

**ATTACHMENT A**  
**BLM COMMENT RESPONSES**  
**WITH EXTENDED NARRATIVES**  
**MARCH 31, 2017**

**This document includes extended narratives for all resources, please see the 20170331 Comments Table to determine which narrative applies to a specific resource.**

**BLM GENERAL 5**

Table 5-1 in Chapter 5, Exhibit E of the License Application is revised to indicate either **No** if no LPP Project water could enter a stream in the watershed or **Possible** if a stream directly crossed by the LPP Project could temporarily receive small quantities of water drained from the pipeline during annual operation and maintenance activities. The revised Table 5-1 is revised as follows:

<b>Table 5-1</b>					
<b>Lake Powell Pipeline Watershed and Tributary Stream Information</b>					
<b>Watershed / Hydrologic Unit Code</b>	<b>Tributary Basin Name / Hydrologic Unit Code</b>	<b>Primary Tributaries</b>	<b>Tributary Length (mile)</b>	<b>Drainage Area (mi.<sup>2</sup>)</b>	<b>Affected by Project Operation<sup>1</sup></b>
Lower Lake Powell (14070006)	Upper Wahweap Creek (1407000608)	Wahweap Creek	46	215	No
	Lower Wahweap Creek (1407000609)	Coyote Creek	49	262	Possible
Paria River (14070007)	Upper Paria River (1407000701)	Paria River	26	265	No
	Sheep Creek (1407000702)	Sheep Creek	21	99	No
	Hackberry Canyon – Cottonwood Creek (1407000703)	Cottonwood Creek	31	108	No
		Hackberry Creek	19		No
	Upper Buckskin Gulch (1407000704)	Buckskin Gulch Park Wash Deer Springs Wash	20 21 22	297	Possible No No
Lower Buckskin Gulch (1407000705)	Buckskin Gulch Coyote Wash	12 16	191	Possible No	
Kanab Creek (15010003)	Kanab Creek Headwaters (1501000301)	Kanab Creek	40	194	No
	White Sage Wash (1501000302)	White Sage Wash	17	214	Possible
		Rock Canyon	21		No
	Upper Johnson Wash (1501000303)	Johnson Wash	45	287	Possible
		Johnson Lakes Can.	15		No
	Lower Johnson Wash (1501000304)	Johnson Wash	18	186	Possible
	Sandy Canyon Wash – Kanab Creek (1501000305)	Kanab Creek	24	242	Possible
Bulrush Wash (1501000306)	Bulrush Wash	30	290	Possible	
	Bitter Seeps Wash	6		Possible	
	S. Moccasin Wash	11		Possible	
Jacob Canyon – Kanab Cr. (1501000309)	Sand Wash	8	228	Possible	
	Jacob Canyon	19		Possible	
	Kanab Creek	36		Possible	

<b>Table 5-1</b>					
<b>Lake Powell Pipeline Watershed and Tributary Stream Information</b>					
<b>Watershed / Hydrologic Unit Code</b>	<b>Tributary Basin Name / Hydrologic Unit Code</b>	<b>Primary Tributaries</b>	<b>Tributary Length (mile)</b>	<b>Drainage Area (mi.<sup>2</sup>)</b>	<b>Affected by Project Operation<sup>1</sup></b>
Virgin River (15010008)	North Fork Virgin River (1501000801)	N. Fork Virgin R. Deep Creek	38	360	No
			19		No
	East Fork Virgin River (1501000802)	East Fork Virgin River	53	404	No No
	La Verkin Creek (1501000803)	La Verkin Creek	33	94	No
	Ash Creek (1501000804)	Ash Creek	32	215	No
	North Creek – Virgin River (1501000805)	Virgin River North Cr. / Blue Cr.	21	217	No
			20		No
	Upper Santa Clara River (1501000807)	Santa Clara River	28	138	No
	Gould Wash – Virgin River (1501000809)	Virgin River Gould Wash	26	353	No
			22		No
Fort Pearce Wash (15010009)	Clayhole Wash (1501000902)	Clayhole Wash	50	352	Possible
	Short Creek (1501000903)	Short Creek	32	276	Possible
	Hurricane Wash (1501000904)	Hurricane Wash	55	359	No
	Dutchman Wash (1501000905)	Dutchman Draw	50	302	No
	Fort Pearce Wash (Local Drainage) (1501000906)	Rock Canyon	25	116	Possible
<b>Notes:</b>					
<sup>1</sup> “No” in this column means no LPP Project water could be temporarily released from the pipeline into a stream within this basin. “Possible” in this column means streams directly crossed by the LPP Project could temporarily receive small quantities of water drained from the pipeline/penstock during annual operation and maintenance activities. Source: Utah AGRC – <a href="http://gis.utah.gov">http://gis.utah.gov</a> and BLM Arizona Strip – <a href="http://www.blm.gov/az/st/en/prog/maps/gis_files">http://www.blm.gov/az/st/en/prog/maps/gis_files</a>					

### **BLM GENERAL 16**

While the organization of this section may be different than BLM is accustomed to, it is organized in accordance with FERC required format that identifies the resources that would potentially have cumulative effects for each interrelated action or project. The presentation of interrelated projects and actions in Section 5.2 Chapter 5, Exhibit E of the License Application meets FERC's format for an Exhibit E environmental document. While the information contained in this document will be utilized in the preparation of the DEIS, the final organization of the DEIS, including the cumulative effects section,

will be determined through collaboration between FERC and the Cooperating Agencies and may not reflect how this document is organized.

Section 5.2.3 Chapter 5, Exhibit E of the License Application (which has now replaced the PLP that BLM reviewed) states that it: "...describes projects and actions that could cause cumulative effects from construction and operation of the proposed LPP when completed" or implemented. These are referred to as interrelated projects and actions for the LPP. The lists of resources with potential to have cumulative effects when combined with the LPP effects, as identified for each project or action (by subsection) represent those resources with potential impacts that could cause cumulative impacts. The cumulative impacts analysis is presented by resource in Section 5.3, Chapter 5, Exhibit E of the License Application. Interrelated projects and actions with no impacts on a resource could not have cumulative effects with the LPP because cumulative effects occur when the proposed project's effects are combined with the effects of interrelated projects and actions.

Air quality under the Interim Guidelines could be affected by water elevation changes which would result in shoreline changes with associated exposure of previously water settled particles to the wind, resulting in fugitive dust. The LPP could cause additional changes in water levels resulting from water diversion, which could increase potential fugitive dust from storage equalization impacts, with resultant cumulative impacts on fugitive dust.

Visual resources in Lake Powell could be affected by water elevation changes resulting from storage equalization operations affecting water surface elevations. The LPP could potentially affect water surface elevations from water diversions, and when combined with water elevation changes from storage equalization operations, cumulative impacts could occur on visual resources. These cumulative impacts would occur from water level changes in Lake Powell that would expose more shoreline, different shoreline coloration, as well as new topographic and shoreline features than previously viewed by visitors.

### **BLM GENERAL 21**

1. The first sentence of Section 5.3.6.1, Chapter 5, Exhibit E of the License Application is revised to read: **The LPP Project involves lands and waters in two states (Utah and Arizona) and crosses a variety of federal, state and private property.**
2. The fourth sentence of Section 5.3.6.1, Chapter 5, Exhibit E of the License Application is revised to read: **However, only the Paria and Virgin rivers and Kanab Creek near Fredonia carry perennial flows within the area of potential effect and provide habitat for aquatic resources.**
3. The first sentence of the second paragraph of Section 5.3.6.1, Chapter 5, Exhibit E of the License Application is revised to read: **The immediate area around the water intake system screens in Lake Powell are considered part of the LPP Project study area for aquatic resources, because the intake screens could potentially entrap native fish from the lake and facilitate the transfer of invasive aquatic species to other drainages.**
4. The fifth sentence of the first paragraph of Section 5.3.6.1.2, Chapter 5, Exhibit E of the License Application is revised to read: **Typically, most healthy fish and actively motile aquatic species can avoid being trapped in an intake suction flow if the velocity is maintained below the escape velocity (swimming speed) of those organisms.**

5. The second sentence of the second paragraph of Section 5.3.6.1.2, Chapter 5, Exhibit E of the License Application is revised to read: **If designed and operated properly to meet the conventional federal and state agency requirements for fish entrapment avoidance, then fish species in Lake Powell near the dam would not be entrapped by the fish screens.**
6. The third sentence of the second paragraph of Section 5.3.6.1.5.1, Chapter 5, Exhibit E of the License Application is revised to read: **For this analysis, of particular concern is the prevention of mussel entrapment at the LPP Project intake and into water conveyance facilities.**

### **BLM GENERAL 27**

The first paragraph of Section 5.3.6.1.5, Chapter 5, Exhibit E of the License Application is revised to read: **Concerns relating to the effect of the quagga mussel (*Dreissena bugensis*) in Lake Mead are well documented and this problem has significantly affected operation of local domestic water intakes at Lake Mead, has resulted in the temporary closure of the Cold Water Fish Hatchery at Lake Mead, has affected surface water withdrawals for the Central Arizona Project and the California water system, and has had effects on recreational use of water resources throughout the western United States and Canada. However, the proposed LPP water diversion from Lake Powell incorporates design features to minimize the probability that invasive mussel species could be transferred (biota transfer) to other drainages.**

### **BLM 28**

#### **WCWCD Planned and Potential Future Water Supply Projects Summary**

The following table summarizes water supply projects currently planned by WCWCD to meet the demands of existing and future water users in Washington County and those that could be considered potential long-term projects if certain technical, environmental or cost concerns were resolved. Individual projects would supply either culinary or secondary untreated water to WCWCD wholesale customers. Each project would have limitations in the areas it could deliver water to economically.

<b>WCWCD Future Planned and Potential Water Supply Projects<sup>1</sup></b>		
<b>Project</b>	<b>Estimated Reliable Culinary Supply (ac-ft/year)</b>	<b>Estimated Reliable Secondary Untreated Supply (ac-ft/year)</b>
Ash Creek Pipeline <sup>2</sup>	2,840	0
Sand Hollow Recharge and Recovery <sup>3</sup>	3,000	0
Cottam Well Maximization	600	0
Sullivan Wells	750	0
Pintura Well	600	0
Diamond Valley Well	400	0
Kayenta (Ence) Wells <sup>4</sup>	480	0

<b>WCWCD Future Planned and Potential Water Supply Projects<sup>1</sup></b>		
<b>Project</b>	<b>Estimated Reliable Culinary Supply (ac-ft/year)</b>	<b>Estimated Reliable Secondary Untreated Supply (ac-ft/year)</b>
Westside Arsenic Treatment <sup>5</sup>	5,000	0
Maximize Existing Wastewater Reuse <sup>4,6</sup>	0	7,300
Agricultural Conversion from Development <sup>7</sup>	0	10,080
<b>Total Potential Yield from Future Projects</b>	<b>13,760</b>	<b>17,380</b>
Notes:		
<sup>1</sup> LPP not included; future planned and potential water supply projects with independent utility		
<sup>2</sup> Ash Creek Pipeline yields 2,840 ac-ft/year based on UDWRe Virgin River Modeling		
<sup>3</sup> Arsenic treatment or blending and transmission upgrades must occur before this water is available for culinary use		
<sup>4</sup> Planned for implementation after 2030		
<sup>5</sup> Includes Gunlock to Santa Clara Pipeline and Snow Canyon Wells; treatment will be needed prior to culinary use		
<sup>6</sup> The St. George wastewater reuse plant could be maximized to its 10 mgd design capacity (11,200 ac-ft per year). The plant's current reuse capacity is 7.0 mgd or 7,800 ac-ft per year, but due to lack of storage, this supply can only be used to meet secondary untreated demands during the irrigation season from April through October. Thus, the usable supply is 50 percent, or 3,900 ac-ft per year. Assuming storage facilities would be implemented, a future maximized 10 mgd plant capacity would result in an additional 7,300 ac-ft per year of future secondary supply.		
<sup>7</sup> Estimated supply is 12,880 ac-ft/year with 90% reliability. However, approximately 2,800 ac-ft/year is currently in use and has been accounted for as part of existing reliable secondary untreated supply.		

### **KCWCD Planned and Potential Future Water Supply Projects Summary**

KCWCD serves the entire area of Kane County; however, only the Kanab City and Johnson Canyon watershed basin is geographically located such that customers could economically receive municipal and industrial water from the LPP. Therefore, planned and potential future water supply projects consist of potential new groundwater production in the Kanab City and Johnson Canyon watershed basin totaling 7,920 ac-ft/per year. There are substantial water quality issues that would limit the use of any potentially future available groundwater supply. Water quality diminishes from the upper portions of the Kanab City and Johnson Canyon watershed basin to the lower portion of the basin. For example, TDS concentrations increase in the lower part of the Kanab Creek subbasin to an extent that any available additional supplies near Kanab City would only be of sufficient quality for secondary untreated use. An analysis of published online water quality data showed that wells within the Johnson Wash area produce groundwater that exceed the State of Utah's Secondary untreated Maximum Contaminant Levels (MCL) for drinking water in total dissolved solids (TDS), electrical conductivity (EC), sulfate (SO<sub>4</sub>) associated with gypsum, and sodium (Na). Sediments derived from erosion of Johnson Canyon are likely to include deposits originating from the Moenkopi Formation exposed in the lower (southerly) extent of the canyon. These exposures include the Shnabkaib Member, which is high in soluble gypsum and evaporites, and could be the source of high TDS, SO<sub>4</sub>, and Na concentrations in the Johnson Wash area groundwater. Appendix A in Final Study Report 19 – Water Needs Assessment contains the data and assessment of groundwater quality in the Kanab City and Johnson Canyon basin. Culinary use of the potential future available groundwater would require treatment with reverse osmosis to remove the high salt concentrations and suitable disposal of the byproduct brine resulting from the reverse osmosis treatment process.

**BLM 432**

The sentence in Chapter 5 of the PLP, Section 5.2.2, second paragraph that BLM Comment No. 432 refers to is specific to FERC's Scoping Document 2 (SD2) and the potential term of a license that would be issued by FERC: "FERC staff did not identify specific resources in SD2 that could be cumulatively affected during the potential term of a new license." FERC prepared SD2 and this sentence only refers to the conclusions of SD2. Other parts of the PLP (and FLA) do explain the role, responsibilities, and federal land management authorities of BLM and the other cooperating agencies as described below. The EIS will have to have sections outlining the authorities including that BLM is the authority on BLM managed public lands and that BLM will make its decision through a BLM ROD. Similar clarity will be included for the other DOI land managing agencies.

BLM will be able to fully participate in development of the EIS pursuant to the Memorandum of Understanding between the Federal Energy Regulatory Commission and the Bureau of Land Management for the Lake Powell Pipeline Project EIS executed by FERC on March 4, 2009 and BLM on February 27, 2009. FERC has committed to work with BLM on preparation of the EIS in accordance with the following terms in the MOU:

- FERC, as lead agency, will prepare drafts of Scoping Document 2 and the EIS and will provide the document to BLM for review and comment before issuance. FERC agrees to work with the BLM on incorporating and resolving comments prior to public release of documents.
- Along with its comments on draft documents, BLM will identify and provide any additional data or analysis for FERC to include in the EIS that is needed to ensure that the information in the EIS supports decisions on the BLM's federal actions
- FERC and BLM agree to assume responsibility for analyses in the EIS that pertain to their respective jurisdictional authority. FERC agrees to incorporate data and analysis determined by BLM to be necessary to the BLM's ultimate decision on the proposed action analyzed in the EIS
- FERC will revise the EIS as necessary to reflect BLM's comments, unless substantive disagreements are involved regarding the comments. In cases of substantive disagreement, FERC will meet with BLM to try to resolve any issues.

In order to explain the cooperating agencies' authority on the public lands they administer, the following paragraph is added to the end of Section 5.2.2, Chapter 5, Exhibit E of the License Application: **The cooperating agencies each maintain authority for determining the temporal scope of the cumulative effects analyses for resources on the public lands they administer and ultimately make decisions through ROD's they issue to meet their NEPA compliance responsibilities. BLM is the authority on BLM-administered public lands and will issue a ROD as their decision document, including analyses of cumulative effects on resources, for a ROW grant on the LPP Project. NPS is the authority on NPS-administered public lands and will issue a ROD as their decision document, including analyses of cumulative effects on resources, for a ROW grant on the LPP Project. Reclamation is the authority on Reclamation-administered public lands and will issue a ROD as their decision document, including analyses of cumulative effects on resources, for a ROW grant on the LPP Project.**

As explained in the response to BLM Comment No.472, the PLP is an environmental document preliminary to the preparation of a NEPA document, and FERC will use Exhibit E, which is part of the License Application as one of, but not the only document to prepare the DEIS. The PLP and Exhibit E were written, however, to reflect NEPA standards FERC uses; so the intent of the Exhibit E (and PLP) environmental analysis has been to provide "NEPA-ready" or NEPA style analysis.

BLM's authority for the public lands it manages is explained in other portions of the PLP as follows. Please see the second paragraph in Section 1.2, Chapter 1, Exhibit E of the License Application which states "the Environmental Impact Statement (EIS) prepared by FERC, based on the license application to be filed by UBWR, will be intended to function as the EIS for Reclamation, NPS and BLM in meeting their respective NEPA compliance requirements on their decisions to grant rights-of-way for the LPP." Also, please see the fifth paragraph in Section 2.1, Chapter 2, Exhibit E of the License Application which states "The BLM purpose of action is whether to approve a ROW grant for constructing and operating the pipeline and other LPP Project facilities on federal land administered by the BLM." Also, please see the sixth paragraph in Section 2.2, Chapter 2, Exhibit E of the License Application which states "The BLM's need for federal action arises from its responsibility under the Federal Land Policy and Management Act of 1976, as amended (FLPMA) and other federal laws to respond to the UBWR's ROW request. The BLM's multiple-use mission includes managing activities on federal land such as ROW authorizations, while conserving natural, historical, cultural, and other resources on public lands in accordance with federal laws and BLM policies, guidance and resource management plans. The FLPMA gives the Secretary of the Interior general authority to grant ROW across public lands administered by the BLM, including ROWs for reservoirs, canals, ditches, flumes, laterals, pipes, pipelines, tunnels and other facilities and systems for the impoundment, storage, transportation or distribution of water (43 USC § 1761). These statements are included in Exhibit E to identify BLM's responsibility and authority for administering public lands that could be affected by the LPP Project.

