

Section 1

Introduction

1.1 Applicant Name

Utah Board of Water Resources (UBWR)

1.2 Applicant Business Address

Utah Board of Water Resources
1594 W. North Temple
P.O. Box 14620
Salt Lake City, UT 84114-6201
Telephone: (801) 538-7235

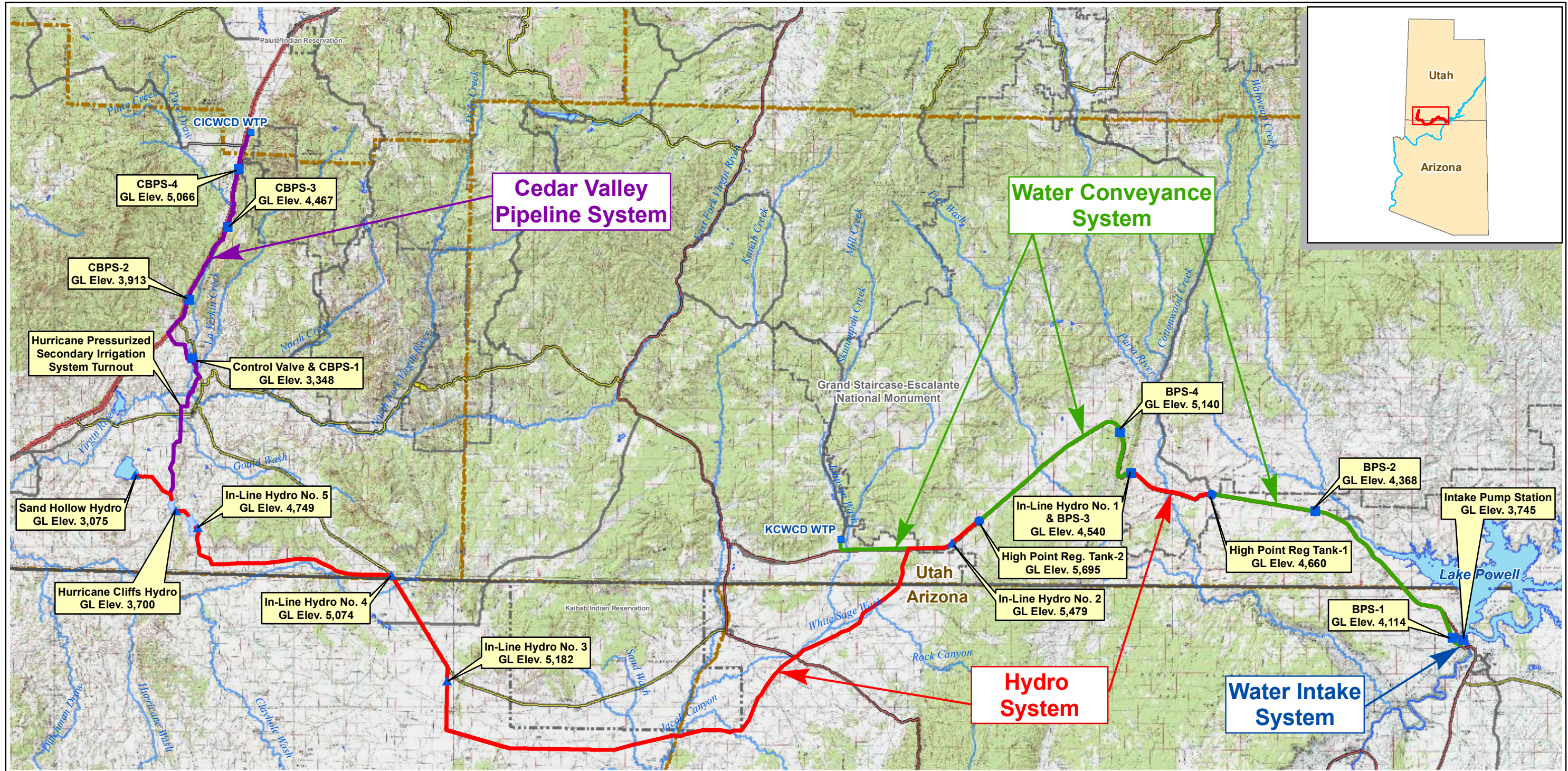
1.3 Telephone Number of Each Person Authorized to Act as Agent

Mr. Eric Millis, P.E.
Utah Division of Water Resources
Telephone: (801) 538-7298
Facsimile: (801) 538-7279

Mr. John H. Clements
Van Ness Feldman
Telephone: (202) 298-1800
Facsimile: (202) 338-2416

1.4 General Information

The Utah Board of Water Resources (UBWR or Applicant) is filing with the Federal Energy Regulatory Commission (FERC or Commission) its Notice of Intent (NOI) to seek an Original License for its proposed Lake Powell Hydroelectric System (Hydro System), FERC No. 12966. The Hydro System, a component of the Lake Powell Pipeline (Project), is more fully described in Section 4, a major water supply project located between Lake Powell in northern Arizona and Sand Hollow Reservoir in southwest Utah. The Project generally would consist of four systems: 1) Water Intake System, 2) Water Conveyance System, 3) Hydro System, and 4) Cedar Valley Pipeline System (see Figure 1-1). The Water Intake System includes two vertical intake shafts, multi-level intake tunnels, and a pumping station at Lake Powell. The Water Conveyance System includes a large diameter conveyance pipeline, four booster pumping stations, two regulating tanks, and pipeline appurtenances. The Hydro System includes large diameter penstocks, seven powerhouses and regulating tanks, a forebay, pumped storage hydro facility, an afterbay and associated equipment and power transmission facilities. A turnout would extend from the Hydro System in Kane County along U.S. 89 to Johnson Canyon, terminating at a regional water treatment plant. The Cedar Valley Pipeline System includes a small diameter water conveyance pipeline, four pumping stations, and a regional water treatment plant in Iron County, Utah. Jointly, the four systems comprising the Lake Powell Pipeline are referred to as the "Project."



Legend

- | | | | |
|---------------------------|-------------------------------------|--------------|--------------------------|
| ■ Water Treatment Plant | — Hydro System | — Interstate | ▭ National Park/Monument |
| ■ Project Pump Station | — Water Conveyance System | — US Highway | ▭ GSENM-Boundary |
| ● Project Regulating Tank | — Cedar Valley Pipeline System | — ST Highway | ▭ Tribal Lands |
| ▲ Project Hydro | ▭ Hurricane Cliffs Forebay/Afterbay | — Hwy | ▭ State Boundaries |
| | ▭ Lakes & Reservoirs | — Major Road | ▭ County Boundaries |
| | — Major Rivers & Streams | | |

0 2 4 8 12 16 Miles



Lake Powell Pipeline Project

Spatial Reference: UTM Zone 12N, NAD-83

UDWR Figure 1-1 MWH

Lake Powell Pipeline Project Systems

UBWR is opting to use FERC's Integrated Licensing Process (ILP) as established in regulations issued by FERC on July 23, 2003 (Final Rule, Order No. 2002) and found at 18 C.F.R. Part 5. The ILP is designed to create a more efficient and timely licensing process for all participants.

This Pre-Application Document (PAD) is a requirement of the ILP. The PAD is required to be filed with FERC simultaneously with the NOI and also distributed to Federal and state resource agencies, local governments, Indian tribes, members of the public, and others likely to be interested in the licensing proceeding. The purpose of the PAD is to provide FERC and the entities listed above with summaries of existing information relevant to the Project that is in the Applicant's possession or that can be obtained with the exercise of due diligence. The information required to be provided in the PAD is specified in 18 C.F.R. § 5.6 (c) and (d). UBWR exercised due diligence in preparing the PAD by contacting appropriate governmental agencies, Indian tribes and others potentially having relevant information; and by conducting extensive searches of publicly available databases and its own records.

