a height that would exceed the ROW requirements. Little Utah juniper (*Juniperus osteosperma*), the most common juniper species in the region, has a mature height of 26 feet (USDA 2010), which would require clearing at a distance of about 50 feet from the corridor center line at the region of maximum sag. Plant communities potentially containing juniper and other trees of equal or greater height occur in 7.5 percent of the Colorado Plateau Ecological Region vegetation survey area; however, juniper stands are relatively patchy where they occur across transmission line corridors. ROW clearing would create a relatively soft edge effect that would not adversely impact most resident species home ranges or movements. The impact of ROW clearing would not be significant because of the extensive area of equivalent or better-quality habitat immediately adjacent to the construction corridor.

Staging areas would cause temporary habitat impacts on 56.1 acres that would be restored and revegetated.

4.6.1.1.2 Mojave Desert Ecological Region. The estimated permanent habitat disturbance in the Mojave Desert Ecological Region is shown in Table 4-5.

Table 4-5 Mojave Desert Ecological Region Permanent Aerial Transmission Line Habitat Disturbance (Acres)			
Transmission Lines	**Access Roads**	**Sub-stations**	**Total**
0.4	23.0	0	23.4

This permanent impact would not be significant because of the extensive area of equivalent or better-quality habitat immediately adjacent to the construction corridor.

Plant communities potentially containing juniper and other trees of equal or greater height occur in 1.1 percent of the Mojave Desert Ecological Region vegetation survey area. ROW impacts would be minimal, as described in Section 4.6.1.1.1.

Staging areas would cause temporary habitat impacts on 120 acres that would be restored and revegetated.

4.6.1.1.3 Big Game Seasonal Ranges and Migration Routes

4.6.1.1.3.1 Mule Deer. A total of 13.9 miles of transmission lines would be constructed in mule deer crucial winter range south of the Cockscomb; the total permanent habitat disturbance would be approximately 17 acres. A 400-foot long transmission line would be constructed near the Petrified Hollow Wash in the area of the migration route across Highway 89; total permanent habitat disturbance would be less than 1 acre.

All construction of transmission lines in crucial mule deer winter range should be coordinated with the UDWLR, and construction should be scheduled outside of the crucial high use period of November 1 to April 15.

4.6.1.1.3.2 Desert Bighorn Sheep. Approximately 2.3 miles of the new Glen Canyon to Buckskin transmission line would be constructed across desert bighorn sheep year-round crucial range located south of the Cockscomb. Approximately 0.6 mile of transmission line and associated access road would be constructed across crucial bighorn sheep range at the Paria River (Figure 3-4); less than 1 acre of potential habitat would be permanently disturbed.

Total permanent habitat impact from new aerial transmission lines would be approximately 3.5 acres. This impact would not be significant because of the large area of equivalent habitat adjacent to the construction corridor. New construction and transmission line upgrades should be performed outside of seasonal high-use periods; UDWLR should be consulted to schedule the transmission line construction.

4.6.1.1.3.3 Pronghorn.
BPS-2 and BPS-3 Alt. transmission lines totaling approximately 28.8 miles would be constructed across crucial pronghorn range on the East Clark Bench. Approximately 14.6 miles of the new Glen Canyon to Buckskin transmission line would be constructed through crucial pronghorn habitat. Three electrical substations would be constructed in crucial pronghorn habitat, with about 15 acres of permanent impacts. Total permanent habitat impact would be approximately 68 acres. This impact would not meet the significance criteria because of the large area of equivalent high-value pronghorn range adjacent to the construction corridors. New construction should be done outside of seasonal high-use periods; UDWLR should be consulted to schedule the transmission line construction.

Staging areas would cause temporary habitat impacts on approximately 52.9 acres that would be restored and revegetated.

4.6.1.2 Wildlife Populations

4.6.1.2.1 Direct Impacts. Direct impacts would be similar to those described in Section 4.3.1.2.1, but of lesser magnitude because excavation would occur in a smaller area. Small vertebrate species could suffer mortality from access road traffic and transmission tower construction; larger species would disperse to surrounding habitats and direct mortality would not be anticipated. No species or population would be placed at risk, and impacts would not exceed the significance criteria.

New transmission lines could provide hunting perches for raptors, possibly impacting prey species in the immediate vicinity of the transmission lines. The impacts of predation would not be quantifiable; it is unlikely that any prey species population would be placed at risk, and impacts would not exceed the significance criteria.

4.6.1.2.2 Indirect Impacts. Indirect impacts would be similar to those described in Section 4.3.1.2.2, but of lesser magnitude because of smaller areas of major construction disturbance. Impacts would be temporary, and habitat would be reoccupied after construction was completed. Home ranges and migration routes would not be impacted.

4.6.2 Operations and Maintenance Phase

4.6.2.1 Wildlife Habitats

4.6.2.1.1 General Wildlife Habitats. It is anticipated that LPP Project switch stations and substations would be operated using electronic SCADA systems, minimizing disturbance from human presence and noise. Infrequent human visitation for operations and maintenance would not cause significant impacts on habitat quality. ROW impacts would be the same as described in Section 4.6.1.1.1.

New or upgraded access roads along transmission lines would lead to increased off-highway-vehicle activity on these roads.

4.6.2.1.2 Big Game Seasonal Ranges and Migration Routes. Operations and maintenance of transmission lines and substations would not require frequent human presence or disturbance during crucial wildlife range high-use or migration periods. Impacts would not exceed the significance criteria.

It is possible that new or upgraded access roads along transmission lines could lead to increased off-road-vehicle activity. Access controls at road heads could minimize potential impacts.

4.6.2.2 Wildlife Populations

4.6.2.2.1 Direct Impacts. Operation and maintenance of transmission lines and substations would not cause direct impacts on most wildlife populations. Some small mammals and reptiles may suffer road kill during ground surveys or maintenance activity, but the number of animals impacted would be small and no species or population would be placed at risk. Impacts would not meet the significance criteria.

It is possible that new or upgraded access roads along transmission lines could lead to increased recreational off-road-vehicle activity and associated road kill mortality; however, the level of impacts would not likely place any population at risk or exceed the significance criteria. Access controls at road heads could minimize potential impacts.

Transmission lines are known hazards to birds by mortality from collisions with towers or conductors and by electrocution of raptors nesting on towers. This mortality would be minimized by following the *Edison Electrical Institute (EEI) Avian Protection Plan Guidelines* (EEI and USFWS 2005) and the *EEI Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (EEI 2006). Mortality caused by transmission lines would not place any species or population at risk and impacts would not meet the significance criteria.

4.6.2.2.2 Indirect Impacts. Transmission lines and associated access roads would not be barriers to migration and would have minimal impacts on species home ranges. Impacts would not be significant.

It is possible that new or upgraded access roads along transmission lines could lead to increased recreational off-road-vehicle activity and associated noise (Aspen 2010) and disturbance that would lower habitat values. Access controls at road heads could minimize potential impacts.

4.7 Natural Gas Pipeline and Generators Alternative

The Natural Gas Pipeline and Generators Alternative would involve constructing, operating and maintaining the features and facilities described in Chapter 1, Section 1.2.1 and shown in Figures 1-1, 1-2 and 1-3 Section 1.2.5, and shown in Figures 1-9 and 1-10. The natural gas supply line would follow the proposed LPP ROW from the Sand Hollow Gate Station to the intake pump station near Page, Arizona. The line would be about 138.5 miles

long and installed a minimum of 10 feet from the edge of the proposed water pipeline in a separately excavated trench within the LPP ROW. The effects on wildlife species and habitat would be the same as those described for the South Alternative in Section 4.3., Section 4.3.1., and Section 4.3.2.

4.8 No Lake Powell Water Alternative

The No Lake Powell Water Alternative would not deliver Lake Powell water to the WCWCD or KCWCD. There would be no construction of the LPP Project water intake, water transmission or water hydro systems or their associated electrical transmission lines. Water supplies for the WCWCD and KCWCD would be obtained by a combination of developing remaining available surface water and groundwater supplies, developing reverse osmosis (RO) treatment of existing low-quality water supplies (WCWCD only), and eliminating residential outdoor irrigation (WCWCD only).