### **BLM 463**

Information on and discussion of biological soil crusts is added to several sections as follows:

A new subsection, 5.3.1.1.6.1 Biological Soil Crusts, is added within Section 5.3.1.1.6, Chapter 5, Exhibit E of the License Application as follows: **5.3.1.1.6.1 Biological Soil Crusts. Biological soil crusts, also referred to as cryptobiotic, cryptogamic, microbiotic, or cyanobacterial-lichen soil crusts occur along portions of the LPP Project alignments. The soil crusts consist of lichens, mosses, and algae usually binding a matrix of clay, silt, and sand soil particles together. Biological soil crusts are formed by living organisms and their by-products, creating a surface crust of soil particles bound together by organic materials (USDA 1997). Biological soil crusts occur in the Colorado Plateau and Mohave Desert ecological regions, and they play an important ecological role in the functioning of soil stability and erosion, water infiltration, atmospheric nitrogen fixation, nutrient contributions to plants, soil-plant-water relations, seedling germination, and plant growth (BLM 1999). Biological soil crusts documented along the LPP Project alignments are generally associated with the presence of gypsum soils, and where actively grazed by livestock, the soil crusts are broken and trampled.**

A new second paragraph is added to Section 5.3.1.2.2.4 Expandable, Collapsible or Subsiding Soils or Rocks in Chapter 5, Exhibit E of the License Application as follows: **Biological soil crusts occurring within the Proposed Action right-of-way totaling 71.0 acres would be disturbed by penstock construction. This impact would be long-term and affect approximately 3.5 percent of the known biological soil crusts associated with Vermilion soils.**

A new second paragraph is added to Section 5.3.1.2.4.4 Expandable, Collapsible or Subsiding Soils or Rocks in Chapter 5, Exhibit E of the License Application, as follows:

**Biological soil crusts occurring within the Existing Highway Alternative right-of-way totaling 180.3 acres would be disturbed by penstock construction. This impact would be long-term and affect approximately 9.0 percent of the known biological soil crusts associated with Vermilion soils.**



**BLM 472**

As a point of clarification, the PLP and the License Application, and other supporting required FERC documentation including the Study Plans and the Study Reports, are required by FERC to respond to all of the specific environmental issues raised during scoping and listed in FERC's Scoping Document 2. The introduction to Section 5.3 of the License Application is revised to be consistent with the actual content of the section as required by FERC, The introduction to Section 5.3, Chapter 5, Exhibit E of the License Application is revised as follows: **This section describes the anticipated effects of the Proposed Action and alternatives on environmental resources. This section also responds to the specific environmental issues listed in FERC's Scoping Document 2 which, in some cases, may include the effect of specific resources or natural processes on the project. The following topics are addressed for each affected resource: affected environment; environmental effects of the Proposed Action and alternatives; when identified in FERC's Scoping Document 2, the environmental effects of specific resources or natural processes on the proposed action or alternatives; proposed protection, mitigation and enhancement (PM&E) measures and their effects; cumulative effects; and unavoidable adverse effects.** Since the introduction and the content of this section are rendered consistent by the revised Introduction, the requested edits by BLM to Exhibit E of the License Application are not made.

This comment points out the difference between the information required to be submitted by FERC as part of the License Application process, which will be utilized in the preparation of the DEIS, and the actual NEPA analysis that will be performed during preparation of the DEIS.

In the case of the Geology and Soils Section 5.3.1.1.7 and related sections, the PLP and the License Application were prepared based on FERC's Scoping Document 2, which states in Section 4.2.1 of that document that the specific geology and soil resources environmental issues to be addressed in the EIS as follows: 1) Effects of active faults and seismic activity on project features and effects of project features on faults and seismic activity, including seismic activity in the Hurricane Cliffs area and 2) Effects of landslides and slumping on project features and effects of project features on landslides and slumping, particularly in the Hurricane Cliffs area. Therefore, the PLP, and the License Application are required to respond to these specific environmental issues listed in FERC's Scoping Document 2 and are grouped under the heading Geologic Hazards on Human Health and Safety. This and related sections are not deleted.

The introduction to Section 5.3, Chapter 5, Exhibit E of the License Application is revised as follows: **This section describes the anticipated effects of the Proposed Action and alternatives on environmental resources. This section also responds to the specific environmental issues listed in FERC's Scoping Document 2 which, in some cases, may include the effect of specific resources or natural processes on the project. The following topics are addressed for each affected resource: affected environment; environmental effects of the Proposed Action and alternatives; when identified in FERC's Scoping Document 2, the environmental effects of specific resources or natural processes on the proposed action or alternatives; proposed protection, mitigation and enhancement (PM&E) measures and their effects; cumulative effects; and unavoidable adverse effects.**

**BLM 473**

Please see the response to BLM Comment No. 472 for a partial response to BLM Comment No. 473.

The Geology and Soils section of the Preliminary Licensing Proposal (PLP) was prepared based on FERC's Scoping Document 2, which was used to prepare the Geology and Soil Resources Study Plan (Study Plan, approved by FERC) and resulted in the information and analyses presented in the Geology and Soil Resources Study Report. FERC's Scoping Document 2 states specific geology and soil resources environmental issues to be addressed in the EIS (and therefore included in the Study Plan) in Section 4.2.1 as follows: 1) "Effects of active faults and seismic activity on project features and effects of project features on faults and seismic activity, including seismic activity in the Hurricane Cliffs area," 2) "Effects of landslides and slumping on project features and effects of project features on landslides and slumping, particularly in the Hurricane Cliffs area," 3) "Effects of rock quality on pipeline excavation methods," and 4) "Effects of groundwater infiltration on tunnels, shafts, or excavation trenches." Therefore, the Study Plan, the Geology and Soil Resources Study Report, the PLP, and the License Application respond to these specific environmental issues listed in FERC's Scoping Document 2, which include relevant information and analyses on geology and soil resources (i.e. impacts on geology and soil resources, and impacts from geology and soil resources on project features) and were incorporated into the PLP and the subsequent License Application Exhibit E.

Additionally, in FERC's November 18, 2008 comments on the draft Study Plan, they request UBWR "make it clear how each of the structural features identified in Section 4.4.3 will be investigated. Please provide further detail on the methods [Section 5.8(b)(6)] you plan to use to investigate each of the important previously identified structural features." and "Structural features identified in Section 4.4.3 and Section 4.4.5 would be identified on the maps." Therefore, UBWR revised the Study Plan to meet FERC's requirements, performed the studies and analyses, and documented them in the Geology and Soil Resources Study Report. The relevant information and analyses on geology and soil resources (i.e. impacts on geology and soil resources, and impacts from geology and soil resources) were incorporated into the PLP and the subsequent License Application Exhibit E.

The heading of Section 5.3.1.1.8, Chapter 5, Exhibit E of the License Application is revised to read: **Structures and Important Mineral Resources.**

#### **BLM 474**

1. There is inconsistency between the sentences of the first paragraph. The phrase "to the extent economically practical" is used to qualify, for example, that hauling soil and rock excavated from the east side of the LPP for placement as bedding, backfill and road construction at the west end of the LPP may be more expensive than using soil and rock excavated from the west end of the LPP for placement as bedding, backfill and road construction. The first paragraph in Section 5.3.1.1.9, Chapter 5, Exhibit E of the License Application is clarified that it is the "intent" to utilize "all" excavated rock and is revised as follows: **The soil and rock materials excavated from the trenches, road cuts, tunnels and shafts would be reused for pipeline bedding and backfill, construction of maintenance roads, and dam construction to the extent economically practical. The intent is that all excavated rock would be used for bedding, backfill, and road construction. Assuming that 75 percent of the excavated rock would be usable for bedding and the remaining rock could be used for maintenance road construction and backfill, all rock could potentially be used. Excavated rock and soil would be compacted for use as bedding, backfill, or spoils. Assuming rock could be re-compacted to an average of 65 percent of its in-situ volume and soil could be compacted to 90 percent of its in-situ volume, there would be a net expansion of 35 percent for rock and 10 percent for soil after re-compaction.**

2. "Will" changed to "would". The first sentence in the second paragraph in Section 5.3.1.1.9 of the License Application is revised to read: **Construction of the North Dam and South Dam for the Forebay reservoir, and construction of the Afterbay Dam for the Afterbay reservoir, would use all rock excavated from the tunnels and shafts for the Hurricane Cliffs hydro system (36,710 cubic yards) and for the Sand Hollow Tunnel (40,291 cubic yards), for a total of 77,001 cubic yards.**

The sixth and seventh sentences in the third paragraph in Section 5.3.1.1.9 are revised to read: **Rock material suitable for crushing and use as pipe bedding would be processed and used for that purpose. The remaining material would be used as backfill and/or spread as spoils along the ROW outside of the cut area.**

3. Clarified where the water would be pumped to and land applied on non-BLM lands. The ninth sentence in the fifth paragraph in Section 5.3.1.1.9 is revised to read: **Any groundwater that is temporarily dewatered would be pumped out of the Cockscomb cut and land-applied on soil, away from surface water, using sprinklers or perforated pipe temporarily installed and operated on land owned by WCWCD near the Cockscomb.**

4. "Will" changed to "would". The first sentence in the seventh paragraph in Section 5.3.1.1.9 is revised to read: **Construction activities, including the pipeline, pump stations, hydro facilities, reservoirs, transmission lines, excavation, hauling, spoils disposal, and other features would require a Right of Way (ROW) grant from the BLM as specified in 43 CFR Parts 2800 and 2880 and in Sections 501 through 506 of the Federal Land Policy Management Act of 1976, Amended October 2001 (FLPMA) (BLM 2001).**

#### **BLM 504**

There are no wells registered with the State of Arizona for residences or businesses that occur within 1,500 feet of the intake pump station, which is outside the projected cone of depression for the drawdown during construction. Further, based on geotechnical testing for the project, the groundwater flow characteristics of the Navajo Sandstone are well understood in the vicinity of the intake pump station, as discussed in more detail below. Therefore, based on the information discussed below, it can be confidently stated that there would be no effect on wells in the vicinity. Section 5.3.1.2.2.8, Chapter 5, Exhibit E of the License Application states the bedrock is comprised of "massive Navajo sandstone at the Intake Pump Station site" with a spatially expansive and thick (1,200 feet to 1,800 feet) sequence of strongly cross-bedded sandstone layers. Based on site geologic mapping, and observations and testing derived from drilling four geotechnical holes at the intake pump station site, groundwater flow and hydrogeologic properties of the Navajo sandstone in the vicinity of the intake pump station site are largely a function of the primary porosity and primary permeability of the rock mass. Significant groundwater flows are not expected to be controlled or influenced by an open and interconnected joint system. The bedrock is generally porous and absorptive due to a high capillarity created by the small size of the intergranular pore space and typically has a low permeability because of the very small interstitial spaces, lack of interstitial connectivity, and silica cementation of the quartz grains. During the geotechnical drilling investigation, the two vertical drill holes (ranging from 460 to 463 feet deep) spaced 100 feet apart and equidistant from Lake Powell had static water levels within 0.8 feet of each other. The two diagonal drill holes (drilled at angles toward and away from Lake Powell, ranging from 444.5 to 489 feet deep) had similar static water level results. These data indicate that groundwater flow is currently directed from the reservoir toward the west at a decreasing gradient averaging approximately 0.048 foot per foot and that water seeps slowly from the reservoir into the surrounding rock mass and not through a significant joint system. These testing results were confirmed by rock permeability testing using field packer tests in each

drill hole and lab testing on rock cores. The intake pump station geotechnical drilling data indicate the groundwater connectivity in the site bedrock is not complex and the static water surface was between 125 and 127 feet below the ground surface during the drill hole tests.

When groundwater in the immediate vicinity of the intake pump station site is drawn-down during construction, the cone of depression is projected to extend no further than 1,500 feet horizontally from the subsurface construction. A search of the Arizona Department of Water Resources' Well Registry in T.41N., R.8E., Sections 23 and 24, which intersect a 1,500-foot radius from the intake pump station site, yielded zero registered wells. There are no homes or businesses within a 1,500-foot radius of the intake pump station site, therefore, it is unlikely there are any unregistered wells in the area. The pipeline trench would be excavated to a depth of 12 feet below ground surface, approximately 115 feet above the static groundwater elevation at the time the intake pump station wells were drilled. Following construction completion of the intake pump station, the dewatering pumping would be discontinued and the cone of depression would gradually refill back to static water levels matching the surrounding groundwater elevations in the bedrock, as influenced by the Lake Powell reservoir water elevation. Therefore, the temporary groundwater drawdown would have no effect on wells in the vicinity of the intake pump station site.

### **BLM 522**

The first paragraph in Section 5.3.1.2.4.7, Chapter 5, Exhibit E of the License Application is revised to read: **The Existing Highway Alternative could have measurable effects on borrow material development for pipeline and penstock bedding. Rock excavated along the alignment and from road cuts that would be suitable for crushing and bedding would meet 42.2 percent of the pipeline and penstock bedding requirements (assuming 75 percent of blasted rock is usable for pipe bedding), and approximately 1,223,300 cubic yards of bedding material would need to be developed from excavated soil along the alignment. If there is insufficient suitable soil for this volume of bedding, the deficit would need to be imported from commercial gravel pits. If the volume of soil suitable for bedding is insufficient to meet the needs of bedding construction, the Existing Highway Alternative would require expanding or developing additional gravel resources by as much as 1.223 million cubic yards to meet construction demands for the LPP pipeline and penstock alignments. If this occurs, the bedding material requirements and the associated land disturbance under the Existing Highway Alternative would be a significant effect on existing commercial gravel pits and currently undisturbed land areas suitable for producing construction bedding materials. Three existing commercial gravel pits (see B-1 and B-3 on attached Figure 2-5, and see B-5 on attached Figure 2-6) would have available rock materials to meet borrow needs for pipeline and penstock bedding. A total area of 50 new acres in the three commercial gravel pits would be disturbed: gravel pit B-1 would disturb approximately 7 acres; gravel pit B-3 would disturb approximately 6 acres; and gravel pit B-5 would disturb approximately 37 acres.**

The second paragraph in Section 5.3.1.2.4.7 is revised to read: **The volumes of material generated (neat lines excluding expansion) in cubic yards are summarized below:**

• <b>Blastable</b>	<b>732,800</b>
• <b>Rippable</b>	<b>1,655,300</b>
• <b>Mixed Soil over Blastable</b>	<b>452,400 (293,600 soil – 158,800 rock)</b>
• <b>Mixed Soil over Rippable</b>	<b>599,700 (389,200 soil – 210,500 rock)</b>
• <b>Excavatable</b>	<b>2,696,400</b>

**BLM 547**

**1<sup>st</sup> Comment:** UDWRe agrees to make the requested edit. The fourth sentence in the first paragraph in Section 5.3.1.9.2.4, Chapter 5, Exhibit E of the License Application is revised to read: **If design considerations are implemented where appropriate, no measurable or significant effects would occur associated with operations and maintenance.**

**2<sup>nd</sup> Comment:** The effects of the No Lake Powell Water Alternative were discussed during the meeting between BLM and UDWRe on March 17, 2017. UDWRe appreciates the “fresh eyes” perspective that BLM’s review of the Integrated Licensing Proposal documents brings to the content of the FLA. BLM expressed concerns regarding the analysis presented by UDWRe in both the PLP and FLA that eliminating residential watering under the No Lake Powell Water Alternative would have a significant adverse, indirect effect on soils. Some were concerned that the analysis of the effects of the No Lake Powell Water Alternative here and elsewhere in Chapter 5, Exhibit E of the FLA appear to be presented in such a manner that the FLA is unfairly portraying the negative effects of the No Lake Powell Water Alternative in favor of the Proposed Action. This was certainly not the intent. There is a range of possible effects on soils in the St. George metropolitan area.

It is important to keep in mind that the FLA is the UBWR’s application for a FERC license and it is not the NEPA document for this project. The contents of the FLA, as well as other relevant environmental information provided by other sources, will be fully considered in the preparation of the EIS and FERC and the Cooperating Agencies will develop an independent analysis of the effects that will be reviewed by the agencies to ensure it meets their needs and standards.

The challenges of restoration of desert landscapes on a larger scale are known. Those efforts generally require comprehensive and intensive planning and management, targeted to local ecosystems and climatological conditions. Individual lot owners in the St. George metropolitan area would not respond consistently. Leaving residential yards unirrigated and without any comprehensively planned and consistently implemented restoration is likely to result in a patchwork of a variety of impacts, including for example: encroachment of invasive species; regrowth of some native species; loss of soil cover due to wind erosion in some locations, including where the homeowner elects to regularly till the soil to eliminate weeds; and retention of soil where xeriscaping with rock or other covers may be utilized. Covering areas with cloth and or rock is costly and, with rock cover, still allows for weed growth which often results in herbicide application by untrained homeowners.

BLM and UDWRe reached a common understanding on March 17, 2017 that the potential impacts of the No Lake Powell Water Alternative presented in the EA are potentially more complex than presented, and that there may be other valid analyses and conclusions of the indirect effects of the No Lake Powell Water Alternative on soils. The agencies may address the range of possible impacts during the EIS process, recognizing the limitations presented by a lack of past experience in this area.

Given the uncertainty and disagreement over the nature and extent of the environmental effects associated with the complete removal of residential irrigation, FERC and the Cooperating Agencies could further consider potential impacts to develop a reasonably foreseeable scenario given the nature of such described actions.

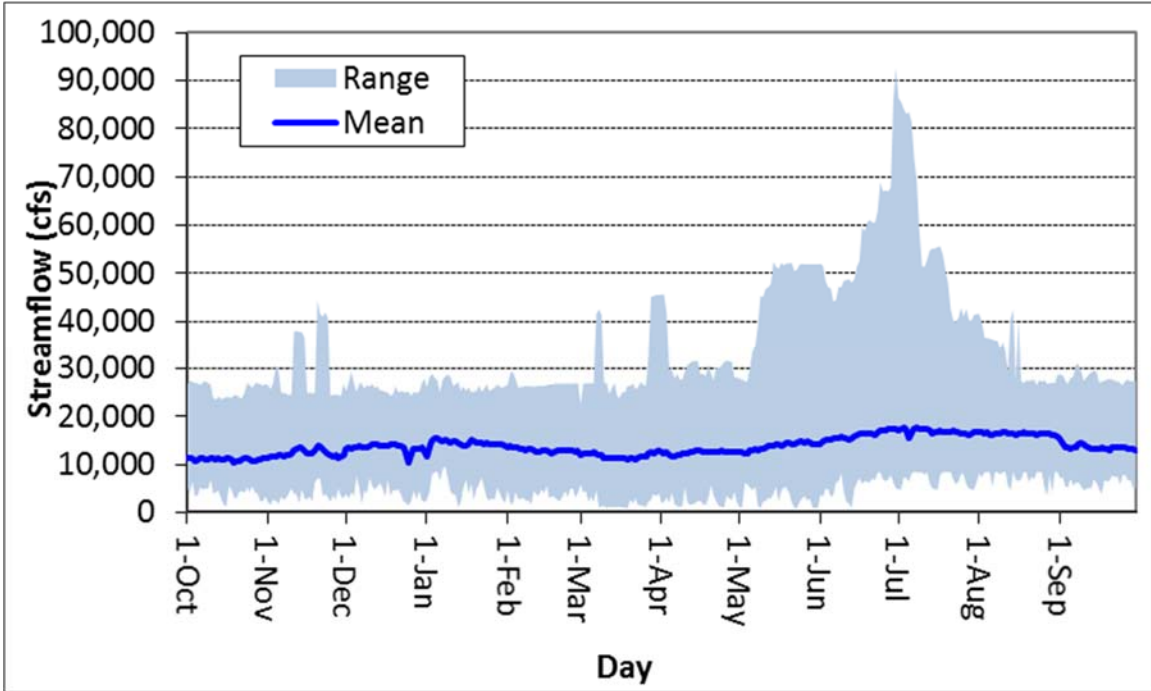
The second paragraph in Section 5.3.1.9.2.4, Expandable, Collapsible or Subsiding Soils or Rocks, Chapter 5, Exhibit E of the License Application is revised to read: **The effects of the No Lake Powell Water Alternative presented below are not definitive and there may be a range of effects on soils and vegetation from the complete removal of irrigation water from residential use in the St. George metropolitan area.**