The existing, relevant, and reasonably available information provided in the PAD is intended to enable participants in the licensing proceeding to identify issues and related information needs; develop study requests and study plans; and ultimately, to prepare documents analyzing UBWR's Application for Original License (License Application) to be filed with FERC by August 26, 2010. The PAD also is a precursor to the environmental analysis section of the License Application and to FERC's Scoping documents and environmental impact statement under the National Environmental Policy Act of 1969 (NEPA). The requirement to file the PAD at the same time as the NOI is intended to enable those who plan to participate in the licensing proceeding to become familiar with the Project at the start of the proceeding and enhance the success of FERC's scoping process.

The PAD follows the content and form requirements of 18 C.F.R. § 5.6 (e) and (d) with minor changes in form for enhanced readability. The PAD is organized into three volumes. Volume I contains all of the information required by 18 C.F.R. § 5.6 (c) and (d) that is being distributed to Federal and state resource agencies, local governments, Indian tribes, members of the public, and others likely to be interested in the licensing proceeding. Volume II is a collection of appendices. Volume III is a collection of Critical Energy Infrastructure Information (CEII) pursuant to 18 C.F.R. § 388.113.

Because the Hydro System is a component of the Project, and most of the Project systems are proposed to be constructed simultaneously, and because substantial portions of the Project also will require permits from other federal agencies, and water quality certification from the State of Utah, this PAD and the license application are proposed to be developed so that to the maximum extent possible one environmental analysis document will serve to satisfy the requirements of NEPA for all federal permits and also to establish a record to support a water quality certification application.

Volume I is organized as follows:

Section 1 – Introduction; Table of Contents; List of Figures; List of Tables; List of Appendices; Definition of Terms, Acronyms, and Abbreviations

Section 2 – Plans, Schedules and Protocols; Process Plan and Schedule for all licensing activities through filing of the License Application per 18 C.F.R. § 5.6(d)(1); Communication Protocols; Integrated Licensing Process Flow Chart

Section 3 – River Basin Description; Project Area Overview; Major Land Uses; Major Water Uses; Project Area Dams; Drainage Basins and Tributary Streams; Climate; and Watershed Water Quality; per 18 C.F.R. § 5.6(d)(3)(xiii)

Section 4 – Description of the Proposed Project; Project Overview; Lake Powell Intake; Water Conveyance System; Hydro System; Cedar Valley Pipeline System; Lands of the United States; and Additional Information; per 18 C.F.R. § 5.6(d)(2)

Section 5 – Description of Existing Environment by resource category, per 18 C.F.R. § 5.6(d)(3)(ii)-(xii)

Section 6 – Issues, Impacts, Studies and Plans by resource category, per 18 C.F.R. § 5.6(d)(3) and (4)

Section 7 – Summary of Contacts; Federal Agencies; Tribes; State Agencies; Regional Agencies; Local Governments; Non-Governmental Organizations; and Public

Section 8 – Literature Cited; References used in developing the PAD, per 18 C.F.R. § 5.6(c)(2)

Maps, figures and tables are incorporated into each Section as applicable.

Volume II contains the following appendices:

Appendix A – Draft Resource Work Plans and Public Involvement Work Plan

Appendix B – Reference Materials

Appendix C – Applicant’s Interested Parties Mailing List

Volume III contains Critical Energy Infrastructure Information.

1.5 Table of Contents

	Page
Section 1	
Introduction	1-1
1.1 Applicant Name	1-1
1.2 Applicant Business Address	1-1
1.3 Telephone Number of Each person Authorized to Act as Agent.....	1-1
1.4 General Information.....	1-1
1.5 Table of Contents	1-4
1.6 List of Figures	1-12
1.7 List of Tables	1-14
1.8 List of Appendices	1-14
1.9 Definition of Terms, Acronyms and Abbreviations.....	1-19
Section 2	
Plans, Schedule and Protocols	2-1
2.1 Process Plan and Schedule Through Filing of License Application.....	2-1
2.2 Post-Application Processing	2-2
2.3 Communications Protocol.....	2-3
2.3.1 Meetings	2-3
2.3.2 Documents	2-3
2.3.3 Project Web Site	2-4
2.3.4 Telephone	2-4

2.3.5	Document Availability	2-4
2.3.6	Definitions	2-5
2.4	Integrated Licensing Process Flow Chart	2-5
Section 3	River Basin Description.....	3-1
3.1	Project Area Overview	3-1
3.1.1	Water Intake System	3-1
3.1.2	Water Conveyance System	3-1
3.1.3	Hydro System	3-4
3.1.4	Cedar Valley Pipeline System	3-5
3.2	Major Land Uses	3-5
3.2.1	Project Area Land Uses	3-5
3.3	Major Water Uses	3-7
3.4	Project Area Dams	3-9
3.5	Drainage Basins and Tributary Streams	3-11
3.6	Climate	3-13
3.7	Watershed Water Quality	3-13
Section 4	Description of the Proposed Project.....	4-1
4.1	Project Overview	4-1
4.2	Water Intake System	4-5
4.3	Water Conveyance System	4-5
4.4	Hydro System	4-11
4.4.1	Overview	4-11
4.4.2	Penstock and In-Line Hydro Stations	4-11
4.4.3	Hurricane Cliffs Pumped Storage Hydro	4-13
4.4.4	Sand Hollow Hydro	4-17
4.4.5	Power Transmission Lines	4-23
4.4.6	Planned Installed Capacity and Average Annual Energy	4-23
4.4.7	Power Consumed by Pump Stations	4-24
4.5	Cedar Valley Pipeline System	4-24
4.6	Lands of the United States	4-24
4.7	Additional Information	4-24
Section 5	Description of Existing Environment.....	5-1
5.1	Geology and Soils	5-1
5.1.1	Geology	5-1
5.1.1.1	Regional Geology	5-1
5.1.1.2	Geology of the Project Pipeline Alignment	5-2
5.1.2	Soils	5-6
5.2	Water Resources	5-7
5.2.1	Water Supply	5-7
5.2.1.1	Groundwater	5-7
5.2.1.2	Surface Water	5-7
5.2.1.2.1	Quail Creek Reservoir	5-7
5.2.1.2.2	Sand Hollow Reservoir	5-8
5.2.1.2.3	Lake Powell	5-8
5.2.2	Existing Use of Water	5-10