4.8.1 Construction Phase

4.8.1.1 Wildlife Habitats

4.8.1.1.1 Colorado Plateau Ecological Region. No features or facilities would be constructed in the Colorado Plateau Ecological Region; there would be no impacts from the No Lake Powell Water Alternative.

4.8.1.1.2 Mojave Desert Ecological Region. The No Lake Powell Water Alternative would have long-term impacts on approximately 3,130 acre**s** of wildlife habitat in the Mojave Desert Ecological Region.

4.8.1.1.3 Big Game Seasonal Ranges and Migration Routes. The No Lake Powell Water Alternative would have no impacts on big game seasonal ranges and migration routes in the Mohave Desert Ecological Region.

4.8.1.2 Wildlife Populations

4.8.1.2.1 Direct Impacts. Direct impacts in construction areas would be similar to those described in Section 4.3.1.2.1 and would not be significant.

4.8.1.2.2 Indirect Impacts. Indirect impacts in construction areas would be similar to those described in Section 4.3.1.2.2 and would not be significant.

4.8.2 Operations and Maintenance Phase

4.8.2.1 Wildlife Habitats

4.8.2.1.1 General Wildlife Habitats. Operations and maintenance impacts would be occasional and similar to those described in Section 4.3.2.1.1. Impacts would not exceed the significance criteria.

4.8.2.1.2 Big Game Seasonal Ranges and Migration Routes. Operations and maintenance impacts would be occasional and would not impact any big game seasonal ranges or migration routes. Operation of the No Lake Powell Water Alternative would have no impact on big game seasonal ranges and migration routes because they do not occur around or in Warner Valley near the St. George metropolitan area. Impacts would not exceed the significance criteria.

4.8.2.2 Wildlife Populations

4.8.2.2.1 Direct Impacts. Operations and maintenance impacts would be occasional and similar to those described in Section 4.3.2.2.1. Impacts would not exceed the significance criteria.

4.8.2.2.2 Indirect Impacts. Operations of the No Lake Powell Water Alternative would reduce non-sewered return flow to the Virgin River between Hurricane and the Utah-Arizona State Line resulting from eliminating residential outdoor irrigation. Reducing non-sewered return flow to the Virgin River by 21.4 to 23.5 cfs (ranging from 77 to 80 percent reduction in non-sewered return flow) (UDWRe 2016c) could reduce riparian and other habitat for wildlife in the Virgin River floodplain. These indirect impacts could reduce wildlife populations along the Virgin River, and the impacts could be significant.

4.9 No Action Alternative

Under the No Action Alternative, there would be no construction of water intake, distribution or treatment facilities. The No Action Alternative would not cause construction, operation or maintenance impacts on wildlife habitat, wildlife populations, or big game seasonal ranges or migration routes.

Chapter 5
Mitigation and Monitoring

This chapter describes mitigation and monitoring methods to reduce impacts of LPP Project construction and operation and maintenance on wildlife habitats and wildlife populations, including those on the Kaibab-Paiute Indian Reservation identified as wildlife species of cultural concern, as applicable. Many of these methods will be incorporated into project "Standard Construction Procedures" (SCPs) to be used in the field as LPP Project features and facilities are being constructed.

5.1 Wildlife Mitigation Measures

The following wildlife mitigation measures would be applicable to all LPP Project features and facilities during construction. Protection, mitigation and enhancement measures for wildlife resources would include the following:

- To the extent feasible, construction activities on or around important wildlife habitat (e.g., critical deer winter range, bighorn fawning areas and migration corridors) would be scheduled to avoid the periods of greatest use.
- Any dead or injured wildlife found within or near the ROW of the LPP Project would be recorded and reported. Handling of dead or injured wildlife would only be performed by a qualified wildlife biologist.
- Wildlife found inhabiting a ROW section of pipeline would be gently hazed by a qualified wildlife biologist into an area safely away from construction of the LPP Project.
- Identify rangelands, both permanent and temporary, for wildlife displaced due to LPP Project.
- Clearing of trees and other vegetation should be conducted outside of the nesting and fledging periods or if performed during the nesting season as determined by Arizona Game and Fish Department (AGFD) and Utah Division of Wildlife Resources (UDWLR). Avian nesting surveys would be conducted to locate active nests to be flagged for avoidance or as removed in compliance with U.S. Fish and Wildlife Service (USFWS), AGFD, or UDWLR direction.
- Consult with ADFG and UDWLR to determine if hunting seasons for wildlife as game should be modified or cancelled in areas affected by the LPP Project construction.
- Re-establish native vegetation that serves or may serve as food for wildlife, at the conclusion of pipeline segment and facilities construction in the various areas.
- Vehicular speeds would be limited to safe speeds in construction zones or on construction access roads to minimize collisions with wildlife.
- The area directly ahead of trenching equipment would be monitored for small animals (mammals, birds, reptiles, and amphibians), and to the extent possible, any small animals observed would be hazed from the construction corridor by a qualified wildlife biologist or captured and relocated to a safe distance from the construction corridor.
- Trenches would be covered or backfilled, or barriers and approved working lights should be placed along open trenches at the completion of each day, and no more than 1,000 feet of trench should be open at any one location or segment. All open trenches would be constructed with escape ramps to allow trapped wildlife to exit the trenches.
- Open trenches would be visually checked before beginning daily construction activities, and small animals in the trenches would be captured and relocated if possible by a qualified wildlife biologist before construction commences.
- Effects on wildlife resources can be avoided and minimized by following standard hazardous materials control procedures, restoration and erosion control procedures, air pollution prevention procedures, surface water protection procedures, noxious weed control procedures and riparian area protection procedures.

- Construction and facility sites would be kept free of all trash, including food refuse and micro-trash. Micro-trash includes small and easily ingestible materials such as bottle caps, broken glass, cigarette butts, small plastic bits, bullets, bullet casings, and food materials. Construction sites would be cleaned up at the end of each day (e.g., trash removed and scrap materials picked up) to minimize potential ingestion of trash by wildlife.
- New and upgraded overhead power transmission lines would be constructed to meet the most current edition of *Suggested Practices for Raptor Protection on Power Lines* (EEI 2006) and *Reducing Avian Collisions with Power Lines: The State of the Art in 2012* (APLIC 2012).
- An Avian Protection Plan would be developed following the *Avian Protection Plan (APP) Guidelines* (APLIC and USFWS 2005) prior to construction.
- Pipeline, penstock and electrical transmission construction would be coordinated with UDWLR to avoid impacts on Paunsaugunt mule deer herd migration. Construction on pipeline and penstock segments between Highway 89 mileposts 36 and 49 would be scheduled to not occur from March 1 to April 30 and October 1 through November 31.
- Pipeline, penstock and electrical transmission line construction in crucial mule deer winter range would be coordinated with UDWLR and scheduled during the period from May 1 through September 30 between Highway 89 milepost 31 and 50 to avoid impacts on crucial mule deer winter habitat. If these dates are determined to be too restrictive to efficiently construct the pipeline and penstock, then alternative minimization techniques would be discussed with UDWLR.
- Unavoidable impacts on Paunsaugunt deer herd crucial winter habitat could be mitigated by compensatory measures, including contributions to ongoing mule deer habitat improvement projects and construction of a new improved crossing structure at Highway 89 milepost 39.5. Compensatory mitigation measures would be coordinated as necessary with UDWLR.
- Pipeline, penstock and electrical transmission line construction in crucial bighorn sheep and pronghorn ranges would be coordinated with UDWLR.
- No permanent fencing would be constructed along the pipeline and penstock alignments to avoid restricting big game and other wildlife movement patterns.
- UDWRe would coordinate with ranchers and UDWLR to make sure existing water sources continue to be available during construction for livestock and wildlife. If the LPP Project construction affects water sources, UDWRe would provide alternate water sources.

5.2 South Alternative

5.2.1 Construction

- Construction of South Alternative features in the mule deer migration zone should be scheduled outside of high-use periods.

5.2.2 Operation and Maintenance

- Survey or maintenance vehicles should be restricted to safe speeds according to road locations.

5.3 Existing Highway Alternative

5.3.1 Construction

The Existing Highway Alternative would have the same protection, mitigation and enhancement measures as described for the South Alternative in Section 5.2.1.

5.3.2 Operation and Maintenance

The Existing Highway Alternative would have the same protection, mitigation and enhancement measures as described for the South Alternative in Section 5.2.2.