**Soils supporting a wide range of irrigated landscapes would not be irrigated with potable water and only those soils irrigated with secondary water supplies would continue to receive water. Soils previously irrigated with potable water would transition to desert-adapted plant species either planted by homeowners or naturally growing, including exotic, native and invasive species supported only by precipitation. The amount of vegetative cover that would occur and be provided by the various possible species is very difficult to predict. The effects would be highly variable and localized to individual residential properties and are therefore difficult to evaluate and predict over the entire metropolitan area. Leaving residential yards without irrigation and without any comprehensive and consistently implemented restoration plan is likely to result in a patchwork of a variety of impacts, including for example: encroachment of invasive species; regrowth of some native species; loss of soil cover due to wind erosion in some locations; and retention of soil where xeriscaping with rock or other covers may be utilized. There is a range of possible effects on soils in the St. George metropolitan area.**

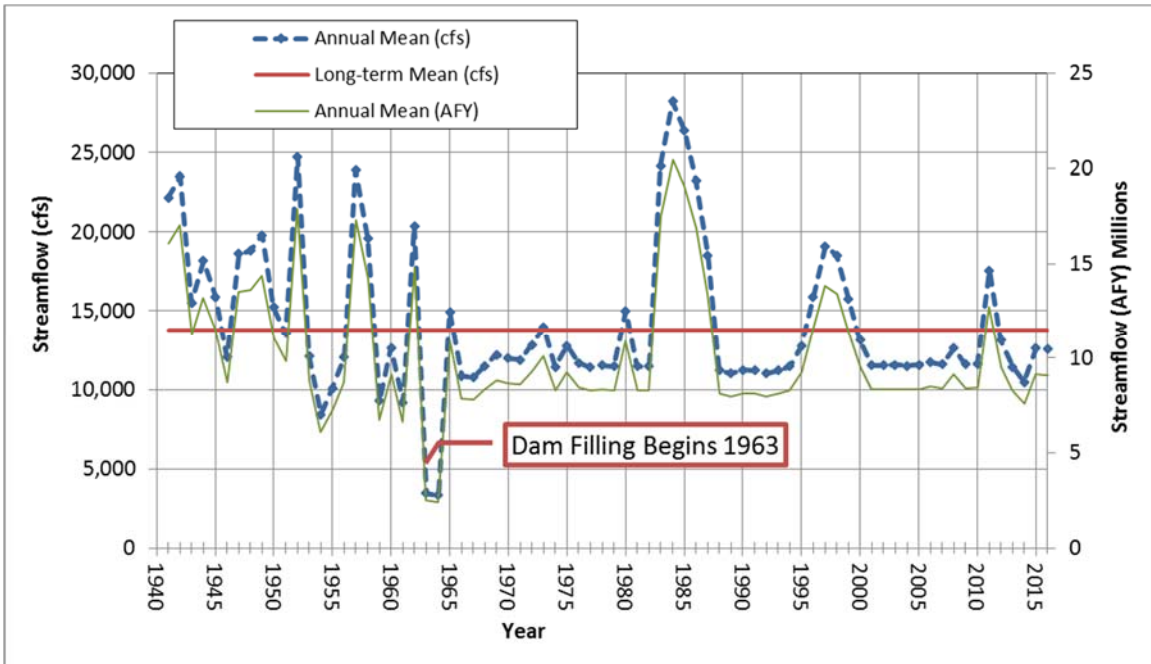
**Soils and traditional landscapes irrigated only with secondary water supplies could lead to an accumulated concentration of surface salts from sources including the irrigation water, salt wicking and transpiration, fertilizer and other chemical compounds, and soil disturbances in the form of grading and tillage. The end result could be a physical and chemical dispersal of soil particles that exacerbates erosion risks and diminishes production capacity of the land. In view of these factors, it is estimated that the effects would be minor within the affected residential developments in the St. George metropolitan area receiving secondary irrigation water.**

#### **BLM 589**

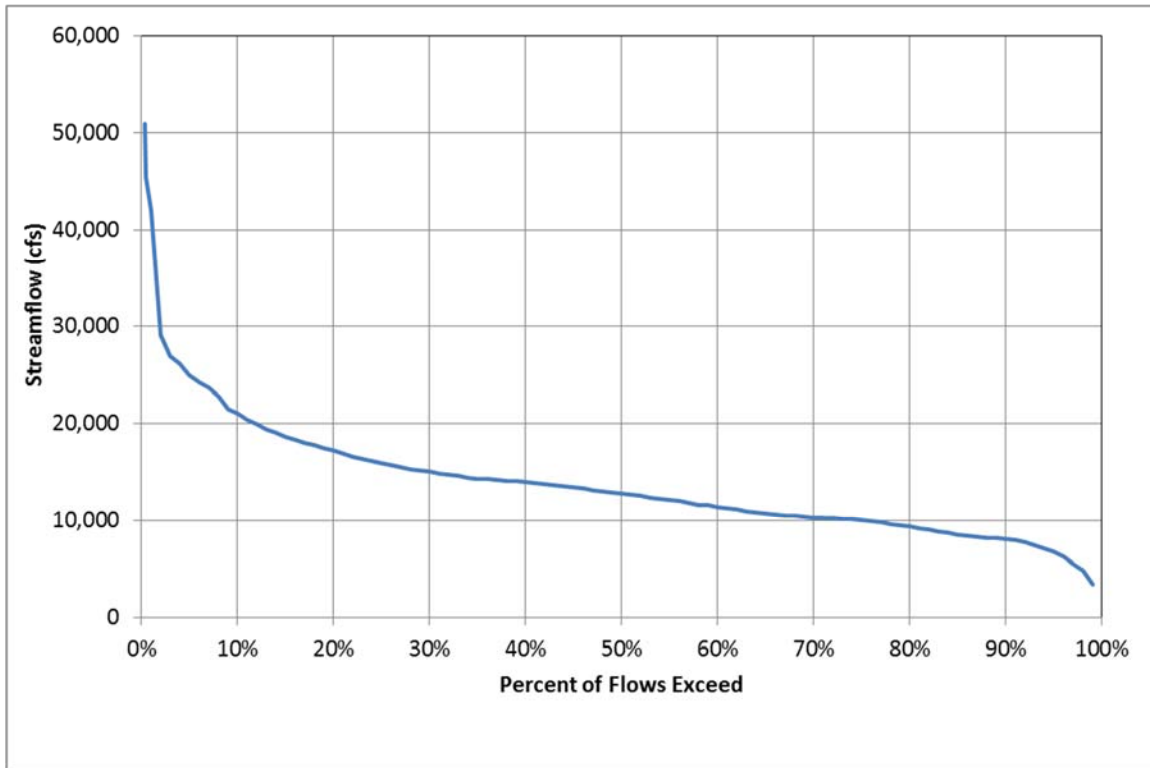
The Final License Application filed with FERC shows the figure in BLM Comment No. 589 as Figure 5-20. The updated Figure 5-20 displaying Mean Daily Flows for the Colorado River at Lees Ferry for the period 1970 through 2016 is shown below. Figure 5-21 displaying Annual Mean Flows for the Colorado River at Lees Ferry streamflow gage and Figure 5-22 displaying the Flow Exceedance Curve for the same location in the Final License Application is changed as a result of the updated data shown in Figure 5-20. Updated Figures 5-21 and 5-22 are provided below.



**Figure 5-20**  
**Colorado River at Lees Ferry Daily Mean and Range of Flow (1970-2016)**



**Figure 5-21**  
**Colorado River at Lees Ferry Annual Mean Flows**



**Figure 5-22**  
**Colorado River at Lees Ferry Flow Exceedance (1970 – 2016)**

### **BLM 592**

Information on the flows between Quail Creek and Washington Fields is added. The following paragraph is added as the 3<sup>rd</sup> paragraph of and the following Figure 27A is added to section 5.3.3.1.2.2, Chapter 5, Exhibit E of the License Application: **Figure 5-27A is a schematic of the current Virgin River inflows and diversions between the Quail Creek Diversion and the Washington Fields Diversion. The 1982 biological opinion for the Quail Creek project recognized that the Virgin River flow regime was created by long-standing water rights that hold an 1890 priority. The 1982 biological opinion as well as subsequent biological opinions issued in 2001 (Virgin River Program), 2004 (Washington Fields Fish Screen), 2006 (Quail Creek Diversion Sluicing Program), 2012 (Washington Fields Road Bridge Repair), 2013 (Stateline Fish Barrier and UDOT I-15 Bridge) and 2014 (Mall Drive Bridge) have all recognized that flows in the Virgin River below the QCD are based upon the “Washington Fields water right [that] requires a minimum flow of 86 cfs (or the natural flow of the river) to the Washington Fields Diversion.” A flow of 3 cfs is maintained downstream of the Quail Creek diversion point pursuant to the Spinedace Conservation Agreement (Utah Division of Wildlife Resources, U.S. Fish and Wildlife, U.S. Bureau of Land Management, National Park Service, Nevada Division of Wildlife, Washington County Water Conservancy District, Arizona Game and Fish Department. 1995. Conservation Agreement and Strategy for Virgin Spinedace (*Lepidomeda mollispinis mollispinis*). April 1995).**



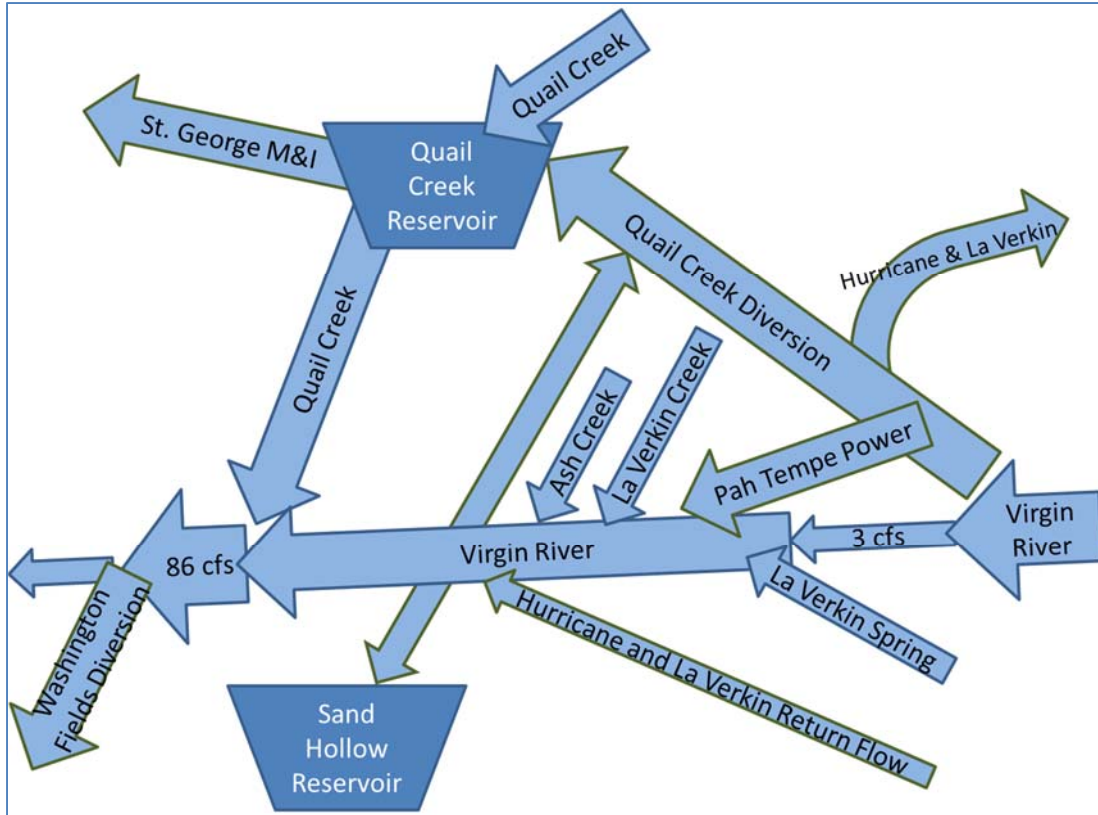
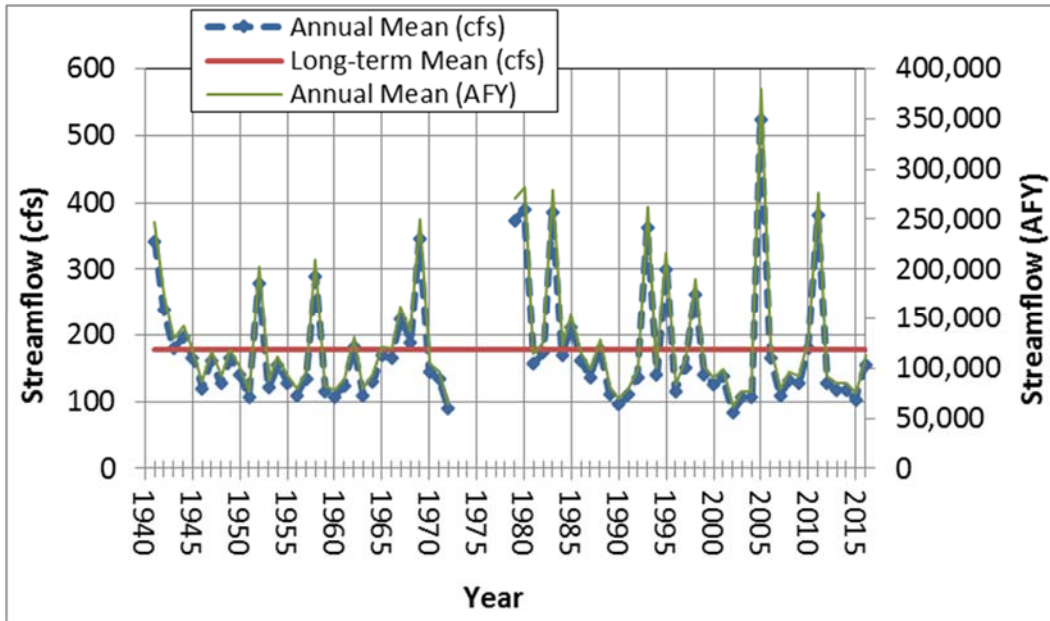


Figure 5-27A

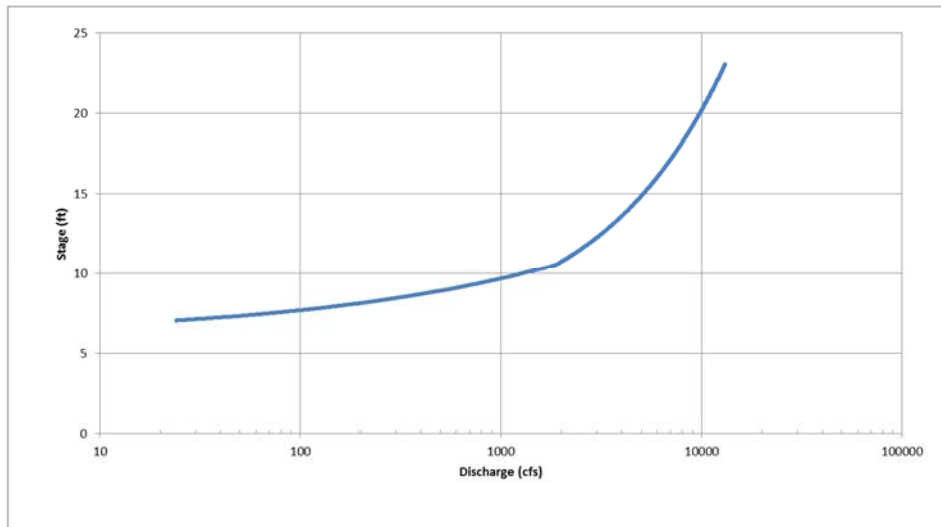
**Schematic of Quail Creek Diversion to Washington Fields Diversion with Instream Flows**

**BLM 595**

The Final License Application filed with FERC shows the figure in BLM Comment No. 595 as Figure 5-33. The text referencing the reader to Figure 5-33 is changed to read as follows: **The long term annual mean streamflow is 178 cfs.** The updated Figure 5-33 displaying Virgin River at Virgin, Annual Mean Flows from 1940 through 2016 is shown below. Figure 5-34 in the Final License Application changed as a result of the updated data shown in Figure 5-33. The updated Figure 5-34 is shown below.



**Figure 5-33**  
**Virgin River at Virgin, Annual Mean Flows**

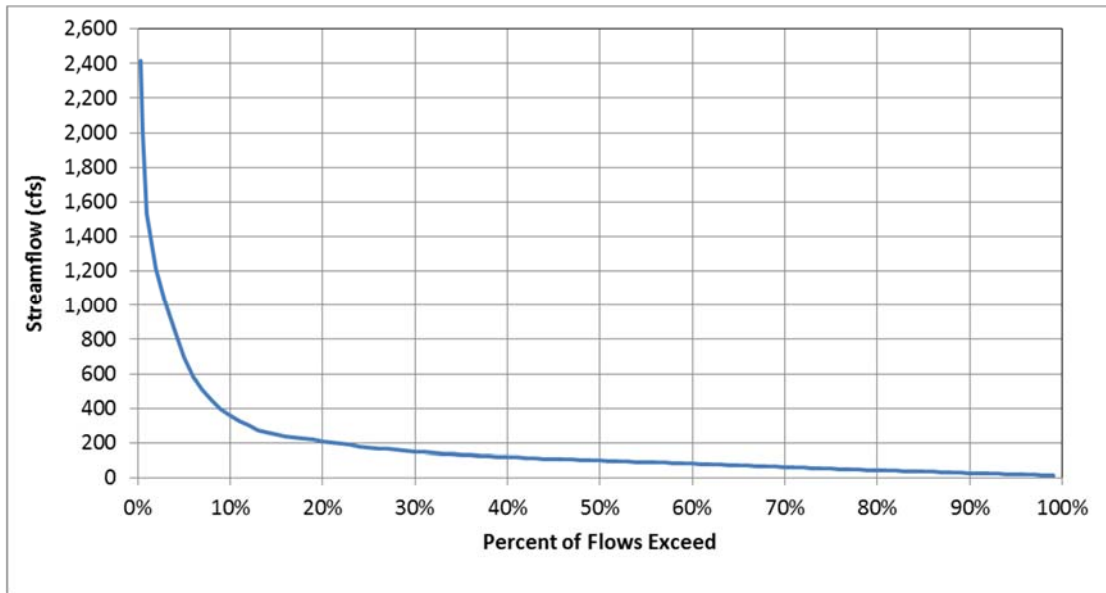


**Figure 5-34**  
**Virgin River at Virgin – Stage Discharge Rating Curve**  
**Note: Rating curves are subject to change over time**

**BLM 596**

The Final License Application filed with FERC shows the figure in BLM Comment No. 595 as Figure 5-38. The text referencing the reader to Figure 5-38 is changed to read as follows: **Figure 5-38 shows the flow exceedance curve for the Virgin River near St. George for the period 1992 through 2016. The 90 percent exceedance value is 21 cfs while the 10 percent exceedance value is 331 cfs. The median**

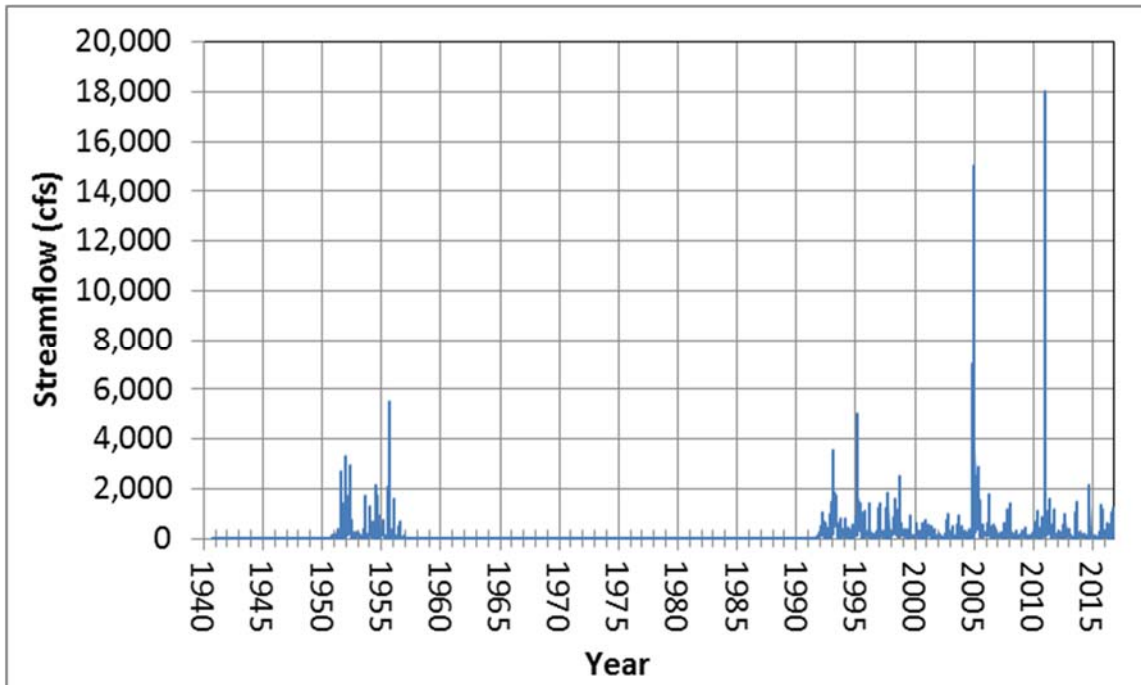
**flow is 96 cfs.** The updated Figure 5-38 displaying the flow exceedance curve for the Virgin River near St. George for the period 1992- 2016 is shown below.