5.2.3	Existing Instream Flow Uses	5-17
5.2.4	Colorado River Basin Climate – Effects on Water Resources.....	5-17
5.2.4.1	Current Factors Affecting Moisture and Temperature	5-17
5.2.4.2	Snowpack and Runoff in the Upper Colorado River Basin.....	5-17
5.2.4.2.1	Wind River Range.....	5-21
5.2.4.2.2	Uintah Range	5-21
5.2.4.2.3	Central Rocky Mountain Range.....	5-21
5.2.4.3	Potential Causes of Climate Variability	5-32
5.2.4.4	Climate Trends and Climate Change.....	5-43
5.2.5	Water Quality Standards	5-43
5.2.5.1	Surface Water	5-43
5.2.5.2	Groundwater	5-51
5.2.6	Existing Water Quality in Lake Powell and Sand Hollow Reservoir	5-55
5.2.6.1	Lake Powell	5-55
5.2.6.2	Sand Hollow Reservoir.....	5-59
5.2.7	Existing Groundwater Quality near St. George and Cedar City	5-59
5.2.7.1	St. George Area Groundwater Quality	5-59
5.2.7.1.1	Sand Hollow.....	5-59
5.2.7.1.2	Quail Creek Reservoir.....	5-65
5.2.7.2	Cedar Valley Groundwater Quality	5-65
5.3	Fish and Aquatic Resources.....	5-69
5.3.1	Watershed Fish Resources	5-69
5.3.2	Reservoir Fish Resources.....	5-69
5.3.3	Watershed Aquatic Resources	5-70
5.3.4	Reservoir Aquatic Resources.....	5-71
5.4	Wildlife Resources.....	5-71
5.4.1	Lake Powell Area.....	5-72
5.4.2	Pipeline Alignment	5-72
5.4.2.1	Mule Deer.....	5-72
5.4.2.2	Pronghorn Antelope.....	5-72
5.4.2.3	Wild Turkey.....	5-75
5.4.2.4	Gambel’s Quail.....	5-75
5.4.2.5	Desert Bighorn Sheep.....	5-75
5.4.2.6	Black Bear	5-75
5.4.3	Quail Creek Reservoir and Sand Hollow Reservoir Areas	5-75
5.5	Botanical Resources.....	5-77
5.5.1	Vegetation Along the Project Pipeline alignment.....	5-77
5.5.2	Vegetation Along the Cedar City Alignment.....	5-77
5.5.3	Invasive Species.....	5-78
5.5.4	Vegetation near Lake Powell	5-79
5.5.5	Non-Vegetated Areas.....	5-79
5.6	Wetlands and Riparian Resources	5-79
5.6.1	Wetlands	5-79
5.6.2	Riparian Resources	5-79
5.7	Rare, Threatened, Endangered and Special Status Species	5-81
5.7.1	Special Status Plants	5-81
5.7.1.1	Jones Waxy-Dogbane	5-81
5.7.1.2	Holmgren Milkvetch	5-83
5.7.1.3	Welch’s Milkweed.....	5-83
5.7.1.4	Yellow Beavertail.....	5-83
5.7.1.5	Dwarf Bearclaw Poppy.....	5-83

	5.7.1.6	Siler's Pincushion Cactus	5-83
	5.7.1.7	Gumbo Milkvetch.....	5-84
5.7.2		Special Status Mammals and Birds.....	5-84
	5.7.2.1	Utah Prairie Dog.....	5-84
	5.7.2.2	Ferruginous Hawk	5-84
	5.7.2.3	American Peregrine Falcon	5-84
	5.7.2.4	Bald Eagle	5-85
	5.7.2.5	Golden Eagle	5-85
	5.7.2.6	Desert Tortoise	5-85
	5.7.2.7	Southwestern Willow Flycatcher.....	5-85
5.7.3		Special Status Invertebrates and Fish	5-87
	5.7.3.1	Desert Spring Snail.....	5-87
	5.7.3.2	Woundfin Minnow	5-87
	5.7.3.3	Virgin River Chub	5-87
	5.7.3.4	Razorback Sucker.....	5-88
	5.7.3.5	Paria River Sensitive Fish Species	5-88
5.7.4		Other Sensitive Wildlife Species Potentially in the Project Area	5-88
	5.7.4.1	Arizona Toad.....	5-88
	5.7.4.2	Greater Sage Grouse.....	5-88
	5.7.4.3	Burrowing Owl.....	5-89
	5.7.4.4	Fringed Myotis	5-89
	5.7.4.5	Western Red Bat.....	5-89
	5.7.4.6	Spotted Bat	5-89
	5.7.4.7	Allen's Big-Eared Bat	5-89
	5.7.4.8	Pygmy Rabbit	5-90
5.8		Recreation and Land Use.....	5-90
	5.8.1	Existing Recreation Facilities and Opportunities	5-90
	5.8.1.1	Glen Canyon National Recreation Area	5-90
	5.8.1.2	Grand Staircase-Escalante National Monument.....	5-92
	5.8.1.3	Arizona Strip	5-93
	5.8.1.4	Sand Hollow Recreation Area and Reservoir.....	5-94
	5.8.1.5	Quail Creek State Park	5-94
	5.8.1.6	Regional Recreation Facilities and Opportunities	5-95
	5.8.2	Recreation Needs Identified in Management Plans	5-96
	5.8.3	Land Uses and Management.....	5-97
5.9		Aesthetic Resources	5-98
	5.9.1	Overview.....	5-98
	5.9.2	Visual Character of Project Lands and Waters	5-98
	5.9.3	Noise	5-100
5.10		Cultural Resources	5-102
	5.10.1	Identification of Historic and Archaeological Sites in the Project Vicinity....	5-102
	5.10.2	Traditional Cultural and Religious Properties	5-103
5.11		Paleontological Resources	5-104
5.12		Socioeconomic Resources	5-105
	5.12.1	Existing Communities.....	5-105
	5.12.2	Recent Population and Economic Growth.....	5-106
	5.12.2.1	Population Forecasts.....	5-108
	5.12.2.2	Temporary Residents.....	5-109
	5.12.3	Water Supporting Population and Economic Growth.....	5-110
	5.12.3.1	Water Resources in WCWCD Service Area	5-110
	5.12.3.2	Water Resources in CICWCD Service Area	5-110

	5.12.3.3	Water Resources in KCWCD Service Area	5-111
5.13		Transportation Resources	5-111
5.14		Air Quality	5-111
5.15		Tribal Resources	5-113
	5.15.1	Identified Native American Tribes and Nations	5-113
	5.15.1.1	Paiute Indian Tribe of Utah	5-113
	5.15.1.2	Kaibab-Paiute Tribe.....	5-113
	5.15.1.3	Navajo Nation.....	5-115
	5.15.1.4	Hopi Indian Tribe	5-115
	5.15.1.5	Traditional Southern Paiute Territory.....	5-115
	5.15.2	Tribal Interests Affected by the Project	5-115
Section 6		Issues, Impacts, Studies, and Plans	6-1
6.1		Geology and Soils.....	6-1
	6.1.1	Geology.....	6-1
	6.1.1.1	Preliminary Issues	6-1
	6.1.1.2	Known or Potential Project Impacts	6-2
	6.1.2	Soils	6-2
	6.1.2.1	Preliminary Issues	6-2
	6.1.2.2	Known or Potential Project Impacts	6-2
	6.1.3	Preliminary Studies and Information Gathering Needs	6-3
	6.1.3.1	Geology	6-3
	6.1.3.2	Soils	6-3
	6.1.4	Potential Protection, Mitigation and Enhancement Measures	6-4
	6.1.5	Relevant Resource Management Plans	6-4
	6.1.5.1	Grande Staircase – Escalante National Monument Approved Management Plan	6-4
	6.1.5.2	Kanab Resource Management Plan	6-4
6.2		Water Resources	6-5
	6.2.1	Water Supply	6-5
	6.2.1.1	Preliminary Issues	6-5
	6.2.1.2	Known or Potential Project Impacts	6-5
	6.2.2	Water Quality.....	6-5
	6.2.2.1	Preliminary Issues	6-5
	6.2.2.2	Known or Potential Project Impacts	6-5
	6.2.3	Preliminary Studies and Information Gathering Needs	6-6
	6.2.3.1	Water Resources	6-6
	6.2.3.2	Water Quality	6-6
	6.2.4	Potential Protection, Mitigation and Enhancement Measures	6-6
	6.2.5	Relevant Resource Management Plans	6-7
6.3		Fish and Aquatic Resources.....	6-7
	6.3.1	Preliminary Issues.....	6-7
	6.3.2	Known or Potential Project Impacts	6-7
	6.3.3	Preliminary Studies and Information Gathering Needs	6-8
	6.3.4	Potential Protection, Mitigation and Enhancement Measures	6-9
	6.3.5	Relevant Resource Management Plans	6-9
6.4		Wildlife Resources.....	6-10
	6.4.1	Preliminary Issues.....	6-10
	6.4.2	Known or Potential Project Impacts	6-10
	6.4.3	Preliminary Studies and Information Gathering Needs	6-11