5.4 Southeast Corner Alternative

5.4.1 Construction

The Southeast Corner Alternative would have the same protection, mitigation and enhancement measures as described for the South Alternative in Section 5.2.1.

5.4.2 Operation and Maintenance

The Southeast Corner Alternative would have the same protection, mitigation and enhancement measures as described for the South Alternative in Section 5.2.2.

5.5 Transmission Line Alignments

5.5.1 Construction

The Transmission Line alignments would have the same protection, mitigation and enhancement measures as described for the South Alternative in Section 5.2.1.

5.5.2 Operation and Maintenance

The Transmission Line alignments would have the same protection, mitigation and enhancement measures as described for the South Alternative in Section 5.2.2.

5.6 Natural Gas Pipeline and Generators Alternative

5.6.1 Construction

The Natural Gas Pipeline and Generators Alternative would have the same protection, mitigation and enhancement measures as described for the South Alternative in Section 5.2.1.

5.6.2 Operation and Maintenance

The Natural Gas Pipeline and Generators Alternative would have the same protection, mitigation and enhancement measures as described for the South Alternative in Section 5.2.2.

5.7 No Lake Powell Water Alternative

5.7.1 Construction

The No Lake Powell Water Alternative would have the same protection, mitigation and enhancement measures as described for the South Alternative in Section 5.2.1.

5.7.2 Operation and Maintenance

The No Lake Powell Water Alternative would have the same protection, mitigation and enhancement measures as described for the South Alternative in Section 5.2.2.

5.8 No Action Alternative

No features or facilities would be constructed, operated or maintained under the No Action Alternative; therefore, no mitigation or monitoring would be required.

Chapter 6
Unavoidable Adverse Impacts

This chapter describes unavoidable adverse impacts from construction, operation and maintenance of the LPP Project alternatives. Unavoidable adverse impacts are those remaining after application of mitigation and monitoring measures described in Chapter 5. Only resources that would have unavoidable adverse impacts are described here. Unavoidable adverse impacts may not meet or exceed the significance criteria.

6.1 South Alternative

6.1.1 Construction Phase

6.1.1.1 Wildlife Habitats

The Proposed Action would have short-term unavoidable adverse impacts on Colorado Plateau Region and Mojave Desert Region wildlife habitat during construction. The portions of the ROW used for access roads along the South Alternative alignment would have long-term unavoidable adverse effects on Colorado Plateau Region and Mojave Desert Region wildlife habitat because the road surfaces would not be revegetated. The South Alternative features (pump stations, regulating tank, hydro stations, forebay reservoir, afterbay reservoir, substations and switchyards) would have long-term unavoidable adverse impacts on Colorado Plateau Region and Mojave Desert Region wildlife habitat because the footprint of these features (1,619 acres) would not be revegetated following construction.

6.1.1.2 Big Game Seasonal Ranges and Migration Routes

6.1.1.2.1 Mule Deer. Long-term disturbance of 86 acres of mule deer crucial winter range would be an unavoidable adverse impact.

6.1.1.2.2 Pronghorn. Long-term disturbance of 54.3 acres of pronghorn crucial habitat would be an unavoidable adverse impact.

6.1.1.3 Wildlife Populations

6.1.1.3.1 Direct Impacts. Construction-related mortality of animals unable to disperse from the construction corridor would be an unavoidable adverse impact.

6.2 Existing Highway Alternative

6.2.1 Construction Phase

6.2.1.1 Wildlife Habitats

The Existing Highway Alternative would have the same unavoidable adverse effects on wildlife habitat as described for the South Alternative in Section 6.1.1.1, except the long-term unavoidable adverse effects on

Colorado Plateau Region and Mojave Desert Region wildlife habitat from the footprint of project features would be 1,469 acres not revegetated following construction.

6.2.1.2 Big Game Seasonal Ranges and Migration Routes

6.2.1.2.1 Mule Deer. Long-term disturbance of 17 acres of mule deer crucial winter range would be an unavoidable adverse impact.

6.2.1.3 Wildlife Populations

Construction-related mortality of animals unable to disperse from the construction corridor would be an unavoidable adverse impact.

6.3 Southeast Corner Pipeline Alternative

6.3.1 Construction Phase

6.3.1.1 Wildlife Habitats

The Southeast Corner Alternative would have the same unavoidable adverse effects on wildlife habitat as described for the South Alternative in Section 6.1.1.1, except the long-term unavoidable adverse effects on Colorado Plateau Region and Mojave Desert Region wildlife habitat from the footprint of project features would be 1,611 acres not revegetated following construction.

6.3.1.2 Big Game Seasonal Ranges and Migration Routes

Long-term disturbance of 86 acres of mule deer crucial winter range would be an unavoidable adverse impact.

6.4 Transmission Line Alignments

6.4.1 Construction Phase

6.4.1.1 Wildlife Habitats

Permanent disturbance of 99 acres of potential wildlife habitat along 79.5 miles of transmission line alignments would be an unavoidable adverse impact.

6.4.1.2 Big Game Seasonal Ranges and Migration Routes

6.4.1.2.1 Mule Deer. Permanent disturbance of 13 acres of mule deer critical winter range would be an unavoidable adverse impact.

6.4.1.2.2 Desert Bighorn Sheep. Permanent disturbance of 3 acres of bighorn sheep critical winter range would be an unavoidable adverse impact.

6.4.1.2.3 Pronghorn. Permanent disturbance of 86 acres of pronghorn high value range would be an unavoidable adverse impact.

6.4.1.3 Wildlife Populations

Unavoidable adverse impacts would be the same as described in Section 6.1.1.3.

6.5 Natural Gas Pipeline and Generators Alternative

The Natural Gas Pipeline and Generators Alternative would have the same unavoidable adverse impacts as described for the South Alternative in Section 6.1.

6.6 No Lake Powell Water Alternative

6.6.1 Construction Phase

6.6.1.1 Wildlife Habitats

The No Lake Powell Water Alternative would have long-term unavoidable adverse effects on wildlife habitat in the St. George metropolitan area that would no longer receive reuse water from the St. George Regional Water Reclamation Facility and from reduced subsurface water caused by eliminating outdoor watering with potable water. Permanent loss of wildlife habitat would be an unavoidable adverse impact. Exact footprints of potential projects are not available, but it is estimated there would be no permanent loss in the Colorado Plateau Ecological Region and approximately 3,500 acres would be permanently lost in the Mojave Desert Ecological Region. The total unavoidable adverse impact would be approximately 3,500 acres.

6.6.1.2 Big Game Seasonal Ranges and Migration Routes

There would be no unavoidable adverse impacts on big game seasonal range in the Mojave Desert Ecological Region.

6.6.1.3 Wildlife Populations

Unavoidable adverse impacts would be the same as described in Section 6.1.1.3.

6.7 No Action Alternative

The No Action Alternative would not cause unavoidable adverse impacts.

Chapter 7
Cumulative Impacts

This chapter analyzes cumulative impacts that may occur from construction and operation of the proposed LPP project when combined with the impacts of other past, present, and reasonably foreseeable future actions and projects after all proposed mitigation measures have been implemented. Only those resources with the potential to cause cumulative impacts are analyzed in this chapter.

7.1 South Alternative

The South Alternative would have direct cumulative impacts on Mojave Desert Region wildlife habitat when combined with the impacts of the Southern Corridor Highway, which crosses the South Alternative penstock alignment near Sand Hollow Reservoir. A carrier pipe was installed on private land under the Southern Corridor Highway in anticipation of the LPP Project crossing under the highway. The vegetation clearing for the Southern Corridor Highway construction would permanently remove Mojave Desert Region wildlife habitat extending for miles north and south of the South Alternative penstock crossing, with the intensity of the cumulative impacts decreasing with distance from the intersection of the two projects. The direct cumulative impacts on Mojave Desert Region wildlife habitat would be minor.

The South Alternative would have direct cumulative impacts on Mojave Desert Region wildlife habitat when combined with the impacts of the proposed Kern River-Hurricane Natural Gas Pipeline, which would parallel the Southern Corridor Highway. The vegetation clearing for the Kern River-Hurricane Natural Gas Pipeline construction would permanently remove Mojave Desert Region wildlife habitat extending for miles north and south of the South Alternative penstock crossing, with the intensity of the cumulative impacts decreasing with distance from the intersection of the two projects.