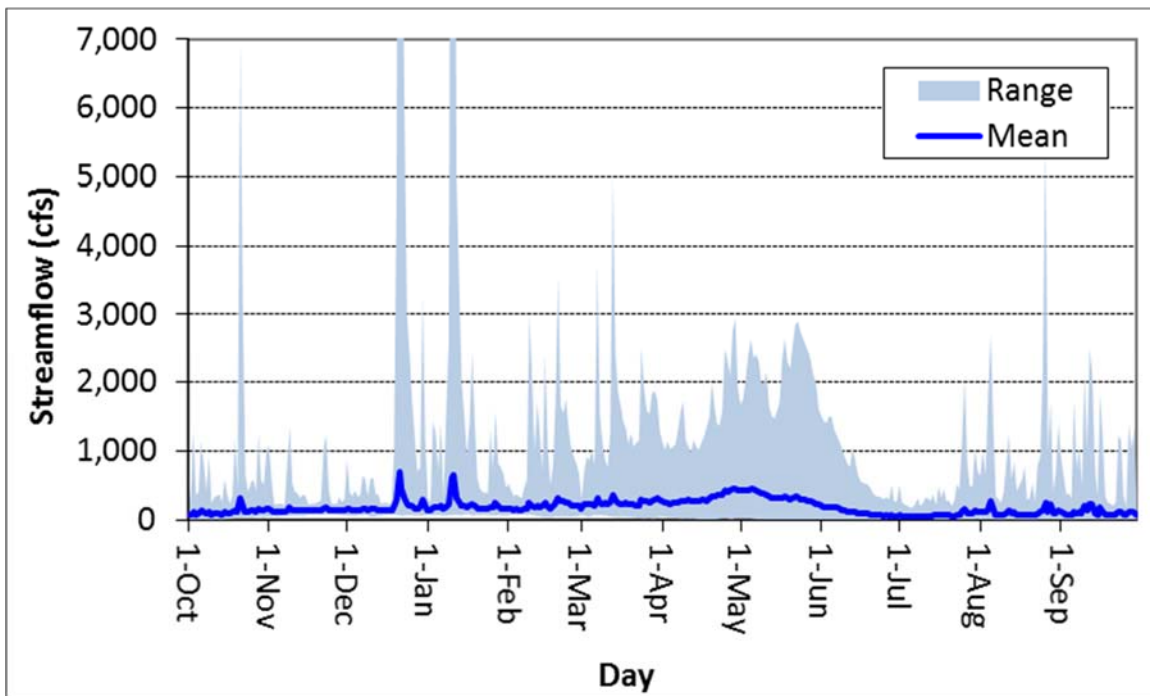
**Figure 5-38**  
**Virgin River near St. George Flow Exceedance (1992 - 2016)**

### **BLM 597**

The Final License Application filed with FERC shows the figure in BLM Comment No. 597 as Figure 5-36. The text referencing the reader to Figure 5-36 is changed to read as follows: **As shown in the daily streamflow chart in Figure 5-36, the period of record for this gage shown in the table is from 1940 through 2016.** The updated Figure 5-36 displaying Mean Daily Flows for the Virgin River near St. George for the period 1940 through September 30, 2016 is shown below. Figure 5-37 in the Final License Application changed as a result of the updated data shown in Figure 5-36. The updated Figure 5-37 is shown below.



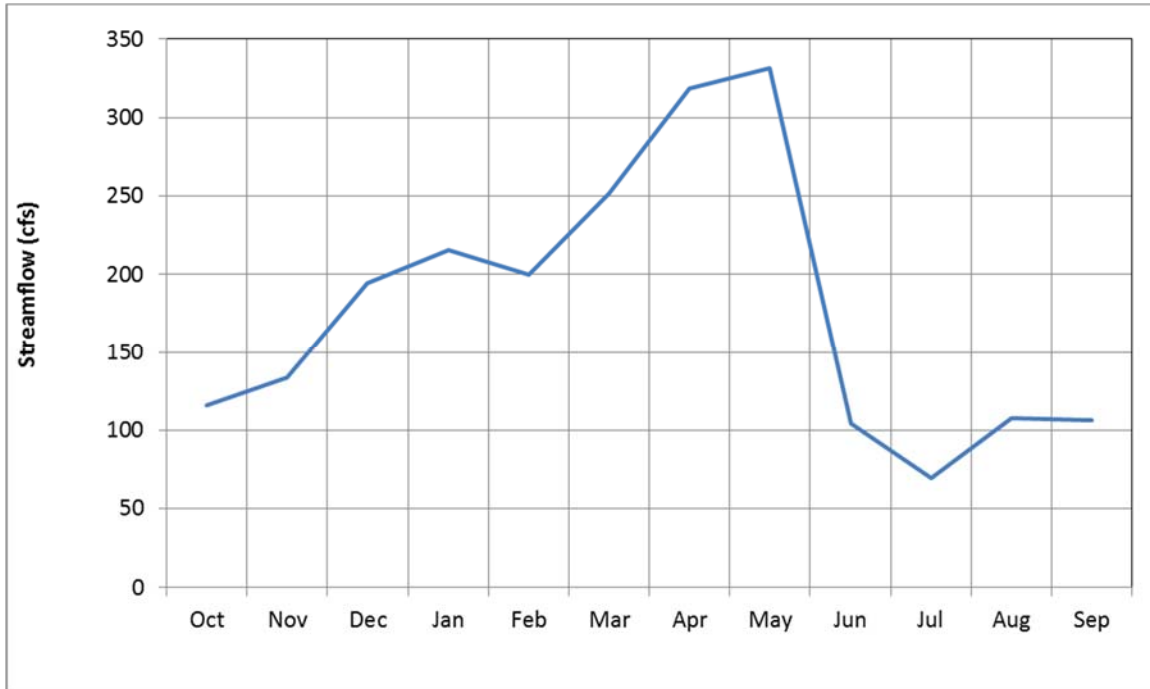
**Figure 5-36**  
**Virgin River near St. George, Daily Flows**



**Figure 5-37**  
**Virgin River near St. George, Daily Mean and Range of Flow**

**BLM 599**

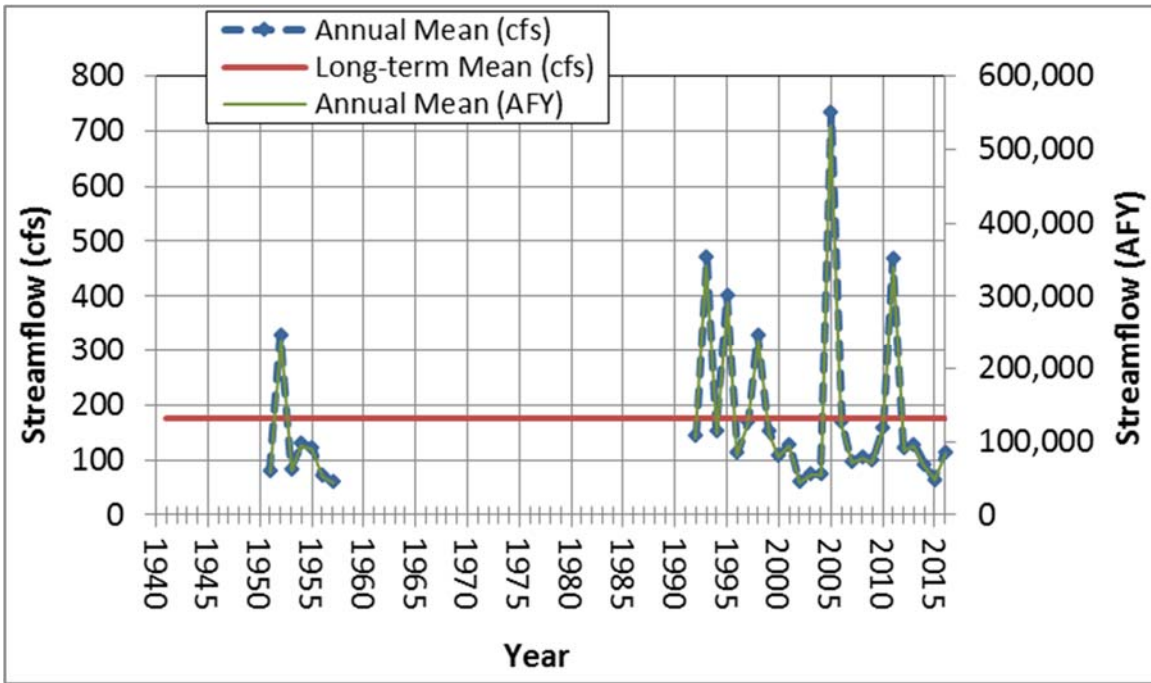
The Final License Application filed with FERC shows the figure in BLM Comment No. 599 as Figure 5-39. The text referencing the reader to Figure 5-39 is changed to read as follows: **Figure 5-39 depicts monthly mean flows for the Virgin River near St. George, Utah gage for the period of 1992 through 2016.** The updated Figure 5-39 displaying Monthly Mean Flows for the Virgin River near St. George for the period 1992 through 2016 is shown below.



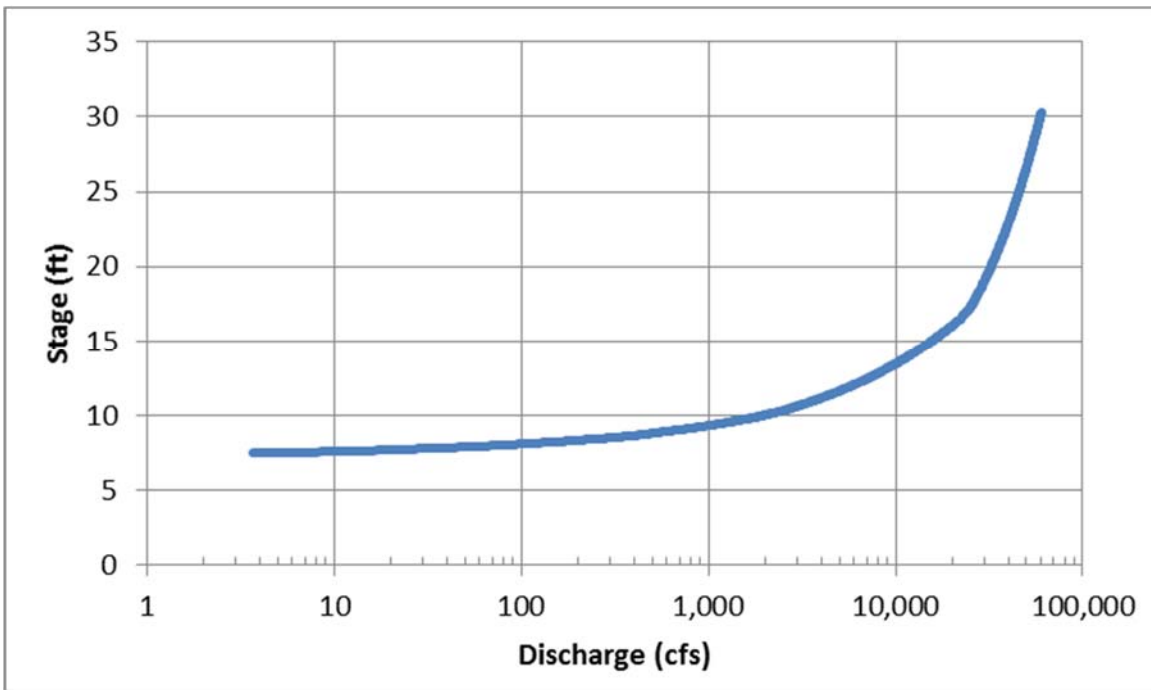
**Figure 5-39**  
**Virgin River near St. George Monthly Mean Flows (1992 - 2016)**

**BLM 600**

The Final License Application filed with FERC shows the figure in BLM Comment No. 600 as Figure 5-40. The text referencing the reader to Figure 5-40 is changed to read as follows: **The long term annual mean streamflow is 176 cfs.** The updated Figure 5-40 displaying Virgin River near St. George, Annual Mean Flows from 1940 through 2016 is shown below. Figure 5-41 in the Final License Application changed as a result of the updated data shown in Figure 5-40. The updated Figure 5-41 is shown below.



**Figure 5-40**  
**Virgin River near St. George Annual Mean Flows**



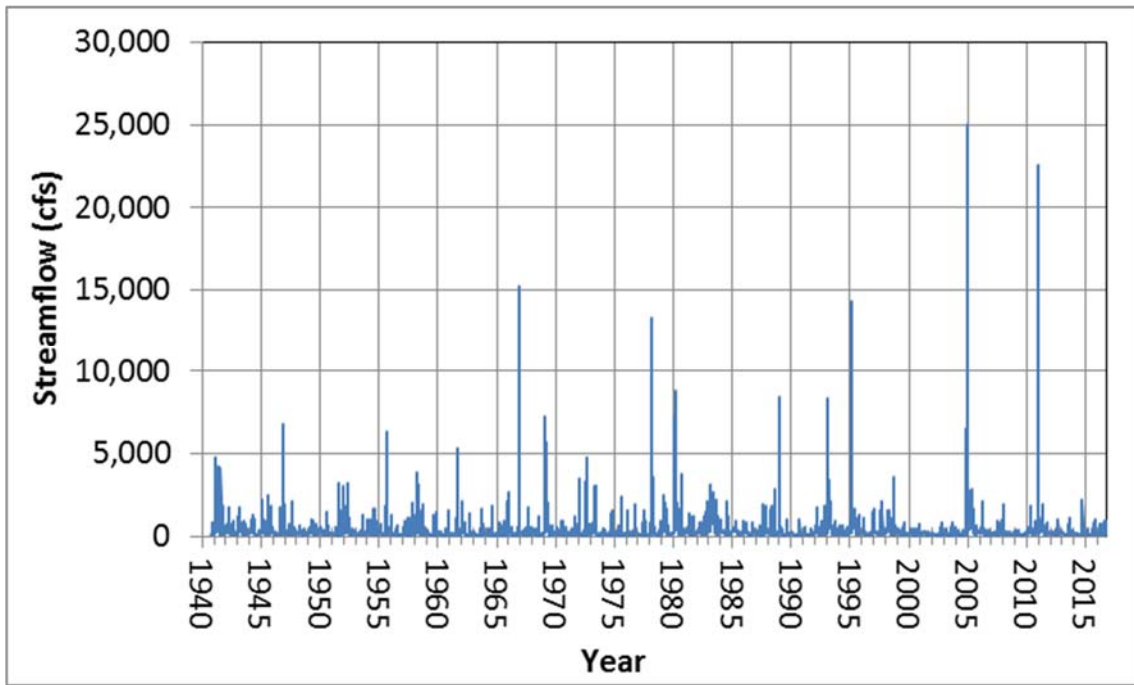
**Figure 5-41**  
**Virgin River near St. George – Stage Discharge Rating Curve**  
**Note: Rating curves are subject to change over time**

**BLM 601**

The Final License Application filed with FERC shows the figure in BLM Comment No. 601 as Figure 5-42. The updated Figure 5-42 displaying Mean Daily Flows for the Virgin River at Littlefield for the period 1940 through September 30, 2016 is shown below. Figure 5-43 in the Final License Application changed as a result of the updated data shown in Figure 5-42. The updated Figure 5-43 is shown below.

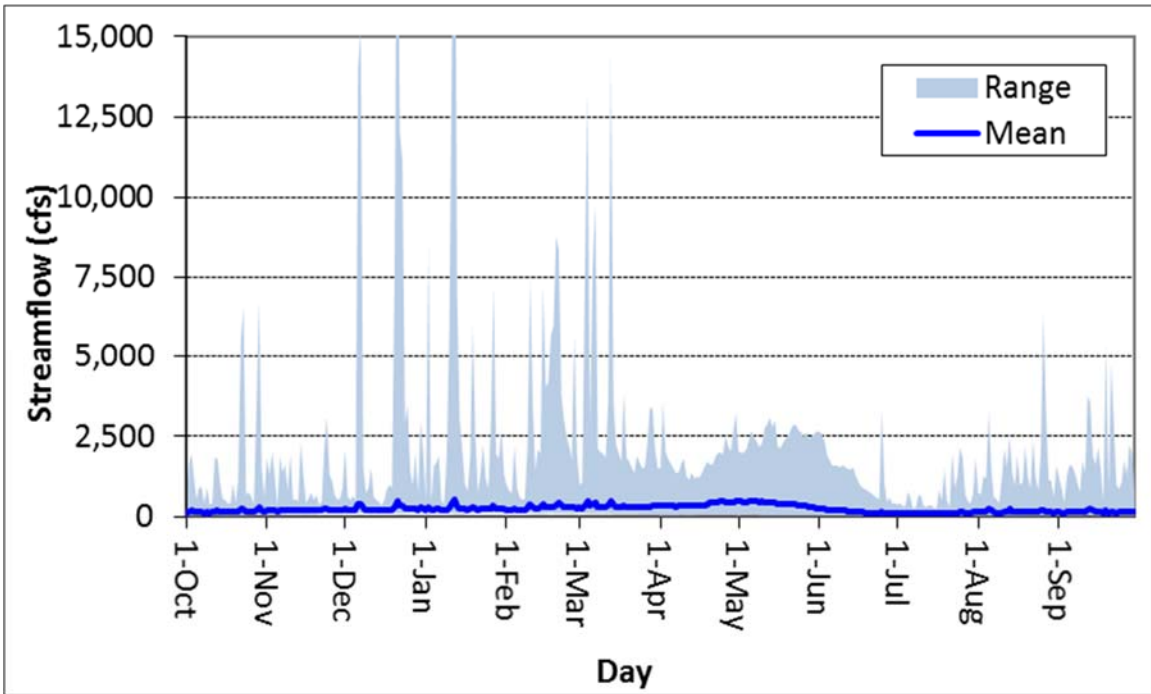
Figure 5-44 in the Final License Application changed as a result of the updated data shown in Figure 5-42. The updated Figure 5-44 displaying the flow exceedance curve for the Virgin River at Littlefield for the period 1940 through 2016 is shown below. The text referencing the reader to Figure 5-44 is changed to read as follows: **Figure 5-44 shows the flow exceedance curve. The 90 percent exceedance value is 62 cfs while the 10 percent exceedance value is 398 cfs. The median flow is 145 cfs.**

Figure 5-45 in the Final License Application also changed as a result of the updated data shown in Figure 5-42. The text referencing the reader to Figure 5-45 is changed to read as follows: **Figure 5-45 shows monthly average flows for the Virgin River at Littlefield, Utah gage for the period of 1940 through 2016. Similar to upstream locations, peak flows occur in late spring with low flows in the summer.** The updated Figure 5-45 showing the Monthly Mean Flows for the Virgin River at Littlefield for the period 1940 through 2016 is shown below.