6.4.4	Potential Protection, Mitigation and Enhancement Measures	6-12
6.4.5	Relevant Resource Management Plans	6-12
6.5	Botanical Resources	6-12
6.5.1	Preliminary Issues	6-12
6.5.2	Known or Potential Project Impacts	6-12
6.5.3	Preliminary Studies and Information Gathering Needs	6-13
6.5.4	Potential Protection, Mitigation and Enhancement Measures	6-13
6.5.5	Relevant Resource Management Plans	6-14
6.6	Wetlands and Riparian Resources	6-14
6.6.1	Preliminary Issues	6-14
6.6.2	Known or Potential Construction Impacts	6-14
6.6.3	Preliminary Studies and Information Gathering Needs	6-14
6.6.4	Potential Protection, Mitigation and Enhancement Measures	6-15
6.6.5	Relevant Resource Management Plans	6-15
6.7	Rare, Threatened, Endangered, and Special Status Species	6-15
6.7.1	Preliminary Issues	6-15
6.7.2	Known or Potential Project Effects	6-15
6.7.2.1.1	Welsh's milkweed	6-16
6.7.2.1.2	Brady pincushion cactus	6-16
6.7.2.1.3	Siler pincushion cactus	6-16
6.7.2.1.4	Gumbo milk-vetch	6-17
6.7.2.1.5	Utah prairie dog	6-17
6.7.2.1.6	Bald eagle	6-17
6.7.2.1.7	Burrowing owl	6-17
6.7.2.1.8	Ferruginous hawk	6-18
6.7.2.1.9	Swainson's hawk	6-18
6.7.2.1.10	Southwestern willow flycatcher	6-18
6.7.2.1.11	Woundfin minnow and Virgin River chub	6-18
6.7.2.1.12	Razorback sucker	6-18
6.7.2.1.13	Desert tortoise	6-19
6.7.2.1.14	Peregrine falcon	6-19
6.7.3	Preliminary Studies and Information Gathering Needs	6-19
6.7.4	Potential Protection, Mitigation and Enhancement Measures	6-20
6.7.5	Relevant Resource Management Plans	6-20
6.8	Recreation and Land Use	6-21
6.8.1	Preliminary Issues	6-21
6.8.2	Known or Potential Project Impacts	6-21
6.8.2.1	Lake Power and Glen Canyon National Recreation Area	6-21
6.8.2.2	Grand Staircase-Escalante National Monument	6-22
6.8.2.3	Arizona Strip Resource Area	6-33
6.8.2.4	Sand Hollow Recreation Area and Reservoir	6-23
6.8.2.5	Quail Creek State Park	6-24
6.8.2.6	Regional Recreation Facilities and Opportunities	6-24
6.8.3	Preliminary Studies and Information Gathering Needs	6-25
6.8.4	Potential Protection, Mitigation and Enhancement Measures	6-25
6.8.5	Relevant Resource Management Plans	6-25
6.9	Aesthetic Resources	6-26
6.9.1	Visual Resources	6-26
6.9.1.1	Preliminary Issues	6-26
6.9.1.2	Known or Potential Project Impacts	6-26
6.9.2	Noise	6-26

	6.9.2.1	Preliminary Issues	6-26
	6.9.2.2	Known or Potential Project Impacts	6-27
	6.9.3	Preliminary Studies and Information Gathering Needs	6-27
	6.9.3.1	Visual Resources	6-27
	6.9.3.2	Noise.....	6-27
	6.9.4	Potential Protection, Mitigation and Enhancement Measures	6-27
	6.9.5	Relevant Resource Management Plans	6-28
6.10		Cultural Resources	6-28
	6.10.1	Preliminary Issues.....	6-28
	6.10.2	Known or Potential Project Impacts	6-28
	6.10.3	Preliminary Studies and Information Gathering Needs	6-29
	6.10.4	Potential Protection, Mitigation and Enhancement Measures	6-30
	6.10.5	Relevant Resource Management Plans	6-30
6.11		Paleontological Resources	6-30
	6.11.1	Preliminary Issues.....	6-30
	6.11.2	Known or Potential Project Impacts	6-31
	6.11.3	Preliminary Studies and Information Gathering Needs	6-31
	6.11.4	Potential Protection, Mitigation and Enhancement Measures	6-32
	6.11.5	Relevant Resource Management Plans	6-32
6.12		Socioeconomic Resources	6-32
	6.12.1	Preliminary Issues.....	6-32
	6.12.2	Known or Potential Project Impacts	6-32
	6.12.3	Preliminary Studies and Information Gathering Needs	6-34
	6.12.4	Potential Protection, Mitigation and Enhancement Measures	6-34
	6.12.5	Relevant Resource Management Plans	6-34
6.13		Transportation Resources	6-34
	6.13.1	Preliminary Issues.....	6-34
	6.13.2	Known or Potential Project Impacts	6-35
	6.13.3	Preliminary Studies and Information Gathering Needs	6-35
	6.13.4	Potential Protection, Mitigation and Enhancement Measures	6-36
	6.13.5	Relevant Resource Management Plans	6-36
6.14		Air Quality	6-36
	6.14.1	Preliminary Issues.....	6-36
	6.14.2	Known or Potential Project Impacts	6-36
	6.14.3	Preliminary Studies and Information Gathering Needs	6-37
	6.14.4	Potential Protection, Mitigation and Enhancement Measures	6-37
	6.14.5	Relevant Resource Management Plans	6-37
6.15		Tribal Resources	6-38
	6.15.1	Preliminary Issues.....	6-38
	6.15.2	Known or Potential Project Impacts	6-38
	6.15.4	Preliminary Studies and Information Gathering Needs	6-38
	6.15.5	Potential Protection, Mitigation and Enhancement Measures	6-38
	6.15.6	Relevant Resource Management Plans	6-38
Section 7		Summary of Contacts	7-1
7.1		Federal Agencies.....	7-1
	7.1.1	Department of the Interior	7-1
	7.1.1.1	Bureau of Land Management	7-1
	7.1.1.2	Bureau of Reclamation	7-1
	7.1.1.3	National Park Service	7-1