The direct cumulative impacts of the South Alternative, Southern Corridor Highway and Kern River-Hurricane Natural Gas Pipeline on Mojave Desert Region wildlife habitat would be minor and short-term, with the Southern Corridor Highway effects being permanent and the South Alternative and Kern River-Hurricane Natural Gas Pipeline cumulative impacts occurring only during construction.

The South Alternative would have no measurable cumulative impacts on Colorado Plateau Region wildlife habitat when combined with the Glen Canyon Dam Long-Term Experimental Management Plan (LTEMP) EIS and future Record of Decision (ROD) actions. The South Alternative impacts on Glen Canyon Dam releases would not be measurable in the Colorado River downstream from Lake Powell; therefore, the potential cumulative impacts of the South Alternative and LTEMP EIS and ROD actions would not be measurable.

7.2 Existing Highway Alternative

The Existing Highway Alternative would have the same cumulative impacts on wildlife habitat as described for the South Alternative in Section 7.1, plus the following additional cumulative effects.

The Existing Highway Alternative would have minimal short-term indirect cumulative impacts on Colorado Plateau Region wildlife habitat when combined with the permanent effects of vegetation clearing for the Jackson Flat Reservoir located in close proximity to the Existing Highway Alternative alignment.

The Existing Highway Alternative would have minimal short-term direct cumulative effects on Colorado Plateau Region wildlife habitat when combined with the permanent effects of the proposed Fredonia Flood Retarding Structure. The Existing Highway Alternative would be constructed under a portion of the Flood Retarding Structure embankment near Lost Spring Wash. The wildlife habitat disturbed by constructing the Existing Highway Alternative would be revegetated following construction completion.

7.3 Southeast Corner Alternative

The Southeast Corner Alternative would have the same cumulative impacts on wildlife habitat as described for the South Alternative in Section 7.1.

7.4 Transmission Line Alternatives

The Transmission Line Alternatives would have the same cumulative impacts on wildlife habitat as described for the South Alternative in Section 7.1.

7.5 Natural Gas Pipeline and Generators Alternative

The Natural Gas Pipeline and Generators Alternative would have the same cumulative impacts on wildlife habitat as described for the South Alternative in Section 7.1.

7.6 No Lake Powell Water Alternative

The No Lake Powell Water Alternative would have long-term significant cumulative impacts on wildlife habitat in the St. George metropolitan area when combined with the St. George Water Reuse Project. Vegetation communities currently irrigated with reuse water produced by the St. George Regional Water Reclamation Facility would be permanently affected by the No Lake Powell Water Alternative because the reuse water would be re-purposed for use as raw water for RO treatment. Long-term indirect cumulative impacts could occur on wildlife habitat in the St. George metropolitan area depending on subsurface water that would be reduced by eliminating outdoor watering with potable water.

7.7 No Action Alternative

The No Action Alternative would have no cumulative impacts.

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Abbreviations and Acronyms

AGRC	Automated Geographic Reference Center
Alt.	Alternative
AMSL	above mean sea level
BLM	U.S. Bureau of Land Management
BPS	Booster Pump Station
CBPS	Cedar Booster Pump Station
CICWCD	Central Iron County Water Conservancy District
CVP	Cedar Valley Pipeline
dB	Decibel
dBA	A-weighted decibel
EEI	Edison Electrical Institute
GIS	Geographic Information System
GOPB	Utah Governor's Office of Planning and Budget
gpcd	gallons per capita per day
GSENM	Grand Staircase-Escalante National Monument
HDMS	Natural Heritage Program Data Management System
HS	Hydro System
KCWCD	Kane County Water Conservancy District
kV	kilovolt
LPP	Lake Powell Pipeline
LSD	Logan Simpson Design
M&I	Municipal and Industrial
mph	miles per hour
RO	Reverse Osmosis
ROD	Record of Decision
ROW	Right-of-Way
SCADA	Supervisory Control and Data Acquisition
SCP	Standard Construction Procedures
SITLA	School and Institutional Trust Land Administration
TDS	Total Dissolved Solids
UCDC	Utah Conservation Data Center
UDWLR	Utah Division of Wildlife Resources
UDWRe	Utah Division of Water Resources
ULS	Utah Lake Drainage Basin Water Delivery System
USDA	U.S. Department of Agriculture
UTM	Universal Transverse Mercator
WCH	Water Conveyance Hydro
WCWCD	Washington County Water Conservancy District

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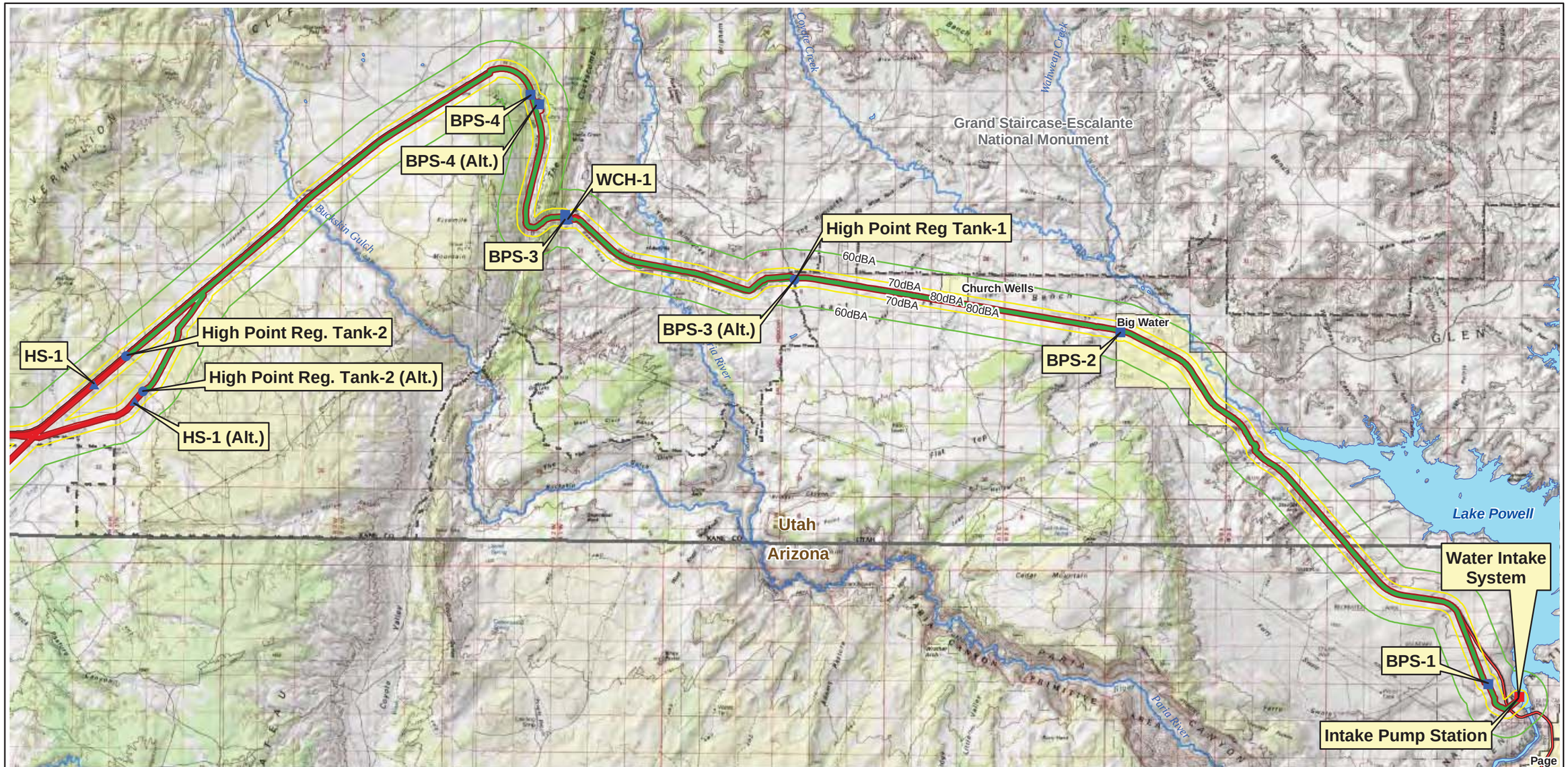
Appendix A
Noise Buffer Zone Maps