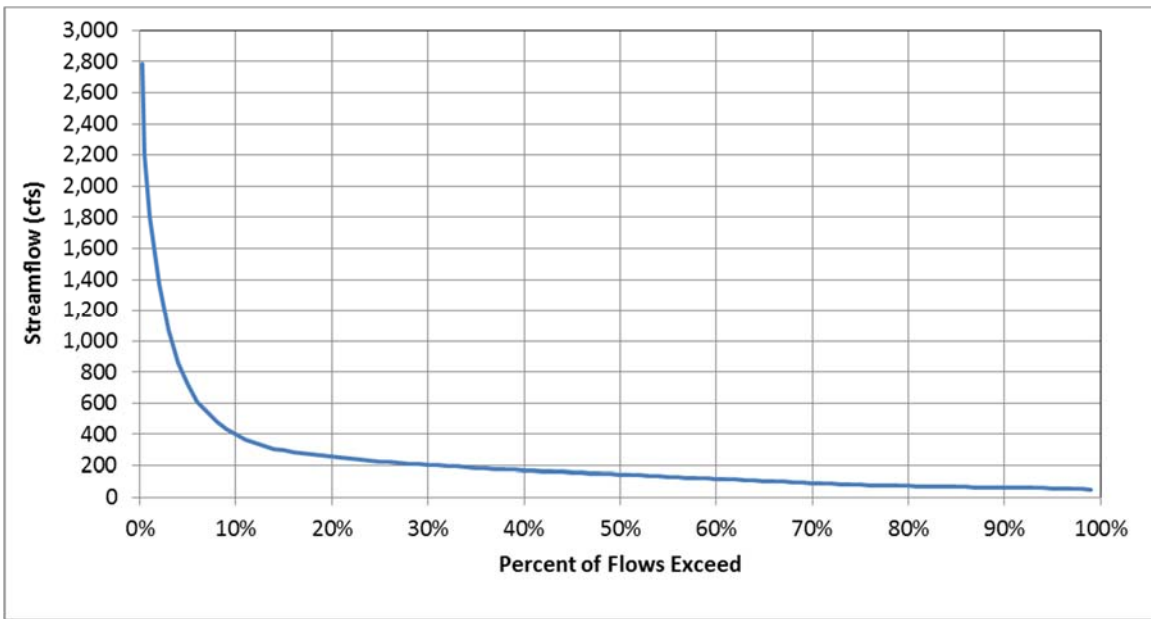


**Figure 5-42  
Virgin River at Littlefield, Daily Flows**



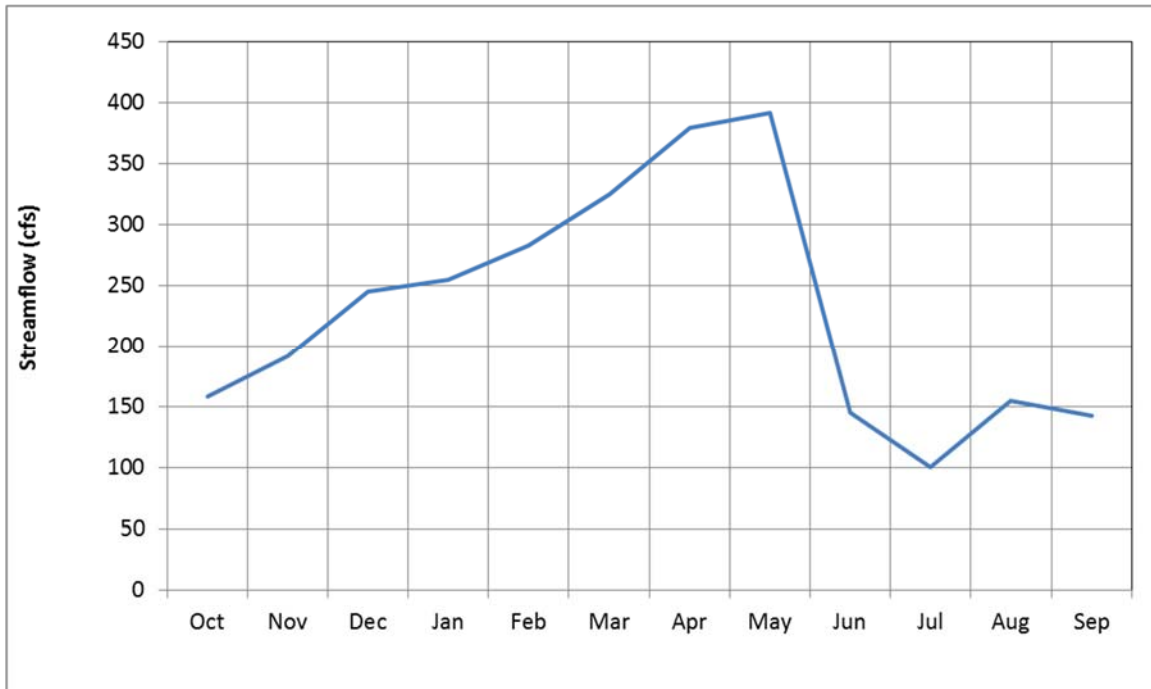


**Figure 5-43**  
**Virgin River at Littlefield, Daily Mean and Range of Flows**



**Figure 5-44**  
**Virgin River at Littlefield, Flow Exceedance**

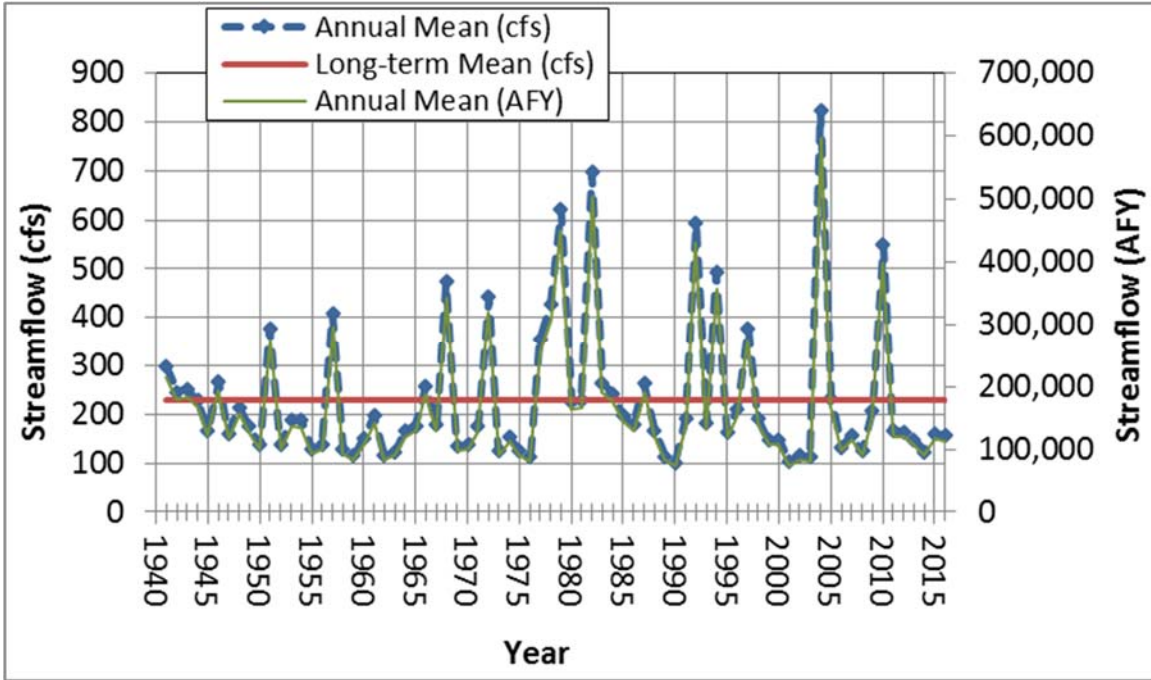




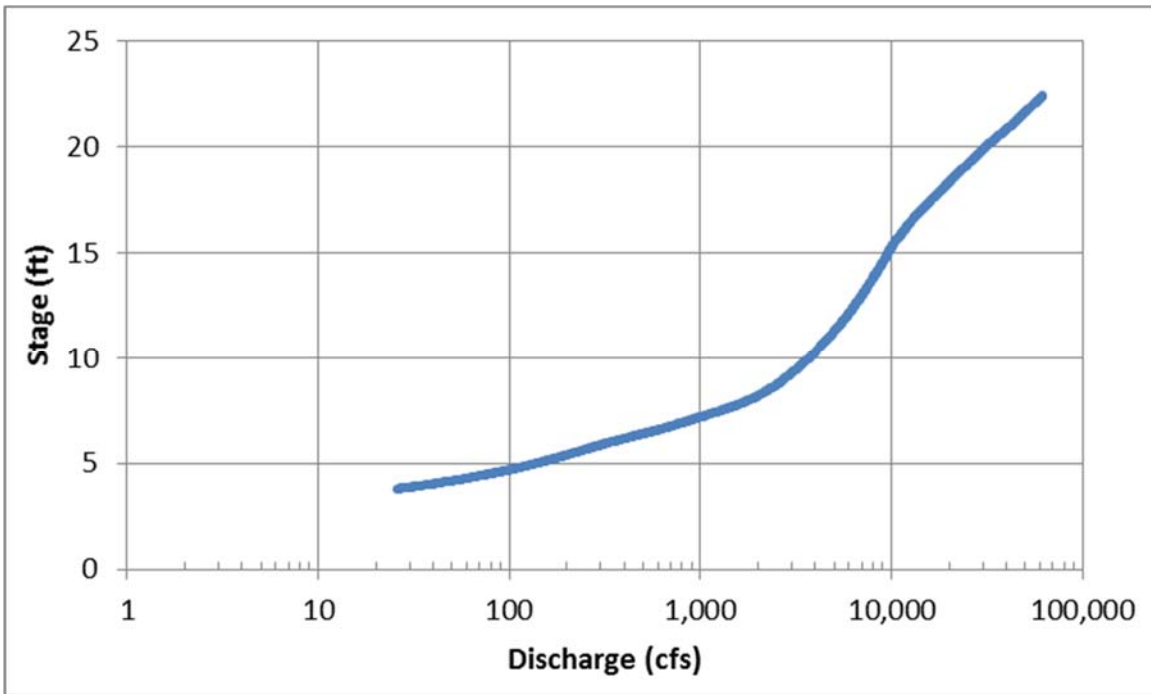
**Figure 5-45**  
**Virgin River at Littlefield, Monthly Mean Flows**

### **BLM 603**

The Final License Application filed with FERC shows the figure in BLM Comment No. 603 as Figure 5-46. The text referencing the reader to Figure 5-46 is changed to read as follows: **The long term annual mean streamflow is 230 cfs.** The updated Figure 5-46 displaying Virgin River at Littlefield, Annual Mean Flows 1940 through 2016 is shown below. Figure 5-47 in the Final License Application is changed as a result of the updated data shown in Figure 5-46. The updated Figure 5-47 is shown below.



**Figure 5-46**  
**Virgin River at Littlefield, Annual Mean Flows**



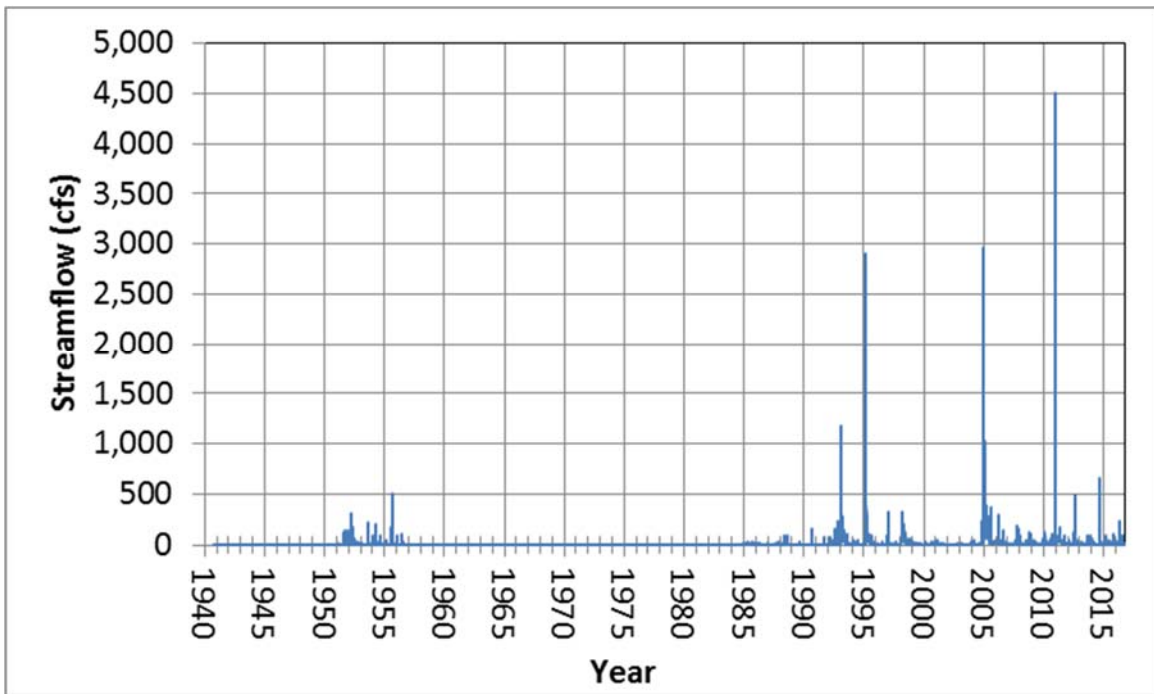
**Figure 5-47**  
**Virgin River at Littlefield – Stage Discharge Rating Curve**  
 Note: Rating curves are subject to change over time

**BLM 605**

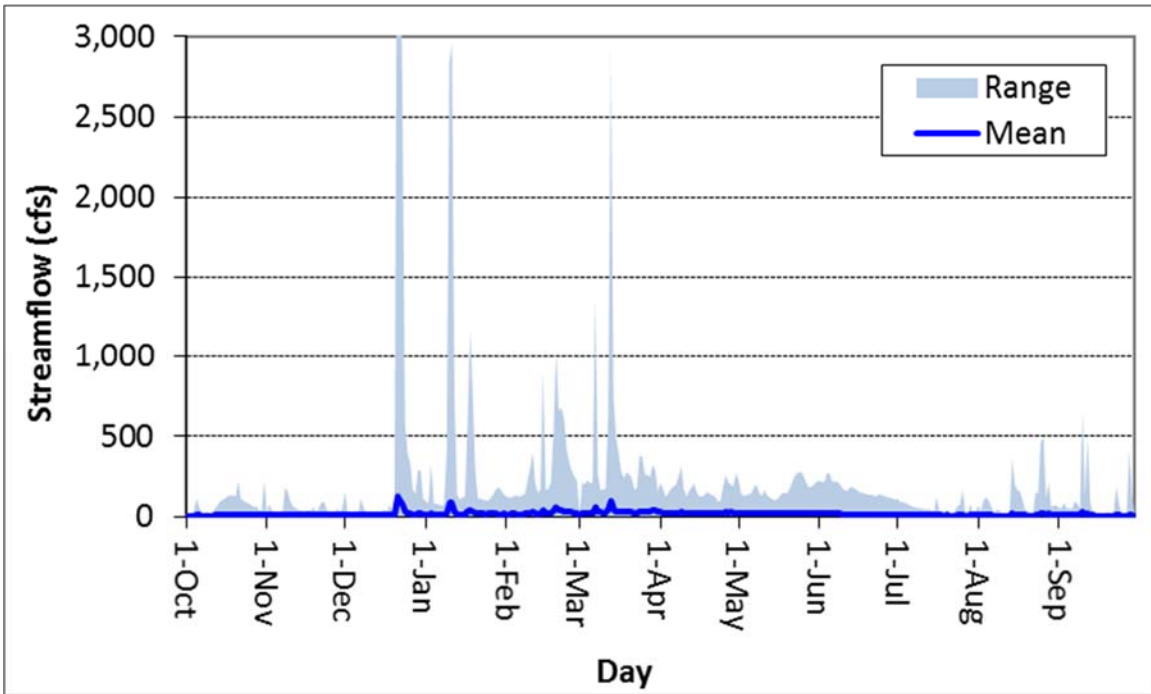
The Final License Application filed with FERC shows the figure in BLM Comment No. 605 as Figure 5-48. The updated Figure 5-48 displaying Mean Daily Flows for the Santa Clara River at St. George for the period 1940 through September 30, 2016 is shown below. Figure 5-49 in the Final License Application is changed as a result of the updated data shown in Figure 5-48. The updated Figure 5-49 is shown below.