	7.1.1.4	Fish and Wildlife Service	7-1
	7.1.1.5	Bureau of Indian Affairs.....	7-1
	7.1.1.6	Office of the Regional Solicitor.....	7-2
	7.1.1.7	Office of Environmental Policy and Compliance.....	7-2
	7.1.1.8	Geological Survey	7-2
	7.1.2	Federal Highway Administration	7-2
	7.1.3	Environmental Protection Agency	7-2
	7.1.4	Western Area Power Administration	7-2
	7.1.5	U.S. Army Corps of Engineers	7-2
	7.1.6	Department of Commerce.....	7-2
	7.1.6.1	Census Bureau	7-2
	7.1.6.2	National Oceanic and Atmospheric Administration.....	7-2
	7.1.7	Department of Agriculture.....	7-3
	7.1.7.1	Natural Resources Conservation Service	7-3
	7.1.8	Federal Energy Regulatory Commission	7-3
7.2	Tribes		7-3
	7.2.1	Kaibab Paiute Tribe	7-3
	7.2.2	Paiute Indian Tribe of Utah	7-3
	7.2.3	Navajo Nation	7-3
7.3	State Agencies.....		7-3
	7.3.1	State of Utah	7-3
	7.3.1.1	Department of Environmental Quality	7-3
	7.3.1.2	Utah Department of Natural Resources.....	7-3
	7.3.1.3	Utah Department of Transportation.....	7-4
	7.3.1.4	Governor’s Office of Planning and Budget.....	7-4
	7.3.1.5	Utah School and Institutional Trust Lands Administration.....	7-4
	7.3.1.6	Utah State Historic Preservation Office	7-4
	7.3.1.7	Utah State Historical Society.....	7-4
	7.3.1.8	Utah Department of Community and Culture	7-4
	7.3.1.9	Utah Automated Geographic Reference Center	7-4
	7.3.2	State of Arizona	7-4
	7.3.2.1	Arizona Department of Transportation	7-4
	7.3.2.2	Arizona State Lands Department.....	7-4
	7.3.2.3	Arizona Game and Fish Department	7-4
	7.3.2.4	Arizona Department of Water Resources.....	7-4
	7.3.2.5	Arizona Geological Survey	7-5
	7.3.2.6	Arizona State Historic Preservation Office	7-5
	7.3.2.7	Arizona Commission of Indian Affairs	7-5
	7.3.2.8	Arizona State Historical Society.....	7-5
	7.3.2.9	Arizona Department of Environmental Quality	7-5
7.4	Regional Agencies		7-5
	7.4.1	Five County Association of Governments.....	7-5
	7.4.2	Northern Arizona Council of Governments.....	7-5
	7.4.3	Western Arizona council of Governments.....	7-5
7.5	Local Governments.....		7-5
	7.5.1	Utah Water Conservancy Districts.....	7-5
	7.5.2	Counties	7-6
	7.5.2.1	Utah Counties	7-6
	7.5.2.2	Arizona Counties.....	7-6
	7.5.3	Municipalities	7-6
7.6	Non-Governmental Organizations		7-6

Section 8	Literature Cited	8-1
------------------	-------------------------------	------------

1.6 List of Figures

Figure No.	Description	Page No.
1-1	Lake Powell Pipeline Project Systems.....	1-2
2-1	Integrated Licensing Process	2-6
3-1	HUC 8 Watershed Areas.....	3-2
3-2	HUC 10 Watershed Areas.....	3-3
3-3	Major Land Uses Map	3-6
3-4	Major Water Uses	3-8
3-5	Dams, Reservoirs and Diversions	3-10
4-1	Water Intake System & Water Conveyance System.....	4-2
4-2	Hydro System	4-3
4-3	Cedar Valley Pipeline System	4-4
4-4	Water Intake System Site.....	4-6
4-5	Conceptual Cross Section of Intake Pump Station	4-7
4-6	Water Conveyance System Hydraulic Grade Line	4-9
4-7	Conceptual Cross Section of Intake Pump Station	4-10
4-8	Hydro System Hydraulic Grade Line	4-12
4-9	Typical In-Line Hydro Powerhouse Plan	4-14
4-10	Typical In-Line Hydro Powerhouse Sections (1 of 2)	4-15
4-11	Typical In-Line Hydro Powerhouse Sections (2 of 2)	4-16
4-12	Hurricane Cliffs Pumped Storage Hydro Layout.....	4-18
4-13	Hurricane Cliffs Pumped Storage (South Forebay) Waterway Profile.....	4-19
4-14	Hurricane Cliffs Pumped Storage Powerhouse Plan and Section.....	4-20
4-15	Sand Hollow Hydro Powerhouse Plan.....	4-21
4-16	Sand Hollow Hydro Powerhouse Section.....	4-22
4-17	Index to Map Series Sheets A-N.....	4-25
4-18	Sheet A – Water Intake System, Arizona	4-26
4-19	Sheet B – Big Water Booster Pump Station	4-27
4-20	Sheet C – The Cockscomb Booster Pump Station.....	4-28
4-21	Sheet D – Sand Gulch Booster Pump Station.....	4-29
4-22	Sheet E – Kanab, Utah.....	4-30
4-23	Sheet F – Fredonia, Arizona	4-31
4-24	Sheet G – Pipe Springs, Arizona.....	4-32
4-25	Sheet H – Colorado City, Arizona	4-33
4-26	Sheet I – St. George, Utah	4-34
4-27	Sheet J – Cedar Valley Pipeline, Utah	4-35
4-28	Sheet K – New Harmony, Utah	4-36
4-29	Sheet L – Kanarraville, Utah	4-37
4-30	Sheet M – Hurricane Cliffs Pumped Storage Hydro.....	4-38
4-31	Sheet N – Sand Hollow Hydro.....	4-39
5-1	Geologic Map of East Half of Project Alignment.....	5-3
5-2	Geologic Map of West Half of Project Alignment	5-4
5-3	Virgin River at Virgin, UT Average Annual Flow	5-9
5-4	Colorado River Below Glen Canyon Dam, Arizona Average Annual Flow	5-11

5-5	Colorado River at Lees Ferry, Arizona Average Monthly Flow	5-12
5-6	Colorado River at Lees Ferry, Arizona Flow Duration of Means Average Daily Flow	5-13
5-7	Green River near Jensen, UT Average Annual Flow.....	5-14
5-8	Green River near Jensen, UT Average Monthly Flow.....	5-15
5-9	Green River near Jensen, UT Flow Duration of Means Average Daily Flow	5-16
5-10	Wind River Range Snowpack Depth Gaging Stations.....	5-18
5-11	Uintah Range Snowpack Depth Gaging Stations	5-19
5-12	Central Rocky Mountains Snowpack Depth Gaging Stations	5-20
5-13	Snowpack Depths as Snow-Water Equivalent Wind River Range, WY-Gros Ventre Summit Station	5-22
5-14	Snowpack Depths as Snow-Water Equivalent Wind River Range, WY-Kendall R.S.	5-23
5-15	Snowpack Depths as Snow-Water Equivalent Wind River Range, WY-New Fork Lake Station	5-24
5-16	Snowpack Depths as Snow-Water Equivalent Wind River Range, WY-Big Sandy Opening Station.....	5-25
5-17	Snowpack Depths as Snow-Water Equivalent Wind River Range, WY-Elkhart Park G.S.	5-26
5-18	Snowpack Depths as Snow-Water Equivalent Uintah Range, UT-Beaver Divide Station	5-27
5-19	Snowpack Depths as Snow-Water Equivalent Uintah Range, UT-Chalk Creek Station #1	5-28
5-20	Snowpack Depths as Snow-Water Equivalent Uintah Range, UT-Chepeta Station	5-29
5-21	Snowpack Depths as Snow-Water Equivalent Uintah Range, UT-Daniels Strawberry Station.....	5-30
5-22	Snowpack Depths as Snow-Water Equivalent Uintah Range, UT-Lakefork Basin Station.....	5-31
5-23	Snowpack Depths as Snow-Water Equivalent Central Rocky Mtns., CO-Independence Pass Station.....	5-33
5-24	Snowpack Depths as Snow-Water Equivalent Central Rocky Mtns., CO-Jones Pass Station.....	5-34
5-25	Snowpack Depths as Snow-Water Equivalent Central Rocky Mtns., CO-Lake Irene Station.....	5-35
5-26	Snowpack Depths as Snow-Water Equivalent Central Rocky Mtns., CO-Nast Lake Station.....	5-36
5-27	Snowpack Depths as Snow-Water Equivalent Central Rocky Mtns., CO-Park Cone Station	5-37
5-28	Snowpack Depths as Snow-Water Equivalent Central Rocky Mtns., CO-Phantom Valley Station	5-38
5-29	Snowpack Depths as Snow-Water Equivalent Central Rocky Mtns., CO-Porphyry Creek Station.....	5-39
5-30	Snowpack Depths as Snow-Water Equivalent Central Rocky Mtns., CO-Red Mtn. Pass Station.....	5-40
5-31	Snowpack Depths as Snow-Water Equivalent Central Rocky Mtns., CO-Roach Station.....	5-41
5-32	Snowpack Depths as Snow-Water Equivalent Central Rocky Mtns., CO-Slimgullion Station	5-42
5-33	Groundwater Sampling Wells – Sand Hollow Reservoir Vicinity	5-64
5-34	Sand Hollow Reservoir Area Groundwater Quality Classification	5-66
5-35	Cedar Valley Groundwater Quality Classification	5-68