Figure A-1 Lake Powell Pipeline Water Conveyance System Noise Buffer Zone Map A-1

Figure A-2 Lake Powell Pipeline Hydro System Noise Buffer Zone Map A-2



Noise Contour dBA Levels

- 80 dBA
- 70 dBA
- 60 dBA

- Project Intake Pump Station
- Project Pump Station
- Project Regulating Tank
- Project Hydro Station
- Water Conveyance System
- Hydro System - South Alignment Alternative

- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road

- Lakes & Reservoirs
- Major Rivers & Streams
- National Park/Monument
- GSENM Boundary
- State Boundaries
- Cities

FERC Project Number:
12966-001
BLM Serial Numbers:
AZA-34941
UTU-85472

N

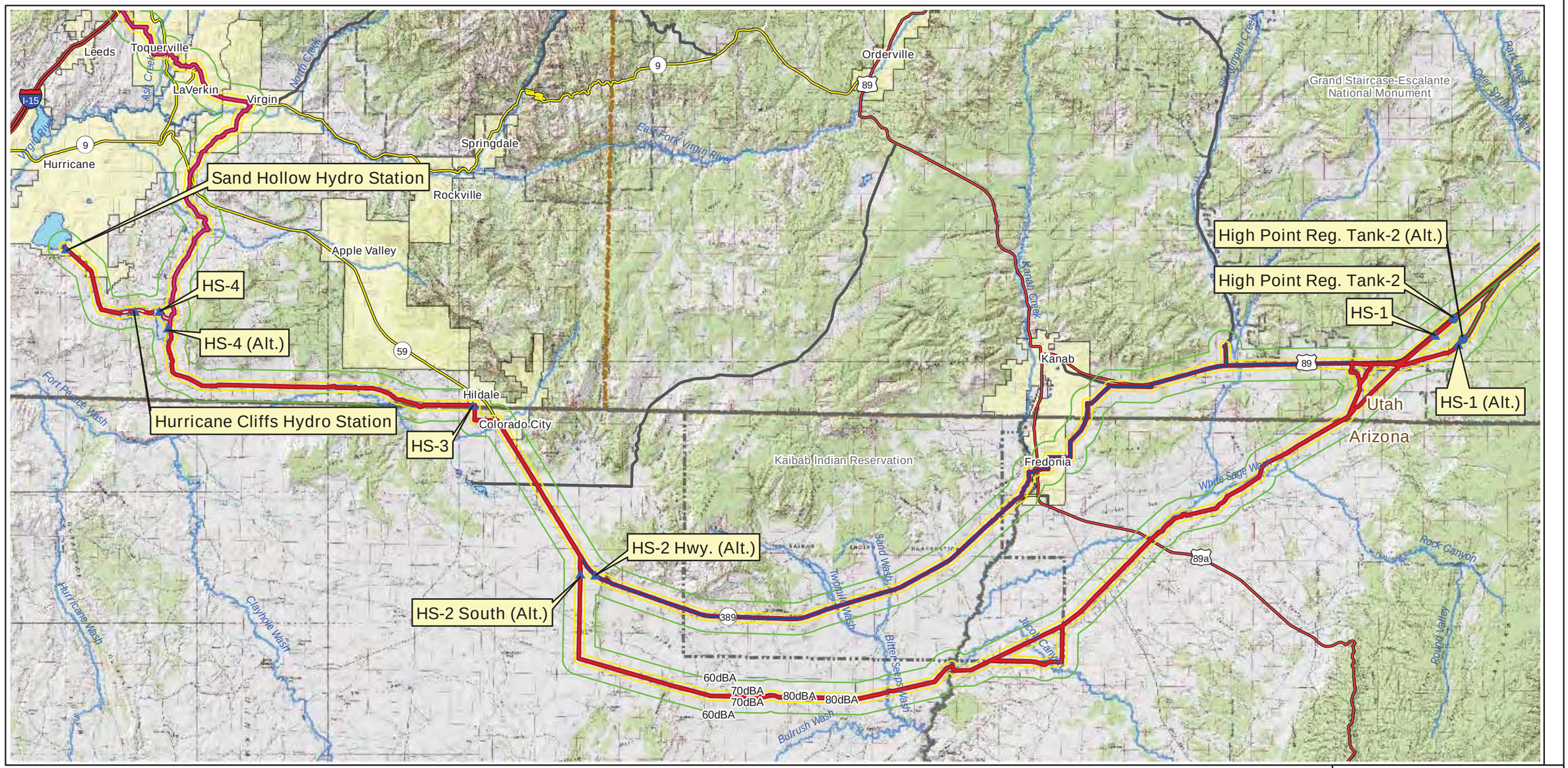
0 0.5 1 2 3 4 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure A-1** MWH

Lake Powell Pipeline
Water Conveyance System
Noise Buffer Zone Map



Noise Contour dBA Levels
- 80 dBA
- 70 dBA
- 60 dBA

- Project Pump Station
- Project Regulating Tank
- Project Hydro Station
- Water Conveyance System
- Hydro System - South Alignment Alternative
- Hurricane Cliffs Forebay/Afterbay
- Lakes & Reservoirs
- Major Rivers & Streams
- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road
- National Park/Monument
- GSENM Boundary
- Tribal Lands
- State Boundaries
- Cities
- County Boundaries

FERC Project Number:
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UTU-85472

N

0 1.25 2.5 5 7.5 10 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe Figure A-2 MWH

Lake Powell Pipeline
Hydro System
Noise Buffer Zone Map

Appendix B
Draft Wildlife Resources Mitigation Plan

Appendix B
Lake Powell Pipeline Project

Draft Wildlife Resources Mitigation Plan

April 2016

Table of Contents

Chapter 1 Introduction 1-1
1.2 Project Description 1-1
Chapter 2 Potentially Impacted Wildlife 2-1
2.1 Potentially Impacted Wildlife Habitat 2-1
2.2 Potentially Impacted Wildlife Populations and Species 2-1
Chapter 3 Mitigation Measures 3-1
3.1 Wildlife Mitigation Measures 3-1
References R-1

Table of Figures

Figure 1-1 Lake Powell Pipeline Proposed Action 1-2
Figure 2-1 Lake Powell Pipeline Water Conveyance Sytem Study Area 2-2
Figure 2-2 Lake Powell Pipeline Lake Powell Pipeline Hydro System Study Area 2-3
Figure 3-1 Big Game Seasonal Range Map 3-3