Figure 5-50 in the Final License Application is changed as a result of the updated data shown in Figure 5-48. The updated Figure 5-50 displaying the flow exceedance curve for Virgin River at Littlefield for the period 1940 through 2016 is shown below. The text referencing the reader to Figure 5-50 is revised to read as follows: **Figure 5-50 shows the flow exceedance curve. The 90 percent exceedance value is 1 cfs while the 10 percent exceedance value is 27 cfs. The median flow is 5 cfs.**

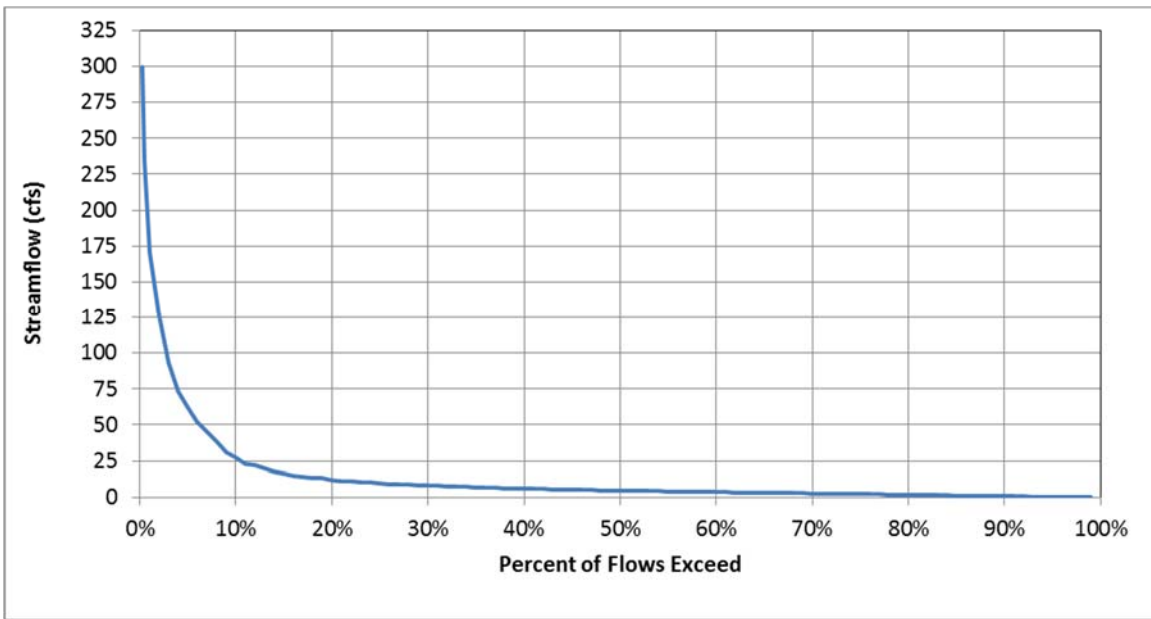
Figure 5-51 in the Final License Application also changed as a result of the updated data shown in Figure 5-48. The text referencing the reader to Figure 5-51 is changed to read as follows: **Figure 5-51 shows monthly mean flows for the Santa Clara River at St. George, Utah gage for the period of 1940 through 2016. Peak flows occur in the spring with low flows occurring in the late summer into fall.** The updated Figure 5-51 displaying Monthly Mean Flows for the Santa Clara River at St. George for the period 1940 through 2016 is shown below.



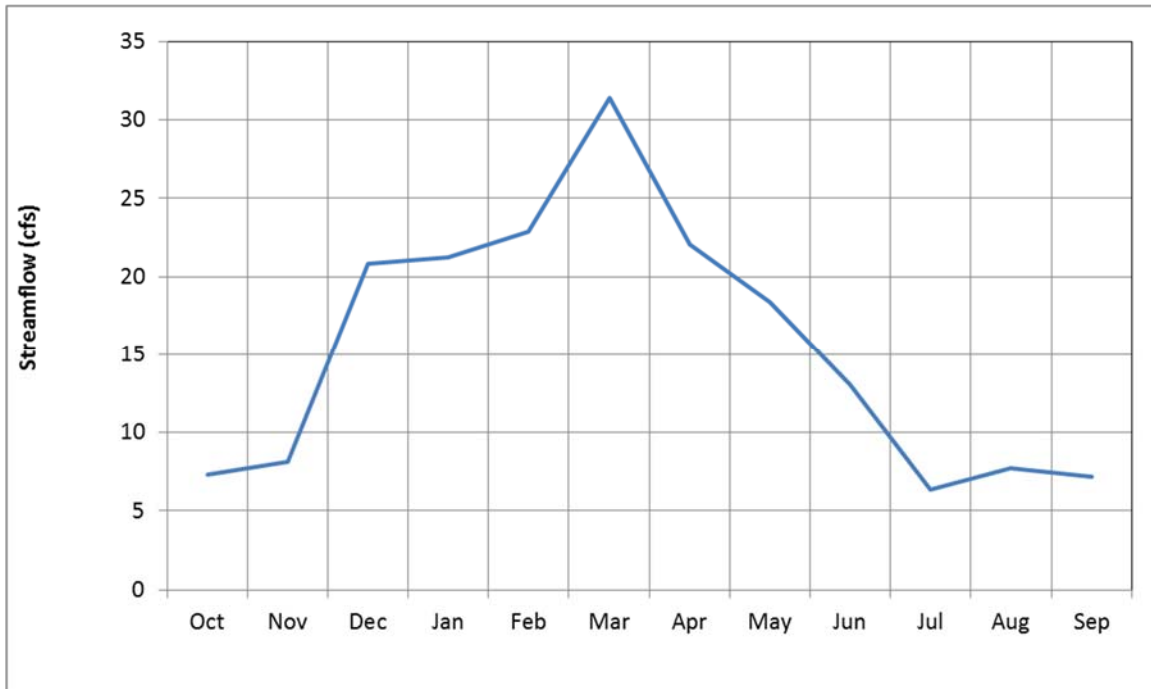
**Figure 5-48  
Santa Clara River at St. George Daily Flows**



**Figure 5-49**  
**Santa Clara River at St. George Daily Mean and Range of Flows**



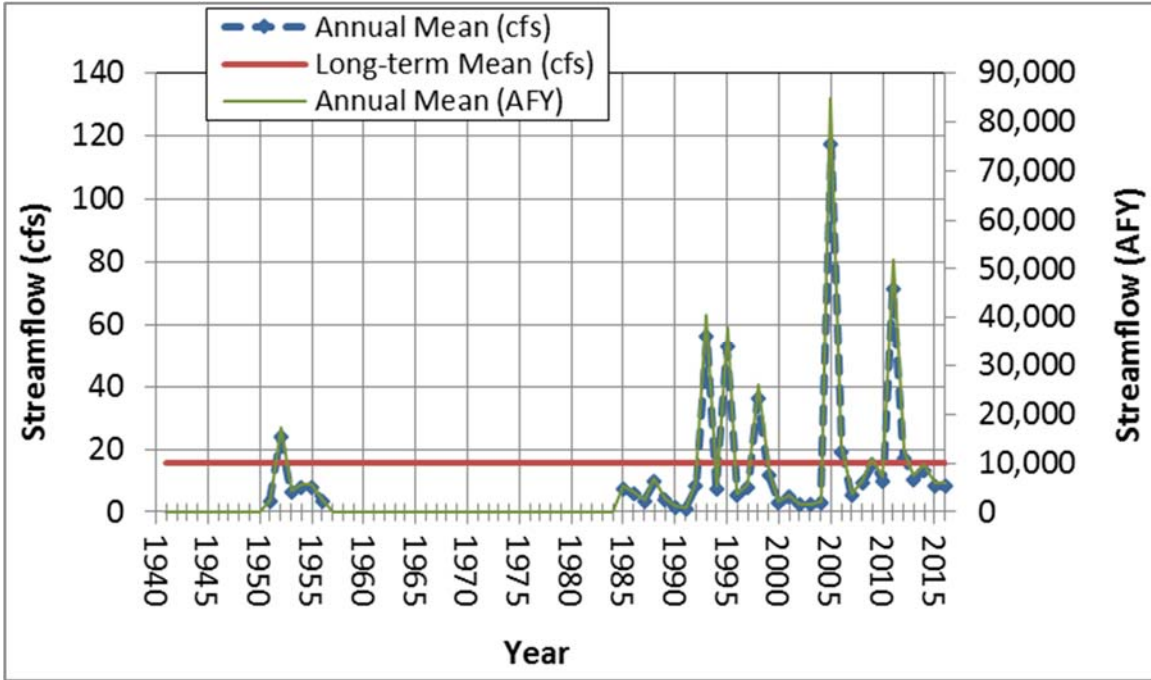
**Figure 5-50**  
**Santa Clara River at St. George Flow Exceedance**



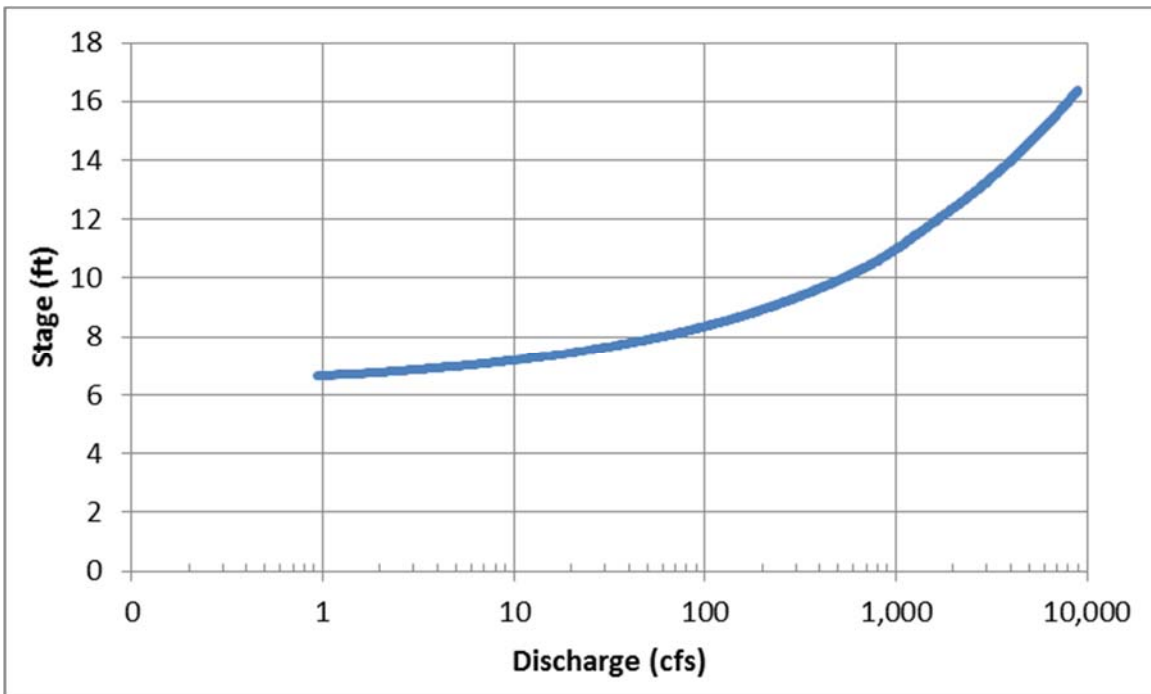
**Figure 5-51**  
**Santa Clara River at St. George Monthly Mean Flows**

### **BLM 607**

The Final License Application filed with FERC shows the figure in BLM Comment No. 607 as Figure 5-52. The text referencing the reader to Figure 5-52 is changed to read as follows: **The long term annual mean streamflow is 16 cfs.** The updated Figure 5-52 showing Santa Clara River at St. George, Annual Mean Flows through 2016 is shown below. The last data point on the graph represents the annual mean flow for the period January 1, 2016 through December 31, 2016. Figure 5-53 in the Final License Application is changed as a result of the updated data shown in Figure 5-52. The updated Figure 5-53 is shown below.



**Figure 5-52**  
**Santa Clara River at St. George Annual Mean Flows**



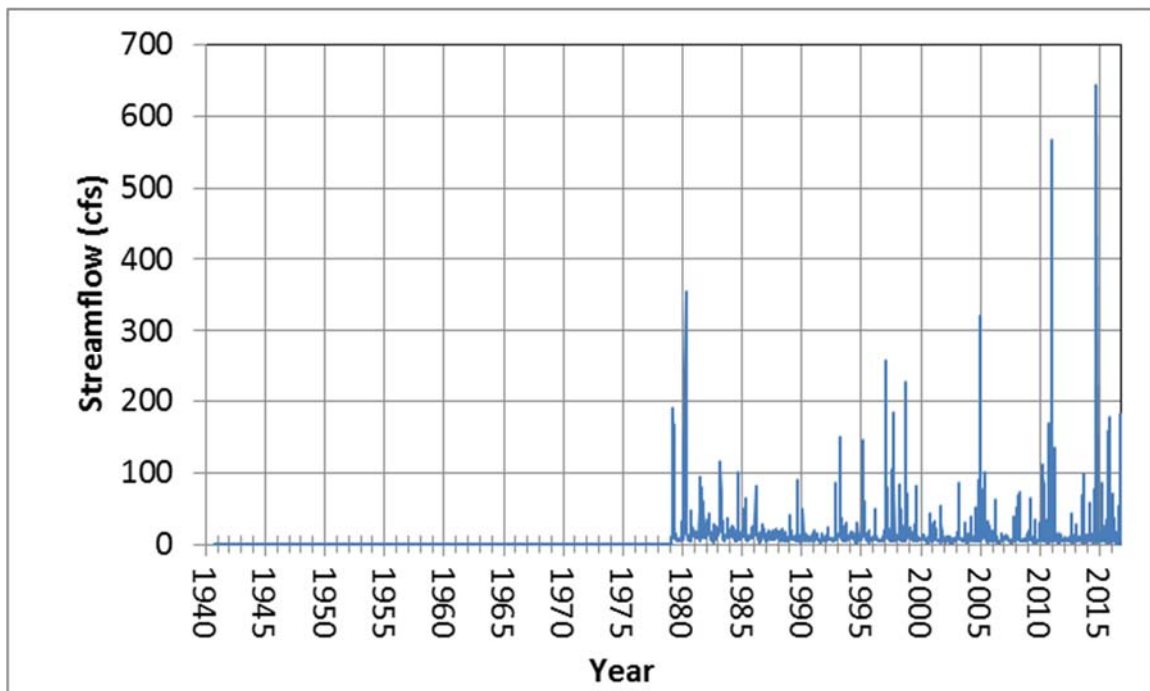
**Figure 5-53**  
**Santa Clara River at St. George – Stage Discharge Rating Curve**  
**Note: Rating curves are subject to change over time**

**BLM 609**

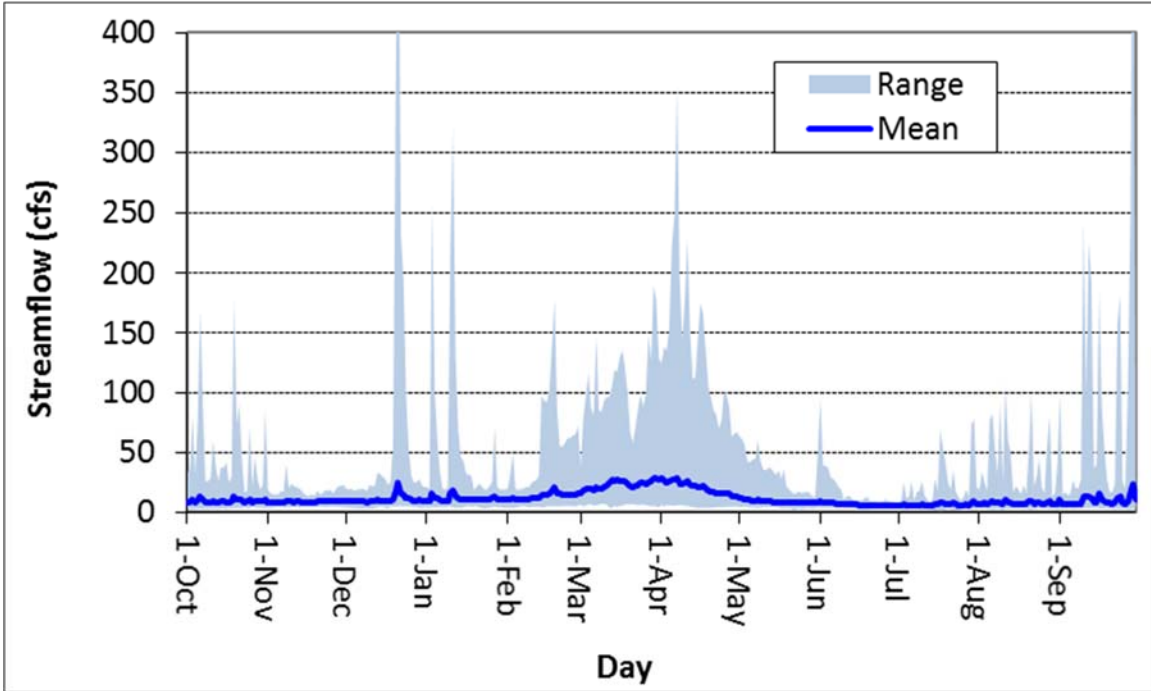
The Final License Application filed with FERC shows the figure in BLM Comment No. 609 as Figure 5-55. The updated Figure 5-55 displaying Mean Daily Flows for Kanab Creek near Kanab for the period 1940 through September 30, 2016 is shown below. Figure 5-56 in the Final License Application is changed as a result of the updated data shown in Figure 5-55. The updated Figure 5-56 is shown below.

Figure 5-57 in the Final License Application is changed as a result of the updated data shown in Figure 5-55. The updated Figure 5-57 displaying the flow exceedance curve for Kanab Creek near Kanab for the period 1940 through 2016 is shown below. The text referencing the reader to Figure 5-57 is revised to read as follows: **Figure 5-57 depicts the flow exceedance curve. The 90 percent exceedance value is 5 cfs while the 10 percent exceedance value is 18 cfs. The median flow is 8 cfs.**

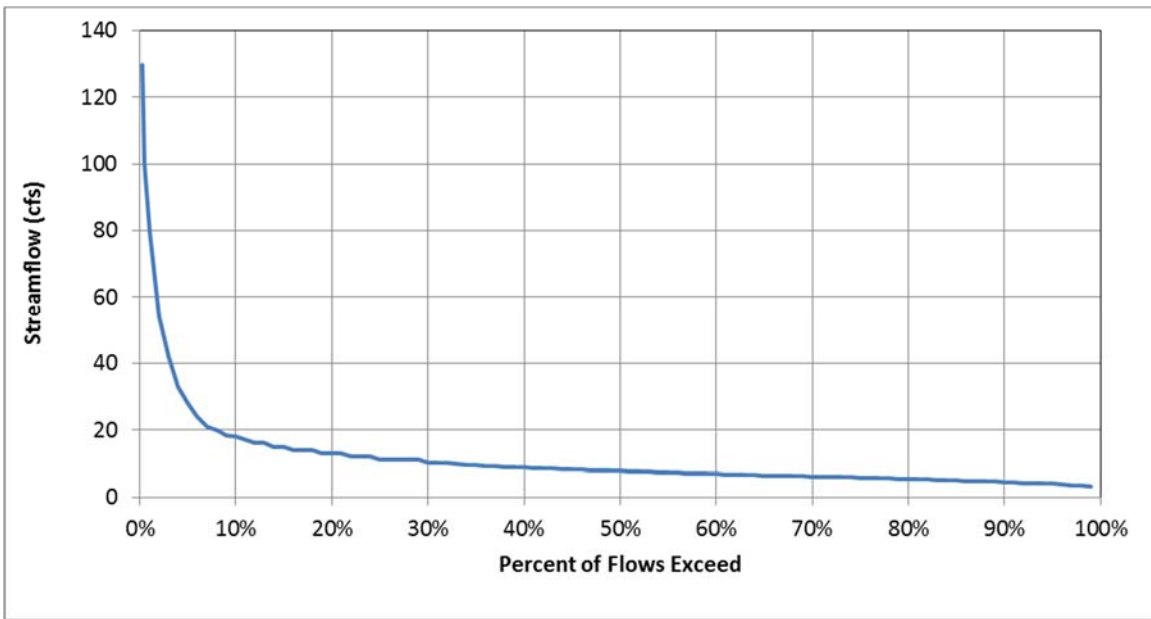
Figure 5-58 in the Final License Application is changed as a result of the updated data shown in Figure 5-55. The text referencing the reader to Figure 5-58 is changed to read as follows: **Figure 5-58 shows monthly mean flows for the Kanab Creek near Kanab, Utah gage for the period of 1940 through 2016. Peak flows occur in the spring with low flows occurring in the summer.** The updated Figure 5-58 displaying Monthly Mean Flows for Kanab Creek near Kanab for the period 1940 through 2016 is shown below.