5-36	Mule Deer Seasonal Habitat	5-73
5-37	Pronghorn Antelope, Bighorn Sheep and Black Bear Habitat.....	5-74
5-38	Fowl Habitat	5-76
5-39	Wetland and Riparian Areas	5-80
5-40	Federally Listed Threatened and Endangered Plants	5-82
5-41	Red Cliffs Desert Reserve.....	5-86
5-42	Recreation Use Lands	5-91
5-43	Wilderness Study Areas and ACECs	5-99
5-44	Visual Resources Management Classifications	5-101
5-45	Transportation Resources	5-112
5-46	Native American Reservations and Nations	5-114
5-47	Traditional Southern Paiute Territory	5-116

1.7 List of Tables

Table No.	Description	Page No.
2-1	Proposed Process Plan and Schedule	2-1
3-1	Watershed and Tributary Stream Information	3-11
3-2	Summary of Temperature and Precipitation Conditions in Regional Communities	3-13
5-1	Snow Depth Gaging Stations Site Information.....	5-21
5-2	Beneficial Use Protection Classifications for Surface Water of the State of Utah, UAC R317-2-6	5-44
5-3	Beneficial Use Protection Classifications Designated for Major Rivers and Reservoirs in the Vicinity of the Lake Powell Pipeline Project Alignment, UAC 317-2-13	5-44
5-4	Surface Water Numeric Standards for Domestic Source (Class 1C).....	5-45
5-5	Groundwater Classes for the State of Utah UAC R317-6-3	5-51
5-6	Utah Numerical Groundwater Quality Standards	5-51
5-7	Water Quality for Lake Powell at Wahweap Sampling Station, Arizona.....	5-56
5-8	Pre- and Post-Filling Groundwater Quality Conditions at Sand Hollow Reservoir	5-60
5-9	Southern Utah and Northern Arizona Change in Population from 2000 to 2006 & Per Capita and Poverty Level Date from 2000	5-107
5-10	Housing Increases Between 2000 and 2005 in Southern Utah	5-107
5-11	Increase in Non-Farm Establishments in the Project Area	5-107
5-12	Permanent Population Projections in the Project Area	5-108
5-13	Average Annual Tourist Information for Southwest Utah Counties	5-109
5-14	Average Annual Student Population for Southwest Utah Counties.....	5-110

1.8 List of Appendices – Volume II

APPENDIX A

LAKE POWELL PIPELINE

FERC FORM 587 – LAND DESCRIPTION FORMS PAGES 1 THROUGH 32 (UPDATED)

APPENDIX B
LAKE POWELL PIPELINE
LIST OF DRAFT RESOURCE WORK PLANS

1. Draft Air Quality Work Plan
2. Draft Cultural Resources Work Plan
3. Draft GIS Work Plan
4. Draft Groundwater Resources Work Plan
5. Draft Land Use Work Plan
6. Draft Noise Work Plan
7. Draft Paleontology Resource Work Plan
8. Draft Public Involvement and Outreach Work Plan
9. Draft Recreation Work Plan
10. Draft Socioeconomic Work Plan
11. Draft Surface Water Work Plan
12. Draft TES Species Work Plan
13. Draft Transportation Work Plan
14. Draft Vegetation Resources Work Plan.
15. Draft Visual Resources Work Plan
16. Draft Water Quality Work Plan
17. Draft Wetlands Work Plan
18. Draft Wildlife Resources Work Plan

APPENDIX C
LAKE POWELL PIPELINE
LIST OF REFERENCE MATERIALS

1. Sand Hollow Reservoir Fishing Report, 2007
2. Geologic Map of Mohave County, Arizona, 1959
3. Geologic Map of Coconino County, Arizona, 1960
4. Arizona Game and Fish Department Heritage Data Management System, 2004
5. Arizona Game and Fish Department Heritage Data Management System, 2005
6. Mohave County Information, 2007
7. Escalante MFD, 1972
8. Paria Management Framework Plan, 1972
9. Dixie Resource Management Plan & Final Environmental Impact Statement, 1998
10. BLM Proposed Management Plan Final Environmental Impact Statement, 1999
11. Grand Staircase-Escalante National Monument Management Plan, 2000
12. BLM Kanab Field Office Final Analysis of the Management Situation, 2005
13. Kanab Field Office Draft Resource Management Plan Volume 1 of 2, 2007
14. Kanab Field Office Draft Resource Management Plan Volume 2 of 2, 2007
15. BLM Arizona Strip District – Paria Canyon/Vermilion Cliffs, 2006
16. BLM Arizona Strip Field Office – Wildlife – Deer, 2006
17. BLM Arizona Strip Field Office – Wildlife – Pronghorn, 2006
18. BLM Arizona Strip Field Office – Wildlife – Bighorn, 2006
19. Arizona Strip Draft Plan/DEIS, 2007
20. Sand Hollow Recreation Area Management Plan, 2001
21. Virgin River Watershed Management Plan, 2006
22. Blue Ribbon Fisheries, 2006
23. Lake Powell Pipeline Feasibility Study – Volume 1 and 2, 2003

24. Cedar City Water Report, 2006
25. Cyclic Eolian Stratification on the Jurassic Navajo Sandstone, Zion National Park: Periodicities and Implications for Paleoclimate, 2000
26. Regional Climate Projections, 2007
27. Inventory of Dominantly Marine and Brackish-Water Fossils from Late Cretaceous Rocks in and near Grand Staircase-Escalante National Monument, Utah, 2000
28. Guidelines for Handling Desert Tortoises During Construction Projects, 1999
29. Coral Pink Sand Dunes State Park, 2007
30. Cedar Breaks National Monument, 2007
31. Colorado River Basin Climate, 2005
32. Glen Canyon Dam Adaptive Management Program, 2001
33. Quail Creek State Park, 2007
34. Sand Hollow: Population Park is Beating Expectations, 2007
35. WCWCD Petition for Classification of the Navajo/Kayenta and Upper Ash Creek Aquifers, 2005
36. Habitat Conservation Plan for Utah Prairie Dogs in Iron County, Utah, 1998
37. Kane County Local Planning Summary, 2003
38. Geologic Map of the Smithsonian Butte Quadrangle, Washington County, Utah, 2001
39. National Oceanic and Atmospheric Administration Global Warming FAQ's, 2007
40. State of the Parks Report on the Natural Resources of Zion National Park, 2004
41. State of the Parks Resource Assessment, 2005
42. Zion National Park General Management Plan, 2001
43. Strategic Plan for Glen Canyon NRA and Rainbow Bridge NM, 2005
44. Navajo Generating Station Water Intake Project Environmental Assessment, 2005
45. Colorado River Management Plan, 2006
46. Bryce Canyon National Park Information Guide, 2007
47. Cedar Breaks National Monument, 2007
48. Soil Survey of Washington County Area, Utah, 1971
49. Soil Survey of Coconino County Area, Arizona, 1983
50. Soil Survey of Iron-Washington Area, Utah, Parts of Iron, Kane and Washington Counties, 1996
51. Soil Survey of Grand Staircase-Escalante National Monument Area, Parts of Kane and Garfield Counties, Utah, 2003
52. Escalante Valley – Iron County, Utah Rapid Watershed Assessment, 2007
53. Soil Map – Grand Staircase-Escalante National Monument Area, Parts of Kane and Garfield Counties, Utah, 2007
54. Soil Map – Coconino County Area, Arizona, North Kaibab Part, 2007
55. Soil Map – Washington County Area, Utah, 2007
56. Soil Map – Iron-Washington Area, Utah, Parts of Iron, Kane, and Washington Counties, 2007
57. Colorado, Utah and Wyoming Snow Data, 2007
58. Final Environmental Impact Statement for Operation of Glen Canyon Dam, Colorado River Storage, 1995
59. Glen Canyon Dam, Arizona, 2007
60. Bureau of Reclamation Upper Colorado Region Water Operations, 2007
61. A Survey of the Paleontological Resources from the National Parks and Monuments in Utah, 2000
62. Air Quality in Southern Utah, It's Everybody's Business, 2007
63. Salmonid Population Size, Relative Density and Distribution in the Colorado River in Grand Canyon During 2001 Annual Report, 2003
64. Central Iron County Water Conservancy District Capital Facilities Plan and Impact Fee Analysis, 2007