Chapter 1 Introduction

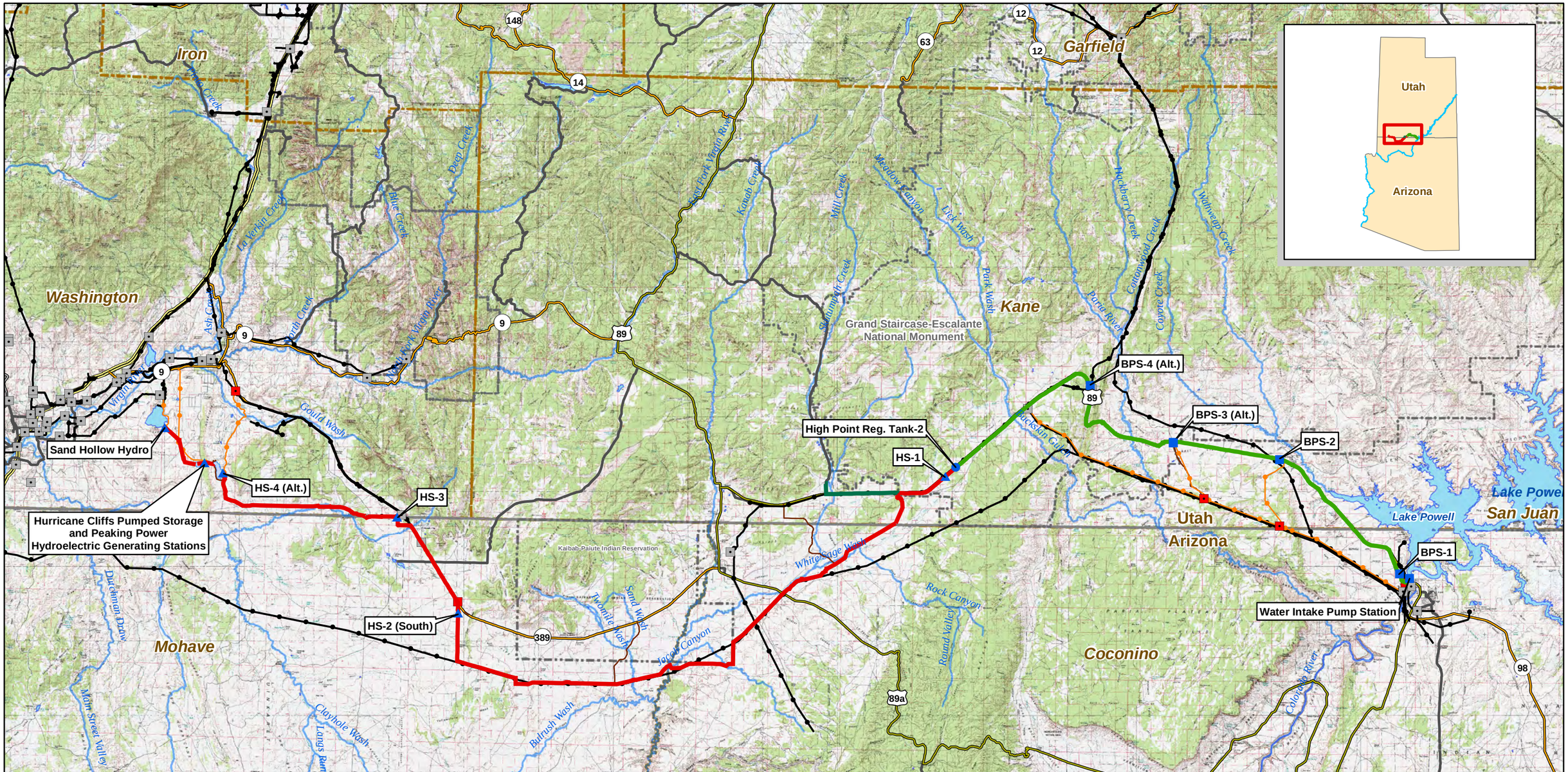
1.1 Wildlife Resources Mitigation Plan

The Wildlife Resources Mitigation Plan describes the actions proposed to mitigate the impacts on wildlife and wildlife habitat resulting from implementing the Lake Powell Pipeline (LPP) Project Proposed Action. Potential mitigation measures for wildlife and habitat impacts are introduced. The objective of the Wildlife Resources Mitigation Plan is to implement measures to enable the native wildlife to become re-established within a reasonable proximity to pre-project population levels after the Project has been completed.

The Wildlife Resources Mitigation Plan is measured by the restoration of pre-project populations into impacted areas of the LPP Project Areas of Potential Effect with natural population fluctuations taken into account. During construction, temporary removal or disruption of wildlife habitat and populations would occur. Native or otherwise-approved vegetation species would be re-established following construction of the project. Permanent removal of the habitat would occur at the various facilities - pump stations, hydro stations, reservoirs, etc. – which are planned to be constructed as part of the LPP Project. The long term goal is to return impacted habitat and animal populations to pre-project conditions with population fluctuations taken into account as quickly as practicable following the completion of LPP Project construction activities. Permanent above ground facilities, such as booster pump stations, in-line hydro stations, underground reservoirs, surface water reservoirs, and transmission facilities, will require security fencing. All other locations will return to pre-existing or near pre-existing conditions without fencing.

1.2 Project Description

The LPP Project would divert water from Lake Powell to supply M&I water for Washington and Kane Counties in Utah. The pipeline would begin at the planned Water Intake Pump Station at Lake Powell and would terminate at Sand Hollow Reservoir near Hurricane, Utah. The LPP Project also includes hydro stations, booster pump stations, storage reservoirs and a regulating tank at the topographical high point in Grand Staircase-Escalante National Monument (GSENM). Power transmission lines and associated substations and switch stations would be constructed as part of the LPP Project. The right-of-way (ROW) would cross parts of southwest Utah and northern Arizona (Figure 1-1).



Project Pump Station
Project Regulating Tank
Project Hydro Station
Substation
Proposed Substation

Water Conveyance System
Hydro System - South Alternative (Penstock Segment)
KCWCD System
Project Transmission Lines
Existing Transmission Lines

Interstate
US Highway
ST Highway
Hwy
Major Road
Access Roads

Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams

National Park/Monument
GSENM-Boundary
Tribal Lands
State Boundaries
County Boundaries

FERC Project Number:
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N

0 2.5 5 10 15 20 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 1-1** MWH

Lake Powell Pipeline Proposed Action

Chapter 2 Potentially Impacted Wildlife

Studies of potentially impacted wildlife and habitat were conducted within the study areas shown in Figures 2-1 and 2-2.

2.1 Potentially Impacted Wildlife Habitat

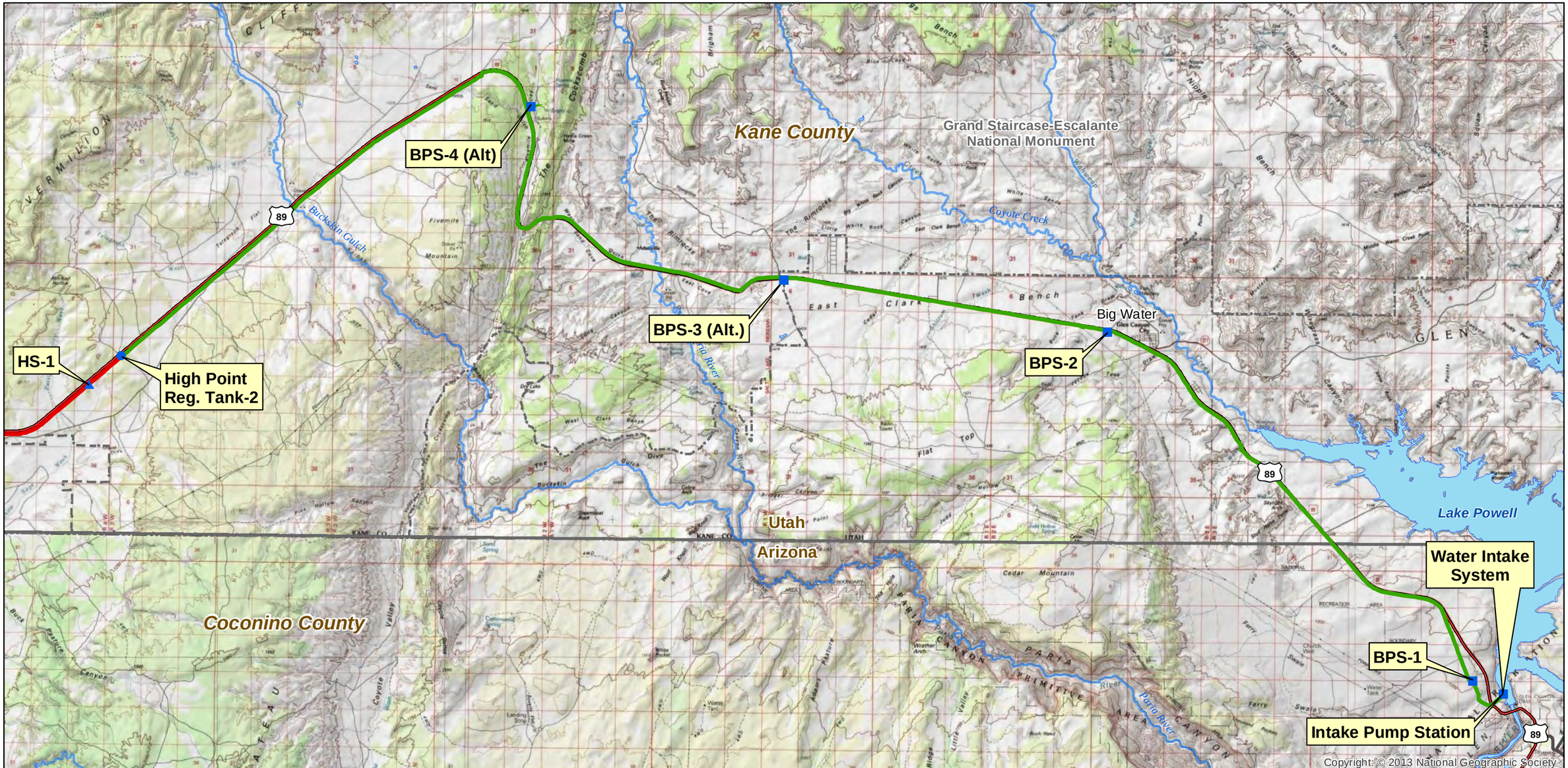
For a discussion of the impact analysis methodology related to potentially impacted wildlife habitat, refer to Section 2.4.1 of Final Study Report 21 - Wildlife Resources. Refer to Section 3.3 of Final Study Report 21 – Wildlife Resources for a list of potentially impacted wildlife habitat.