**Figure 5-55**  
**Kanab Creek near Kanab, Daily Flows**

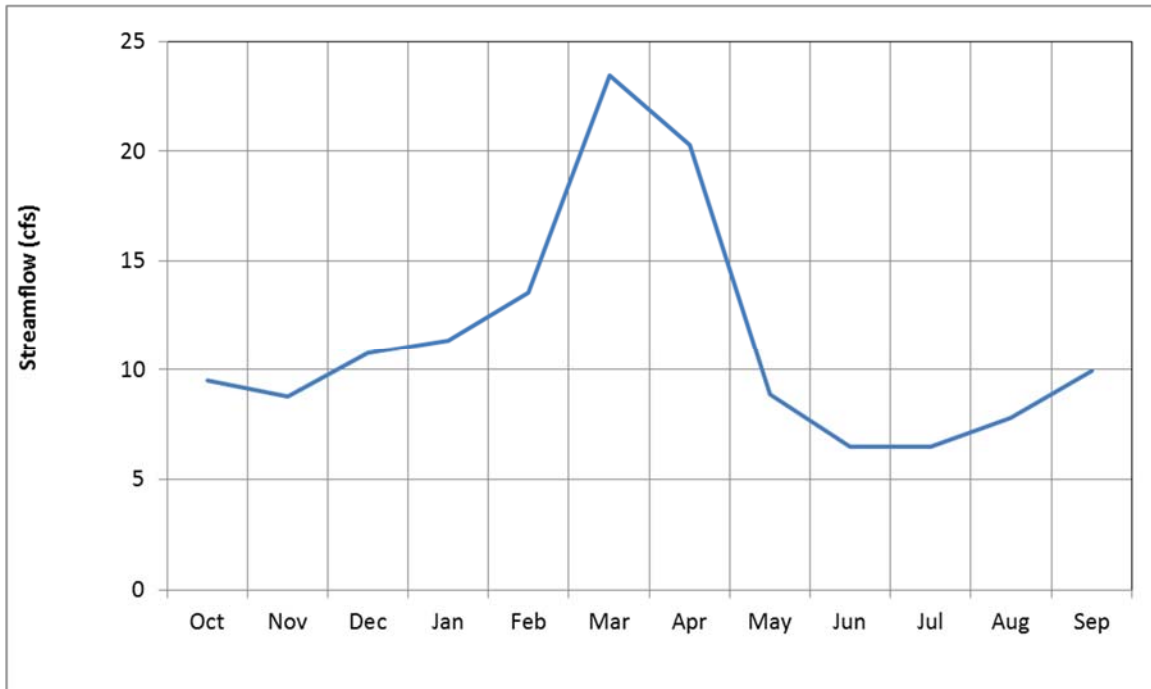


**Figure 5-56**  
**Kanab Creek near Kanab, Daily Mean and Range of Flows**



**Figure 5-57**  
**Kanab Creek near Kanab, Flow Exceedance (1979 - 2016)**

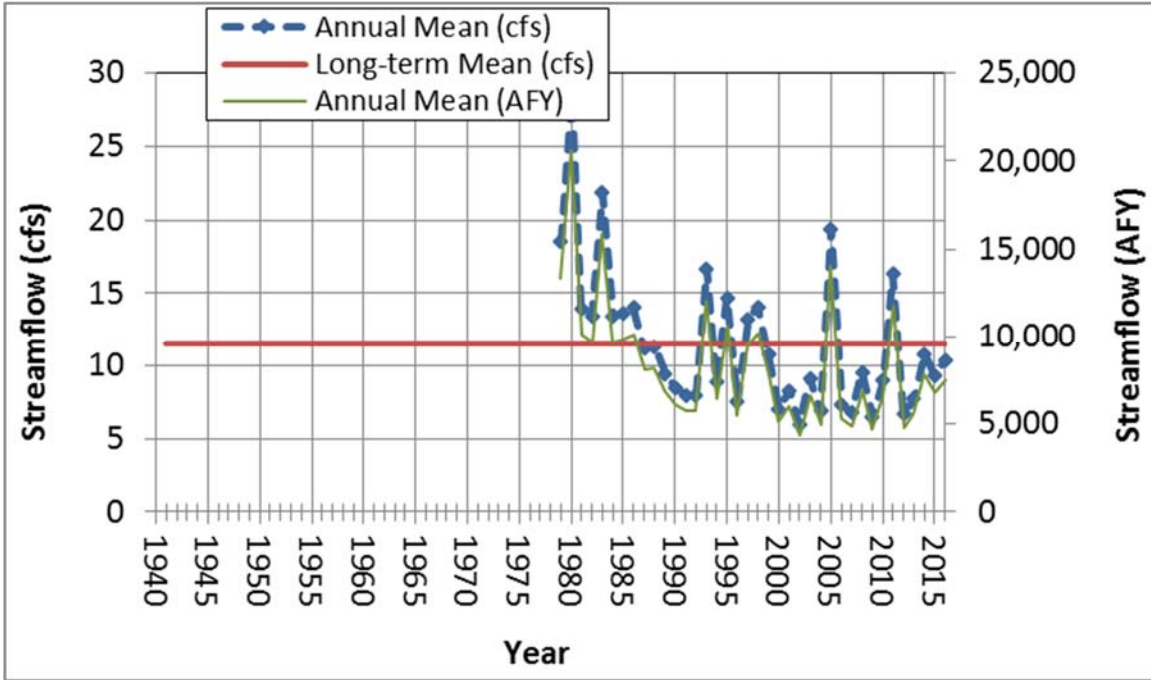




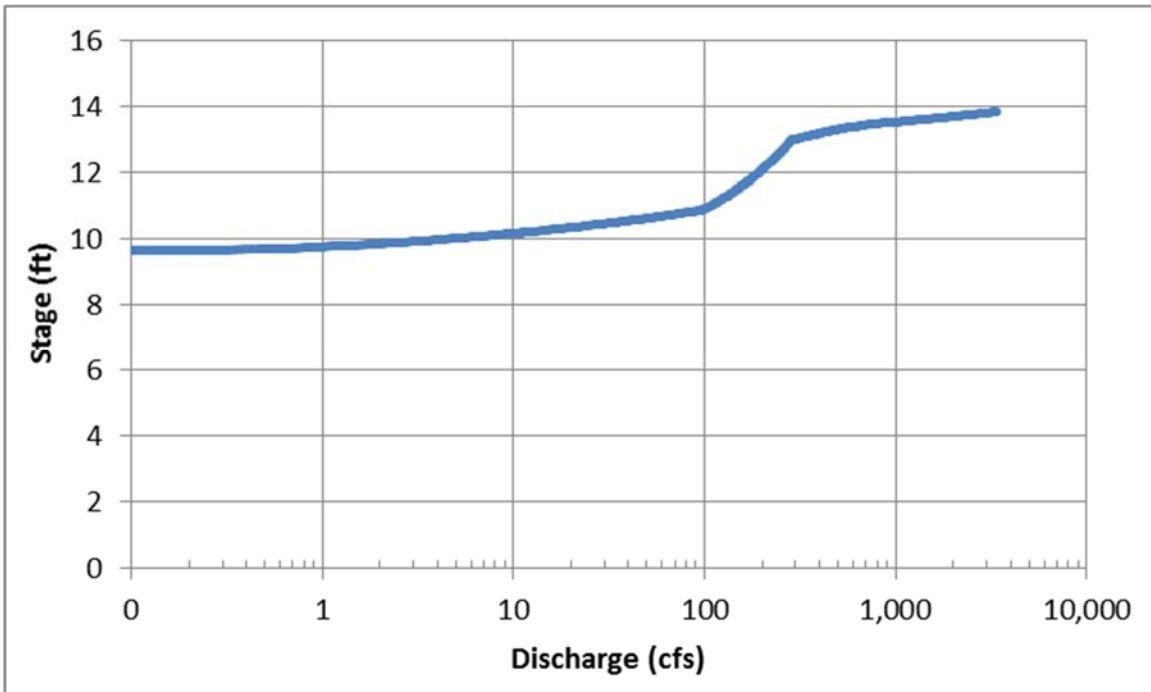
**Figure 5-58**  
**Kanab Creek near Kanab, Monthly Mean flows (1979 - 2016)**

### **BLM 611**

The Final License Application filed with FERC shows the figure in BLM Comment No. 611 as Figure 5-59. The text referencing the reader to Figure 5-59 is changed to read as follows: **The long term annual mean streamflow is 11 cfs.** The updated Figure 5-59 displaying Kanab Creek near Kanab, Annual Mean Flows through 2016 is shown below. The last data points on the graph represent the annual mean flow for the period January 1, 2016 through December 31, 2016. Figure 5-60 in the Final License Application is changed as a result of the updated data shown in Figure 5-59. The updated Figure 5-60 is shown below.



**Figure 5-59**  
**Kanab Creek near Kanab Annual Mean Flows**



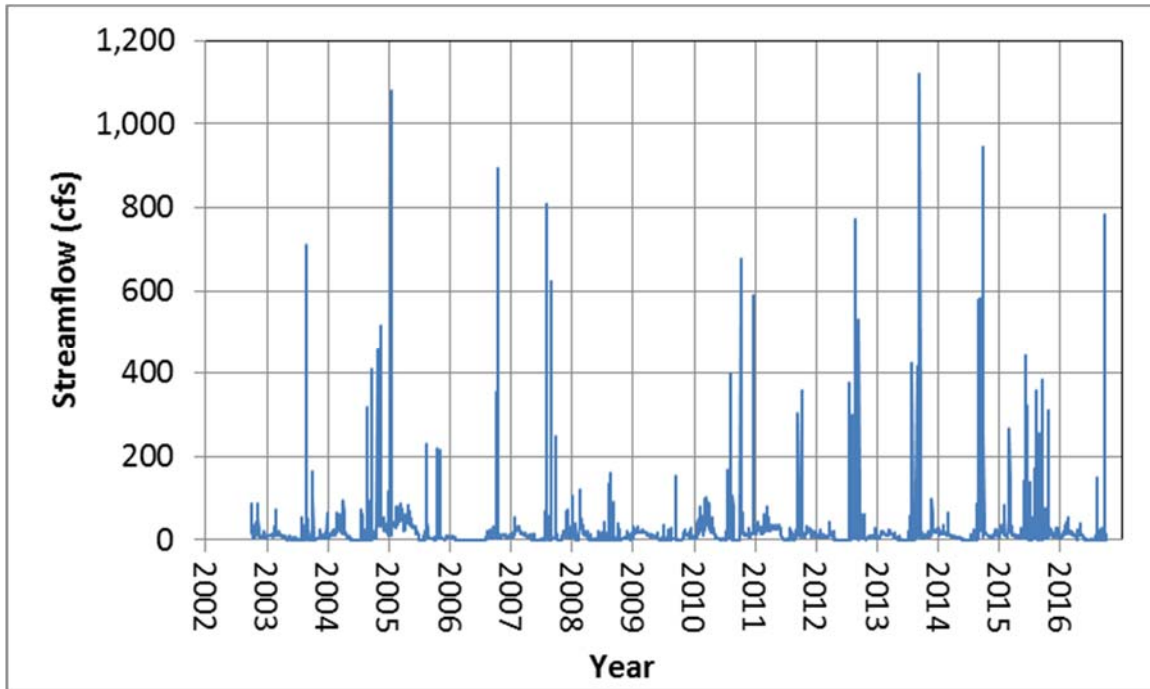
**Figure 5-60**  
**Kanab Creek near Kanab – Stage Discharge Rating Curve**  
 Note: Rating curves are subject to change over time

**BLM 612**

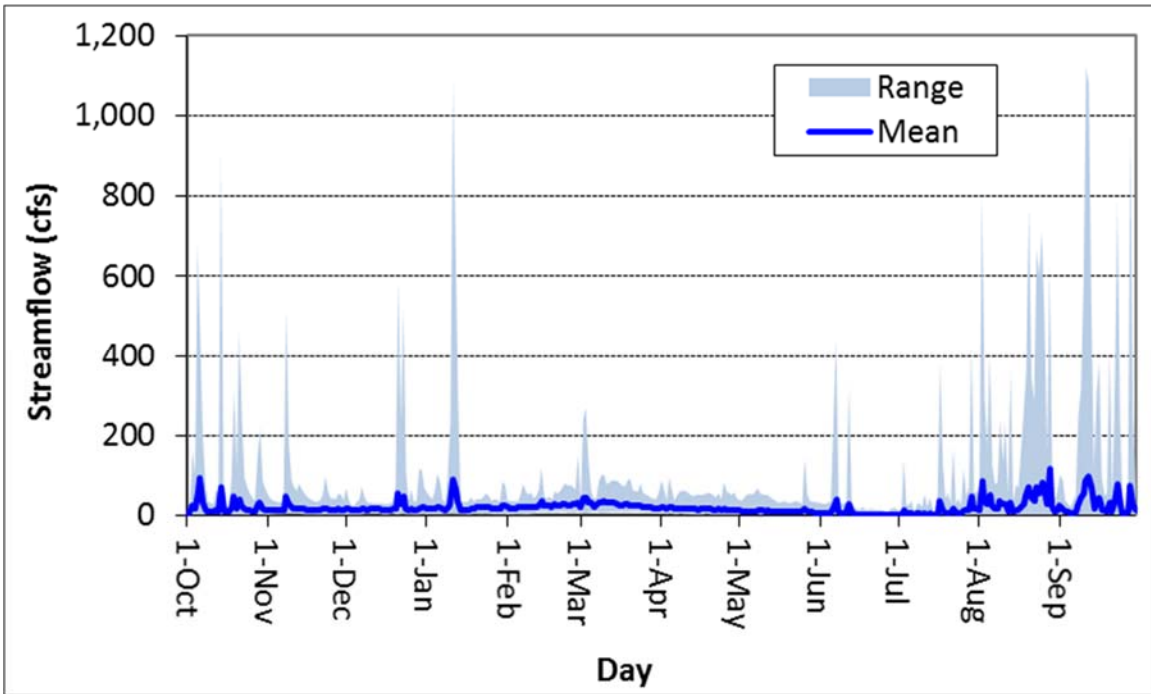
The Final License Application filed with FERC shows the figure in BLM Comment No. 612 as Figure 5-61. The updated Figure 5-61 displaying Mean Daily Flows for the Paria River near Kanab for the period 2002 through September 30, 2016 is shown below. Figure 5-62 in the Final License Application is changed as a result of the updated data shown in Figure 5-61. The updated Figure 5-62 is shown below.

Figure 5-63 in the Final License Application is changed as a result of the updated data shown in Figure 5-61. The updated Figure 5-63 displaying the flow exceedance curve for the Paria River near Kanab for the period 2002 through 2016 is shown below. The text referencing the reader to Figure 5-63 is changed to read as follows: **Figure 5-63 depicts the flow exceedance curve. The 90 percent exceedance value is 0.2 cfs while the 10 percent exceedance value is 36 cfs. The median flow is 9 cfs.**

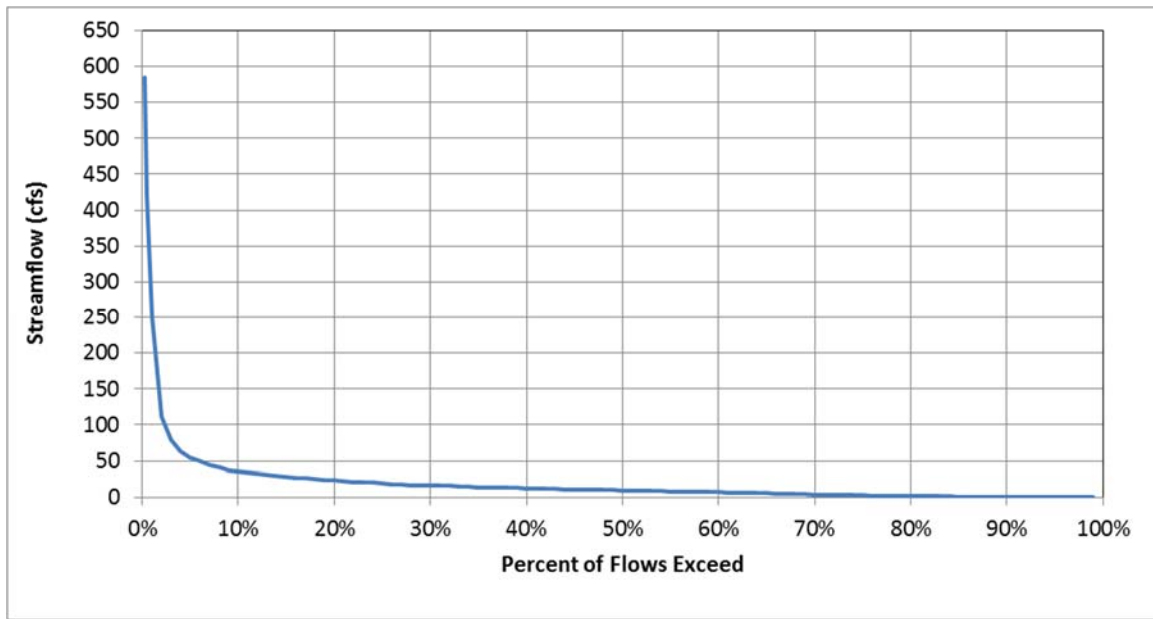
Figure 5-64 in the Final License Application is changed as a result of the updated data shown in Figure 5-61. The updated Figure 5-64 is shown below.