65. Utah State Parks 2007 Visitation, 2007
66. Aquatic Nuisance Threat Prevention, 2007
67. Geohydrology and Numerical Simulation of Groundwater Flow in the Central Virgin River Basin of Iron and Washington Counties, Utah, 2000
68. Utah Conservation Data Center, 2006
69. Snow Canyon State Park Resource Management Plan, 1998
70. Coral Pink Sand Dunes State Park Draft General Management Plan, 2004
71. LPP Study Water Needs Assessment, 2007
72. Geological Road Guide to Quail Creek State Park, Washington County, Utah, 2000
73. Utah Geological and Mineral Survey Map of the Elephant Butte Quadrangle, 1990
74. Earthquakes in Utah, 1997
75. The Geology of the Central Virgin River Basin, Southwestern Utah and its Relation to Groundwater Conditions, 1998
76. Digital Geologic Map of the Kanab 30' x 60' Quadrangle, Kane and Washington Counties, Utah and Coconino County, Arizona, 1999
77. The Geology of Quail Creek State Park, 1999
78. Interim Geologic Map of the Kolob Arch Quadrangle, Washington and Iron Counties, Utah, 2002
79. Geologic Map of the Harrisburg Junction Quadrangle, 2003
80. Geologic Map of the Hurricane Quadrangle, 2003
81. Geologic Map of the Pintura Quadrangle, 2003
82. Geologic Map of the Little Creek Mountain Quadrangle, 2004
83. Geologic Map of The Divide Quadrangle, 2004
84. Geologic Map of the Smoky Mountain 30' x 60' Quadrangle, 2006
85. Interim Geologic Map of the Kanab Quadrangle, 2006
86. Geologic Map of the Cedar City Quadrangle, 2006
87. Groundwater Quality Classification Map for the Basin-fill Aquifer for Cedar Valley, Iron County, Utah, 2007
88. US Census Bureau for Arizona and Utah, 2000
89. Dwarf Bear-Poppy Recovery Plan, 1985
90. Biological Opinion for the Arizona Strip Resource Management Plan, 1990
91. Welsh's Milkweed Recovery Plan, 1992
92. Final Biological Opinion of the Operation of Glen Canyon Dam. 1995
93. Desert Tortoise Recovery Plan, 1994
94. Kanab Ambersnail Recovery Plan, 1995
95. Biological Opinion on the Effects to Woundfin and Virgin River Chub from the Proposed Placement of Kellner Jacks and Riprap in the Beaver Dam Wash, Mohave County, Arizona, 1996
96. Draft Environmental Assessment for Federal Agency Participation in the Virgin River Resource Management and Recovery Plan, 2000
97. Final Recovery Plan Southwestern Willow Flycatcher, 2002
98. Razorback Sucker Recovery Goals, 2002
99. Biological Opinion for the Lake Mead National Recreation Area Fire Management Plan, 2004
100. Reinitiation of Section 7 Consultation for the Tilapia Removal Program on the Virgin River, Clark County, Nevada, and Mohave County, Arizona, 2005
101. Holmgren Milk-Vetch Recovery Plan, 2006
102. Biological Opinion for Grazing Permit Renewal for Six Allotments Containing Siler Pincushion Cactus Habitat, 2007
103. Endangered Species Program Recovery of the Peregrine Falcon, 2007
104. Invasive Mussels Detected in Lake Powell, 2007

105. Geology of the Lees Ferry Area, Coconino County, Arizona, 1963
106. Study and Interpretation of the Chemical Characteristics of Natural Water, 1985
107. Field Guide to Geologic Excursions in Southwestern Utah and Adjacent Areas of Arizona and Nevada, 2002
108. Geologic Map of Clayhole Wash and Vicinity, Mohave County, Northwestern Arizona, 2002
109. Precipitation History of the Colorado Plateau Region, 2002
110. Selected Hydrologic Data for Cedar Valley, Iron County, Southwestern Utah, 2002
111. Geologic Map of the Lower Hurricane Wash and Vicinity, Mohave County, Northwestern Arizona, 2003
112. Geologic Provinces of the United States: Colorado Plateau Province, 2004
113. Geologic Provinces of the United States :Basin and Range Province, 2004
114. Geologic Map of the Kanab 30' x 60' Quadrangle, Utah and Arizona, 2004
115. Geologic Map of Pipe Spring National Monument and the Western Kaibab-Paiute Indian Reservation, Mohave County, Arizona, 2004
116. Climatic Fluctuations, Drought, and Flow in the Colorado River Basin, 2004
117. Pre and Post-Reservoir Groundwater Conditions and Assessment of Artificial Recharge at Sand Hollow, Washington County, Utah, 2005
118. Hydrology and Simulation of Groundwater Flow in Cedar Valley, Iron County, Utah, 2005
119. USGS Surface-water Annual Statistics for the Nation – Colorado River at Lees Ferry, Glen Canyon Dam and Green River at Jensen, 2007
120. USGS Surface-water Monthly Statistics for the Nation – Colorado River at Lees Ferry, Glen Canyon Dam and Green River at Jensen, 2007
121. Spreadsheet of Monthly and Annual Means, 2007
122. Assessment of Artificial Recharge at Sand Hollow Reservoir, Washington County, Utah, Updated to Conditions through 2006, 2007
123. Utah Environmental Quality Drinking Water Rules Code R309, 2007
124. Utah Environmental Quality Drinking Water Rules Code R317, 2007
125. Quail Creek Reservoir, 2007
126. Lake Powell, 2007
127. Aquifer Classification Maps for Utah's Ground Water, 2007
128. Utah Gap Analysis – Predicted Habitat for the Mule Deer, 2007
129. Utah Gap Analysis – Predicted Habitat for the Gambel's Quail, 2007
130. Utah Fishing Proclamation, 2006
131. DEA Long-term Projections, 2005
132. DEA Demographics – Data on People – Data Tables, 2007
133. Zion National Park, 2007
134. Buckskin Gulch/Paria Canyon, 2007
135. Resource Guide to Utah Outdoor Activities, 2007
136. Utah Outdoors Recreation Guide, 2007
137. Quail Creek State Park, 2007
138. Virgin River Management Plan, 1999
139. Geology Along the Route of the Lake Powell Water Pipeline, Utah and Arizona, 2005
140. WCWCD Water Line, 2005
141. WCWCD Water Line, 2006
142. WCWCD Water Line, 2007
143. Wikipedia – Lake Powell, 2007
144. Wikipedia – Glen Canyon Dam, 2007
145. Wikipedia – Utah, 2007
146. Washington County Habitat Conservation Plan, 1995
147. Wahweap Water Quality Data, 2008