For potential - temporary and permanent - impacts on wildlife habitat refer to Section 4.2.1 of Final Study Report 21 - Wildlife Resources.

2.2 Potentially Impacted Wildlife Populations and Species

For a discussion of the impact analysis methodology related to potentially impacted wildlife populations and species refer to Section 2.4.2 of Final Study Report 21 - Wildlife Resources. Refer to Section 3.4 of Final Study Report 21 – Wildlife Resources for a list of potentially impacted wildlife populations and species.

For potential temporary and permanent impacts on wildlife populations and species refer to Section 4.2.2 of Final Study Report 21 - Wildlife Resources.



- Project Pump Station
- Project Regulating Tank
- Project Hydro Station
- Water Conveyance System
- Hydro System - South Alternative (Penstock Segment)
- KCWCD System
- Interstate
- US Highway
- ST Highway
- Hwy
- Major Road
- Lakes & Reservoirs
- Major Rivers & Streams
- National Park/Monument
- GSENM Boundary
- State Boundaries

FERC Project Number: 12966-001
BLM Serial Numbers: AZA-34941 UTU-85472

N

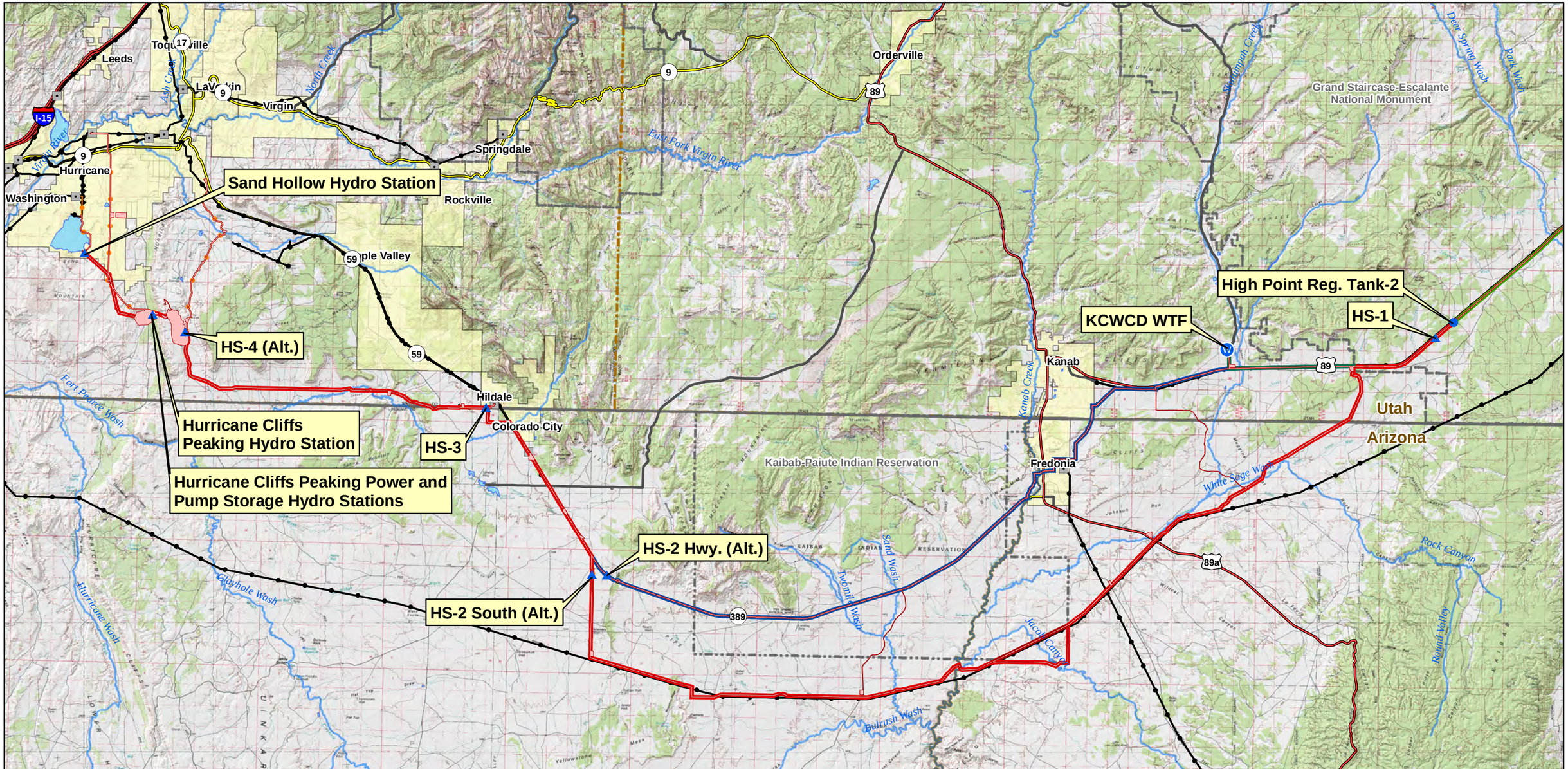
0 0.5 1 2 3 4 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 2-1** MWH

Lake Powell Pipeline Water Conveyance System Study Area



250 ft Study Area
Water Treatment Facility
Project Pump Station
Project Regulating Tank
Project Hydro Station
Water Conveyance System
Hydro System - Proposed Action
KCWCD System
Hydro System, Existing Highway Alternative
Hydro System, Southeast Corner Alternative
Interstate
US Highway
ST Highway
Hwy
Major Road
National Park/Monument
GSENM Boundary
Tribal Lands
State Boundaries
Cities
County Boundaries
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams
Substation
Project Transmission Line
Existing Transmission Lines

FERC Project Number:
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N

0 1.25 2.5 5 7.5 10 Miles

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 2-2** MWH

Lake Powell Pipeline Hydro System Study Area

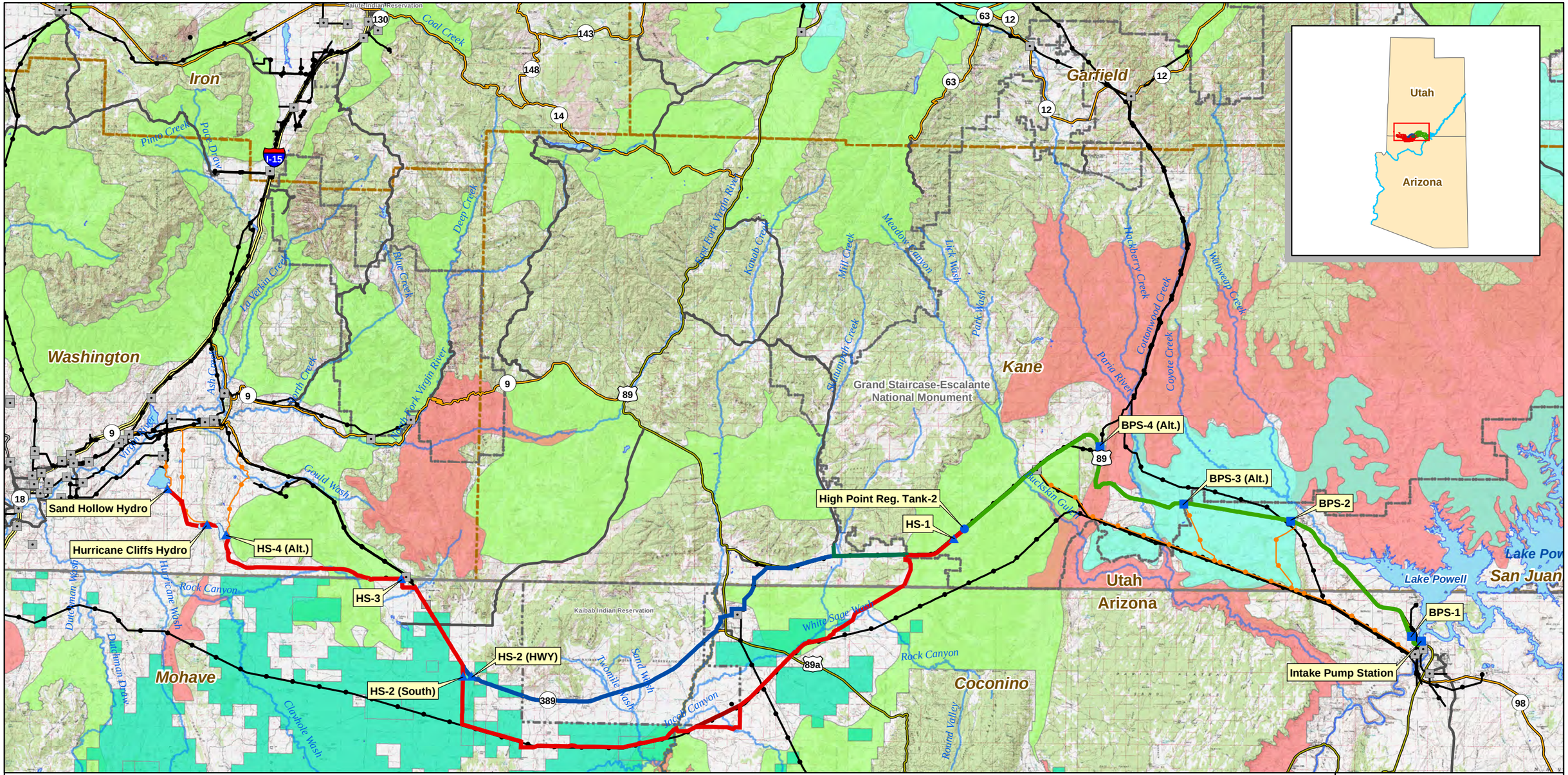
Chapter 3 Mitigation Measures

3.1 Wildlife Mitigation Measures

The following wildlife mitigation measures would be applicable to all LPP Project features and facilities during construction. Protection, mitigation and enhancement measures for wildlife and wildlife habitat would include the following:

- To the extent feasible, construction activities on or around important wildlife habitat (e.g., critical deer winter range, bighorn fawning areas and migration corridors) would be scheduled to avoid the periods of greatest use.
- Any dead or injured wildlife found within or near the ROW of the LPP Project would be recorded and reported. Handling of dead or injured wildlife would only be performed by a qualified wildlife biologist.
- Wildlife found inhabiting a ROW section of pipeline would be gently hazed by a qualified wildlife biologist into an area safely away from construction of the LPP Project.
- Identify rangelands, both permanent and temporary, for wildlife displaced due to LPP Project.
- Clearing of trees and other vegetation should be conducted outside of the nesting and fledging periods or if performed during the nesting season as determined by Arizona Game and Fish Department (AGFD) and Utah Division of Wildlife Resources (UDWLR). Avian nesting surveys would be conducted to locate active nests to be flagged for avoidance or as removed in compliance with U.S. Fish and Wildlife Service (USFWS), AGFD, or UDWLR direction.
- Consult with ADFG and UDWLR to determine if hunting seasons for wildlife as game should be modified or cancelled in areas affected by the LPP Project construction.
- Re-establish native vegetation that serves or may serve as food for wildlife, at the conclusion of pipeline segment and facilities construction in the various areas.
- Vehicular speeds would be limited to safe speeds in construction zones or on construction access roads to minimize collisions with wildlife.
- The area directly ahead of trenching equipment would be monitored for small animals (mammals, birds, reptiles, and amphibians), and to the extent possible, any small animals observed would be hazed from the construction corridor by a qualified wildlife biologist or captured and relocated to a safe distance from the construction corridor.
- Trenches would be covered or backfilled, or barriers and approved working lights should be placed along open trenches at the completion of each day, and no more than 1,000 feet of trench should be open at any one location or segment. All open trenches would be constructed with escape ramps to allow trapped wildlife to exit the trenches.
- Open trenches would be visually checked before beginning daily construction activities, and small animals in the trenches would be captured and relocated if possible by a qualified wildlife biologist before construction commences.

- Effects on wildlife resources can be avoided and minimized by following standard hazardous materials control procedures, restoration and erosion control procedures, air pollution prevention procedures, surface water protection procedures, noxious weed control procedures and riparian area protection procedures.
- Construction and facility sites would be kept free of all trash, including food refuse and micro-trash. Micro-trash includes small and easily ingestible materials such as bottle caps, broken glass, cigarette butts, small plastic bits, bullets, bullet casings, and food materials. Construction sites would be cleaned up at the end of each day (e.g., trash removed and scrap materials picked up) to minimize potential ingestion of trash by wildlife.
- New and upgraded overhead power transmission lines would be constructed to meet the most current edition of *Suggested Practices for Raptor Protection on Power Lines* (EEI 2006) and *Reducing Avian Collisions with Power Lines: The State of the Art in 2012* (APLIC 2012).
- An Avian Protection Plan would be developed following the *Avian Protection Plan (APP) Guidelines* (APLIC and USFWS 2005) prior to construction.
- Pipeline, penstock and electrical transmission construction would be coordinated with UDWLR to avoid impacts on Paunsaugunt mule deer herd migration. Construction on pipeline and penstock segments between Highway 89 mileposts 36 and 49 would be scheduled to not occur from March 1 to April 30 and October 1 through November 31.
- Pipeline, penstock and electrical transmission line construction in crucial mule deer winter range would be coordinated with UDWLR and scheduled during the period from May 1 through September 30 between Highway 89 milepost 31 and 50 to avoid impacts on crucial mule deer winter habitat. If these dates are determined to be too restrictive to efficiently construct the pipeline and penstock, then alternative minimization techniques would be discussed with UDWLR.
- Unavoidable impacts on Paunsaugunt deer herd crucial winter habitat could be mitigated by compensatory measures, including contributions to ongoing mule deer habitat improvement projects and construction of a new improved crossing structure at Highway 89 milepost 39.5. Compensatory mitigation measures would be coordinated as necessary with UDWLR.
- Pipeline, penstock and electrical transmission line construction in crucial bighorn sheep and pronghorn ranges would be coordinated with UDWLR. (Figure 3-1)
- No permanent fencing would be constructed along the pipeline and penstock alignments to avoid restricting big game and other wildlife movement patterns.
- UDWRe would coordinate with ranchers and UDWLR to make sure existing water sources continue to be available during construction for livestock and wildlife. If the LPP Project construction affects water sources, UDWRe would provide alternate water sources.



Project Pump Station
Project Regulating Tank
Project Hydro Station
Substation
Project Transmission Line
Existing Transmission Lines

Water Conveyance System
Hydro System - Proposed Action
KCWCD System
Hydro System, Existing Highway Alternative
Hydro System, Southeast Corner Alternative
State Boundaries
County Boundaries

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US Highway
ST Highway
Hwy
Major Road
Hurricane Cliffs Forebay/Afterbay
Lakes & Reservoirs
Major Rivers & Streams

National Park/Monument
Tribal Lands
UT Pronghorn Crucial Habitat
AZ Pronghorn (High quality with no problems, High quality with problems and Moderate quality)
Big Horn Sheep Crucial Habitat
Muledeer Crucial Habitat

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0 2.5 5 10 15 20 Miles

N

Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 3-1** MWH

Big Game Seasonal Range Map

References

Edison Electrical Institute (EEI). 2006. Edison Electrical Institute. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. EEI Webstore, Item #400601 (print).

_____. 2012. Edison Electrical Institute. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2012. Available at the EEI Webstore at: http://www.eei.org/resourcesandmedia/products/.