148. Utah Governor's Office of Planning and Budget, Detailed Demographic and Economic Projections, 2008
149. Utah Governor's Office of Planning and Budget, Population Estimates for the State of Utah and Utah Counties 1940 to 2007, 2007

1.9 Definition of Terms, Acronyms and Abbreviations

Term	Definition
A	
AADT	average annual daily traffic
ABM	Arizona Bureau of Mines
ACEC	area of critical environmental concern
Afterbay	reservoir located immediately downstream from a powerhouse
AGRC	Automated Geographic Reference Center
AIR	additional information request
ALP	alternative licensing process
AMO	Atlantic multidecadal oscillation
Applicant	Utah Board of Water Resources (UBWR)
Applicant's Interested Parties Mailing List	List of interested parties Applicant has prepared in anticipation of the Project licensing proceeding. Applicant anticipates that once the licensing proceeding begins, Applicant's Interested Parties Mailing List and FERC's Project No. 12966 Mailing List may be consolidated into one common list.
Avg.	average
AZ	Arizona
B	
BLM	United States Bureau of Land Management
BOD	biochemical oxygen demand
BPS	booster pumping station
C	
C	celsius
CFR	Code of Federal Regulations
cfs	cubic feet per second
CICWCD	Central Iron County Water Conservancy District
CL	centerline
cm	centimeter
Co.	county
Commission	Federal Energy Regulatory Commission (FERC)
D	
DBCP	dibromochloropropane
DBP	disinfection by-product
DEIS	draft environmental impact statement
DIA	diameter
Term	Definition
DO	dissolved oxygen
DOI	United States Department of the Interior
DRP	dispute resolution panel
DWQ	Division of Water Quality
E	

E. coli	<i>Escherichia coli</i>
EA	environmental analysis
EDB	ethylene dibromide
EIS	environmental impact statement
EL	elevation
ENSO	El Nino Southern Oscillation
EPA	Environmental Protection Agency
ESA	Endangered Species Act
F	
FEIS	final environmental impact statement
FERC	Federal Energy Regulatory Commission
FERC Project No. 12966 Mailing List	mailing list of interested parties prepared and maintained by FERC throughout the Project licensing proceeding
FERC Project No. 12966 Service List	mailing list of parties that have formally intervened in the licensing proceeding, prepared and maintained by FERC after it accepts the License Application
FIN FLR	finish floor
Forebay	Reservoir upstream from a powerhouse, from which water is drawn into a tunnel or penstock for delivery to the powerhouse
Ft	feet
G	
GCAMPWG	Glen Canyon Adaptive Management Plan Work Group
GCDAMP	Glen Canyon Dam Adaptive Management Program
Generator	machine powered by a turbine that produces electric current
GIS	geographic information system
GL	ground level
GOPB	Governor's Office of Planning and Budget
GSENM	Grand Staircase-Escalante National Monument
GWh	gigawatt-hour (equals one million kilowatt-hours)
H	
HAA5	five haloacetic acids
HGL	hydraulic grade line
hp	horsepower
HUC	hydrologic unit code
HWL	high water level
Hwy	highway
Hydro Station	hydroelectric generating station
I	
ICP	inductively coupled plasma
ID	inside diameter
ILP	integrated licensing process
IPCC	Intergovernmental Panel on Climate Change
ITA	Indian trust asset

Term	Definition
K	
KCWCD	Kane County Water Conservancy District
KOP	key observation point
kV	kilovolts: 1,000 volts
L	
L	length or liter
Lat	latitude
License Application	UBWR's Application for Original License
LNSO	La Nina Southern Oscillation
Long	longitude
LOS	level of service
LPP	Lake Powell Pipeline
LWL	low water level
M	
μ	micro
μg/L	micrograms per liter
μS	microsiemens
m	meter
M&I	municipal and industrial
Max.	maximum
MCA/T	mandatory condition agency/tribes
MCL	maximum contaminant level
mg/L	milligrams per liter
Min.	minimum
mrem/year	millirems per year
MSL	mean sea level
Mt.	mount or mountain
Mtg.	meeting
MW	megawatt
MWH	Montgomery Watson Harza
N	
NAD-83	North American Datum of 1983
NBS	National Bureau of Standards
NEPA	National Environmental Policy Act
NGVD29	National Geodetic Vertical Datum of 1929
NHPA	National Historic Preservation Act
NLT	not later than
NMON	National Monument
NOAA	National Oceanic and Atmospheric Association
NOI	notice of intent
NP	National Park
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRA	National Recreation Area
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historical Places
NTU	nephelometric turbidity unit

Term	Definition
O	
OHV	off-highway vehicle
ORP	oxygen reduction potential
P	
P.L.	Public Law
PAD	pre-application document
PAH	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
pCi/L	picocuries per liter
PCPI	per capita personal income
PDO	Pacific decadal oscillation
Peaking	Operation of generating facilities to meet maximum instantaneous electrical demands
Pelton-type turbine	Wheel-shaped turbine fitted with spoon-shaped buckets driven by forceful streams of water directed from nozzles, transferring water momentum from high velocity to low velocity into the mechanical energy of rotation
Penstock	An inclined pressurized pipe through which water flows from a forebay or tunnel to the powerhouse turbine
Precip.	precipitation
Project	Lake Powell Pipeline Project, FERC No. 12966
psi	pounds per square inch
R	
Reclamation	United States Bureau of Reclamation
Reg. Tank	water tank that regulates flow along a pipeline and operates at atmospheric pressure
Reservation	Kaibab Paiute Indian Reservation or Paiute Indian Tribe of Utah Tribal Reservation
RMP	resource management plan
RVs	recreation vehicles
S	
S.U.	standard units
SCADA	supervisory control and data acquisition
SD1	Scoping Document 1
SD2	Scoping Document 2
SHPO	State Historic Preservation Officer
SITLA	School and Institutional Trust Lands Administration
SNOTEL	snowpack telemetry
SNWA	Southern Nevada Water Authority
SP	state park
SRMA	special recreation management area
ST	state
Sta	station
Surge Tank	structure used to absorb and attenuate the overflow and prevent any disruption due to a sudden change in water pressure through a pipeline
SWE	snow-water equivalent

Term	Definition
T	
Tailrace	channel through which water is discharged from the powerhouse turbines
TCP	traditional cultural property
TDS	total dissolved solids
Temp.	temperature
TKN	total Kjeldahl nitrogen
TLP	traditional licensing process
TMDL	total maximum daily load
TSS	total suspended solids
TTHM	total trihalomethanes
Turbine	Machine that converts the energy of a water stream into the mechanical energy of rotation. This energy is then used to turn an electrical generator or other device.
TWL	top water level
TYP	typical
U	
UAC	Utah Administrative Code
UBWR	Utah Board of Water Resources
UDEQ	Utah Department of Environmental Quality
UDNR	Utah Department of Natural Resources
UDP&R	Utah Division of Parks and Recreation
UDWQ	Utah Department of Environmental Quality, Division of Water Quality
UDWR	Utah Division of Water Resources
UGA	Utah Geological Association
UGS	Utah Geological Survey
US	United States
USFS	United States Department of Agriculture, Forest Service
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UT	Utah
V	
Vertical turbine pump	water pump with the motor located above ground, connected by a shaft to the pump below
VRM	visual resource management
W	
W.L.	water level
WCD	water conservancy district
WCWCD	Washington County Water Conservancy District
WSA	wilderness study area
Y	
yr.	year