**Figure 5-61**  
**Paria River near Kanab, Daily Flows**



**Figure 5-62**  
**Paria River near Kanab, Daily Mean and Range of Flow**



**Figure 5-63**  
**Paria River near Kanab Flow Exceedance**

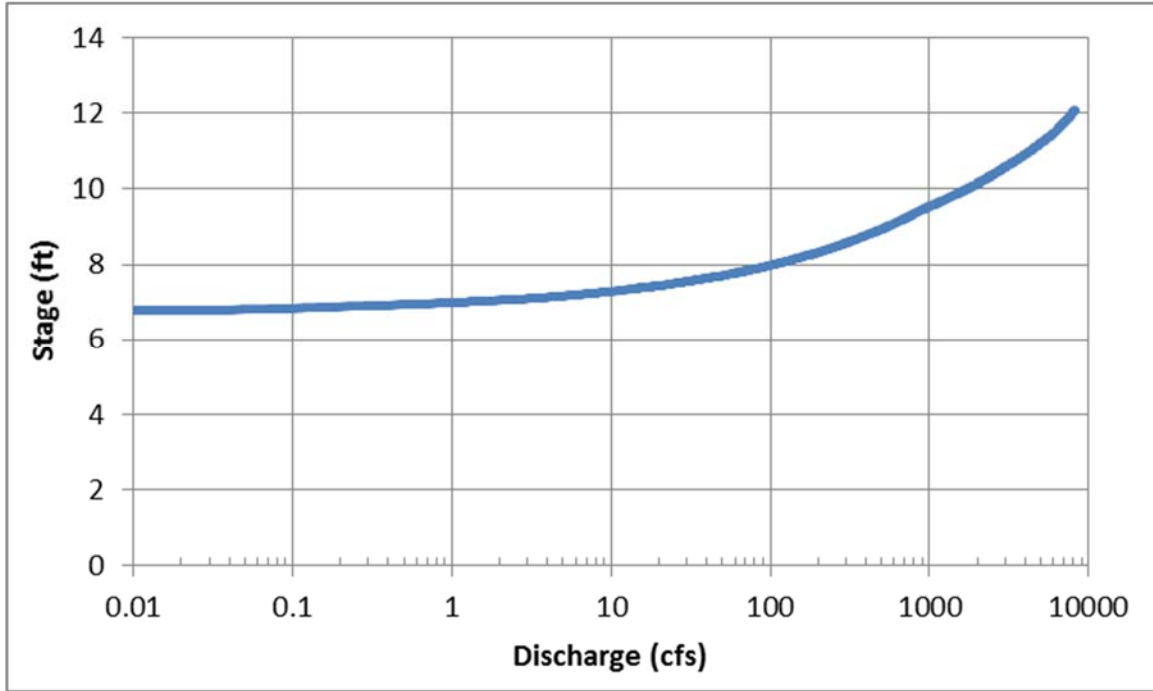


Figure 5-64

**Paria River near Kanab – Stage Discharge Rating Curve**

**Note: Rating curves are subject to change over time**

**BLM 614**

Thanks to the commenter for identifying that Section 5.2.3.11.10 Return Flows in Chapter 5, Exhibit E of the License Application is incorrectly numbered. The section number is revised to read: **5.3.3.1.3 Return Flows**. The return flow data is updated as requested in section 5.3.3.1.3, Chapter 5, Exhibit E of the License Application as follows: **The St. George wastewater treatment plant (WWTP) serves the communities of St. George, Ivins, Santa Clara, and Washington. According to the 2010 M&I Water Supply and Use Report for the Kanab Creek/Virgin River Basin (published in October 2014), for the communities served by the St. George WWTP, 50 percent of M&I water use was indoor water use and 50 percent was outdoor water use. A total of 14,878 ac-ft returned to the wastewater treatment facility at St. George, 97 percent of the total indoor use. Most of the wastewater treatment plant flow, 97 percent, was considered sewered return flow and the effluent returned to the Virgin River. Of the 22,807 ac-ft of outdoor water use, UDWRe estimated that 50 percent returned to the Virgin River as non-sewered return flow (UDWRe 2014). Table 5-20 summarizes water use and return flow estimates for 2010 for communities involved in the LPP.**

**The St. George WWTP discharges to the Virgin River southwest of St. George (Figure 5-26). Figure 5-65 depicts historical flows through the wastewater treatment plant, which represent historical sewered return flows. Sewered return flows have increased at a steady rate since 1990. In 2016, wastewater effluent flows totaled 10 mgd, or about 14.5 cfs. In 2006 St. George completed a regional wastewater reuse plant that takes water from the WWTP and treats it for use as secondary water. The plant is designed for 10 mgd capacity. The plant's current reuse capacity is 7.0 mgd or 7,800 ac-ft per year, but due to lack of storage, this supply can only be used to meet secondary untreated demands during the irrigation season from April through October. Thus, the usable supply is 50 percent, or 3,900 ac-ft per**

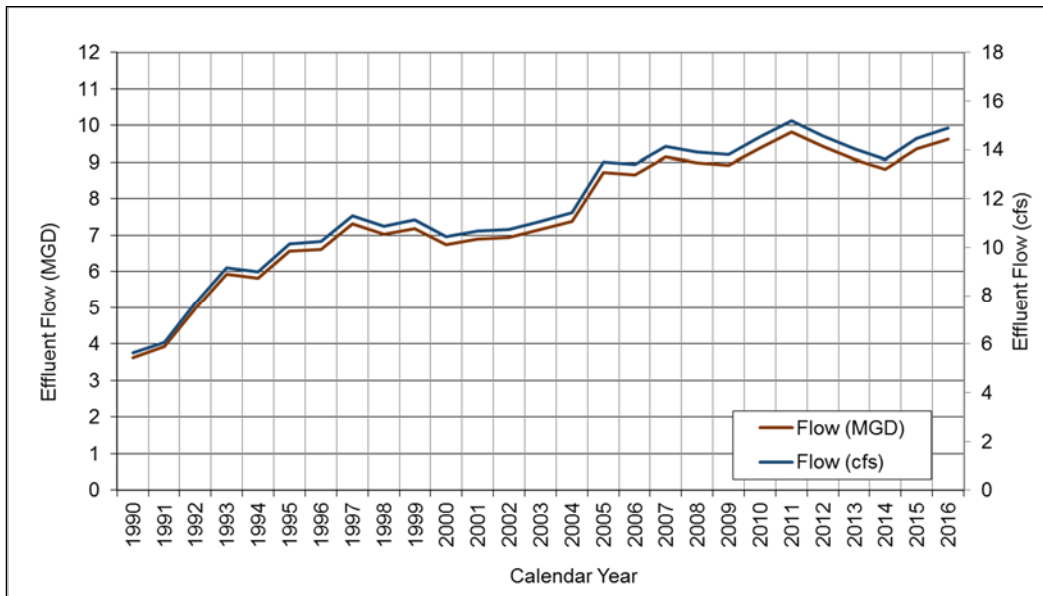
year. Assuming storage facilities would be implemented, a future maximized 10 mgd plant capacity would result in an additional 7,300 ac-ft per year of future supply.

The wastewater reuse plant only has one current large customer, a golf course, but the Shivwits Band of the Paiute Tribe of Utah is entitled to 2,000 ac-ft per year pursuant to the Shivwits Band of the Paiute Indian Tribe of Utah Water Rights Settlement Agreement (2003). The city has approved plans to store reuse water in a new 2,500 ac-ft reservoir and expand the system in the future. This expansion would reduce future sewer return flows to the Virgin River.

**BLM 615**

The Final License Application filed with FERC shows the figure in BLM Comment No. 615 as Figure 5-65. The updated Figure 5-65 displaying the historical effluent flows for the St. George Wastewater Treatment Plant for the period 1990 through 2016 is shown below.

In addition, an updated reference citation for the data is shown below.



Source: Taylor (2017)

**Figure 5-65**  
**St. George Wastewater Plant Historical Effluent Flows**

**Reference:**

**Taylor, S. 2017. City of St. George, Utah Wastewater Treatment Plant. Updated table of average annual flows provided to MWH.**

**BLM 617**

Section 5.2.3.11.10 Return Flows in Chapter 5, Exhibit E of the License Application is incorrectly numbered. The section number is revised to read as **5.3.3.1.3 Return Flows**.

The first and second paragraphs in Section 5.3.3.1.3 and Table 5-20 are revised to read: **The St. George wastewater treatment plant (WWTP) serves the communities of St. George, Ivins, Santa Clara, and Washington. According to the 2010 M&I Water Supply and Use Report for the Kanab Creek/Virgin River Basin (published in October 2014), for the communities served by the St. George WWTP, 50 percent of M&I water use was indoor water use and 50 percent was outdoor water use. A total of 14,878 ac-ft returned to the wastewater treatment facility at St. George, 97 percent of the total indoor use. Most of the wastewater treatment plant flow, 97 percent, was considered sewer return flow and the effluent returned to the Virgin River. Of the 22,807 ac-ft of outdoor water use, UDWR estimated that 50 percent returned to the Virgin River as non-sewered return flow (UDWR 2014). Table 5-20 summarizes water use and return flow estimates for 2014 for communities involved in the LPP.**

**The St. George WWTP discharges to the Virgin River southwest of St. George (Figure 5-26). Figure 5-65 depicts historical flows through the wastewater treatment plant, which represent historical sewer return flows. Sewer return flows have increased at a steady rate since 1990. In 2016, wastewater effluent flows totaled 10 mgd, or about 14.5 cfs. In 2006 St. George completed a regional wastewater reuse plant that takes water from the WWTP and treats it for use as secondary water. The plant is designed for 10 mgd capacity. The wastewater reuse plant only has one current large customer, a golf course, but the Shivwits Band of the Paiute Tribe of Utah is entitled to 2,000 ac-ft per year pursuant to the Shivwits Band of the Paiute Indian Tribe of Utah Water Rights Settlement Agreement (2003). The city has approved plans to store reuse water in a new 2,500 ac-ft reservoir and expand the system in the future. This expansion would reduce future sewer return flows to the Virgin River.**

<b>Water Supplier</b>	<b>Total Water Use</b>	<b>Total M&amp;I Water Use</b>	<b>Outdoor Water Use</b>	<b>Non-Sewered Return Flow</b>	<b>Indoor Water Use</b>	<b>Wastewater Treatment Inflow</b>	<b>Sewered Return Flow</b>
Ivins	1,521.3	1,440.6	914.2	457.1	607.1	523.5	513
Santa Clara Municipal	1,579.2	1,564.2	980	490	599.2	548	537
St. George City	30,140.9	25,450.6	16,724.6	8,362.3	13,416.3	11,709.7	11,258.1
Washington Municipal	6,590.7	5,798.3	4,187.9	2093.9	2,402.8	2,097.1	2,055.2
<b>Total St. George WWTP</b>						<b>14,878.3</b>	<b>14,363.3</b>
Toquerville	489.5	311.5	385.4	192.7	104.1	96.1	94.2
Hurricane	5,181.3	3,020.0	3,449.9	1720	1,741.4	1,558.9	1,527.8
La Verkin	775.0	532.2	446.1	223.1	328.9	306.2	300.1
<b>Total Ash Creek WWTP</b>						<b>1,961.2</b>	<b>1,922.1</b>
Kanab	1,440.6	1,360.6	871.2	435.6	569.4	533.9	263.2

Source: UDWR 2014

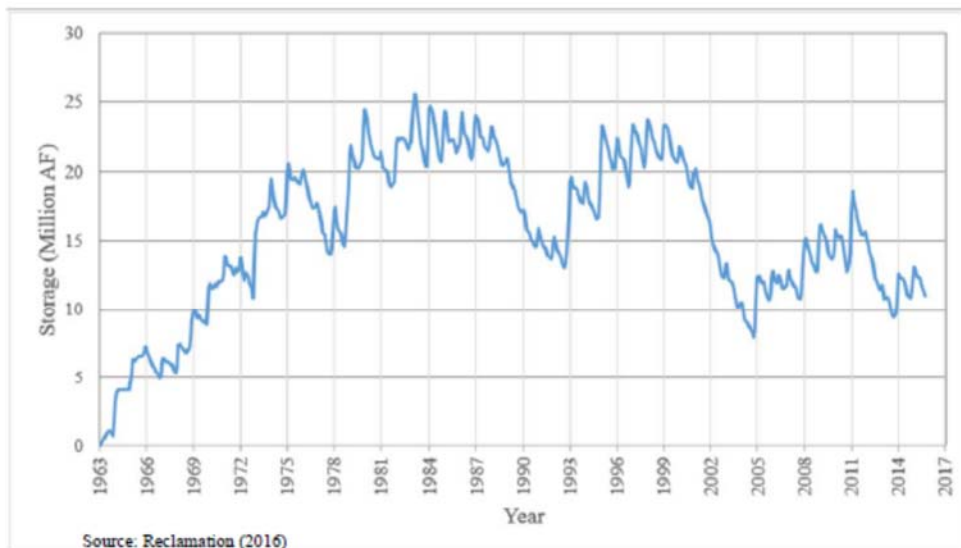
- The third and fourth paragraphs in Section 5.3.3.1.3, Chapter 5, Exhibit E of the License Application are revised to read:

Wastewater for the towns of Toquerville, Hurricane, and La Verkin, Utah is treated at the Ash Creek Special Service District wastewater treatment lagoons. For the communities served by the Ash Creek lagoons 56 percent of M&I water use was indoor water use and 44 percent was outdoor water use. A total of 1,961 ac-ft returned to the Ash Creek lagoons, 90 percent of the total indoor use. Water from the lagoons is land applied and does not have a surface return flow to the Virgin River. However, after accounting for evaporation, UDWR considered that 98 percent of the water delivered to the lagoons returned to the Virgin River. Of the 4,281 ac-ft of outdoor water use, UDWR estimated that 50 percent eventually returned to surface waters as non-sewered return flow (UDWR 2014).

The City of Kanab uses a lagoon system for wastewater treatment. Water use data for 2010 showed that 42 percent of M&I water use was indoor water use and 58 percent was outdoor water use. A total of 534 ac-ft returned to the wastewater lagoons, 94 percent of the total indoor use. After accounting for evaporation, UDWR considered that 96 percent of the water delivered to the lagoons returned to Kanab Creek. Of the 871 ac-ft of outdoor water use, UDWR estimated that 50 percent eventually returned to surface waters as non-sewered return flow (UDWR 2014).

### **BLM 619**

Figure 5-67 in Chapter 5, Exhibit E of the License Application filed with FERC is shown below:

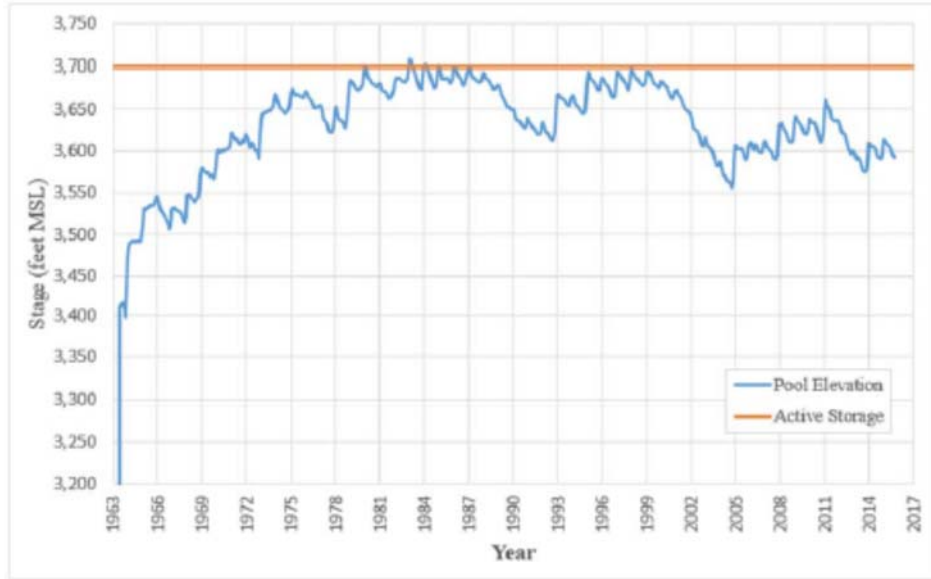


**Figure 5-67**  
**Lake Powell Historical Storage**



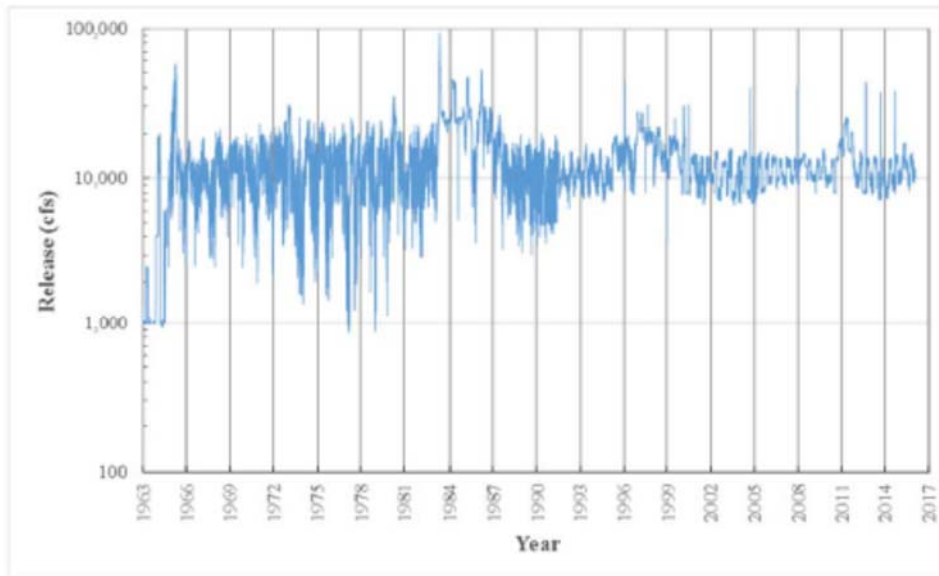
**BLM 620 AND BLM 621**

Figures 5-68 and 5-69 in Chapter 5, Exhibit E of the License Application filed with FERC are shown below:



Source: Reclamation (2016)

**Figure 5-68  
Lake Powell Historical Stage**



Source: Reclamation (2016)

**Figure 5-69  
Lake Powell Historical Daily Releases**

**BLM 631**

The following text describing the management of flows in the Virgin River is inserted following the second paragraph in Section 5.3.3.1.2.2, Chapter 5, Exhibit E of the License Application: **Rights of way for the Quail Creek project were issued by BLM pursuant to an environmental assessment dated August 15, 1983. The EA analysis was based upon studies performed by Hardy and Deacon in 1982, which formed the basis for the December, 1982 biological opinion for the Quail Creek project. The 1982 BO and subsequent BOs have been based upon a recognition of the Virgin River flow regime created by long-standing water rights that hold an 1890 priority.**

The 1982 BO stated:

**It is our opinion that the operation of the PQCRP [Proposed Quail Creek Reservoir Project] will not significantly alter the temperature regime or any other water quality characteristics in the Virgin River. As a result of this and the above discussion on flow depletions, it is our opinion that the PQCRP (based upon the operational plan provided by the applicant) will not have any significant negative impact on the woundfin or its habitat. Therefore, the PQCRP is not likely to jeopardize the continued existence of the woundfin.”**

**In 1994 litigation was filed by Southern Utah Wilderness Alliance against BLM and USFWS pertaining to operations of the project. In 1992 BLM reinitiated consultation on operations of the project. The BLM consultation analysis relied upon further studies performed by Hardy and Addley in 1993 and 1994 updating effects of project operations on listed and conservation fish species. In 1997, settlement of the litigation called for creation of the Virgin River Resources Recovery and Management Program (VRP), a partnership of the USFWS, State of Utah Division of Wildlife Resources and the Washington County Water Conservancy District. The VRP was finalized in 2002, although the various partners had a long history of funding recovery actions prior to the formalization of the program. The baseline for the VRP included the flow simulations that formed the basis for the original 1982 biological opinion. In all cases, the objective studies showed that the District maintains a minimum of 86 cfs or natural flow at the Washington Fields Diversion in accordance with its commitments, taking into account obligations to deliver priority water rights, along with 3 cfs released for Spinedace at the Quail Creek Diversion.**

**Biological opinions issued in 2001 (Virgin River Program), 2004 (Washington Fields Fish Screen), 2006 (Quail Creek Diversion Sluicing Program), 2012 (Washington Fields Road Bridge Repair), 2013 (Stateline Fish Barrier and UDOT I-15 Bridge) and 2014 (Mall Drive Bridge) have all recognized that flows in the Virgin River below the QCD are based upon the “Washington Fields water right [that] requires a minimum flow of 86 cfs (or the natural flow of the river) to the Washington Fields Diversion.”**

**These opinions have taken into account the fundamental requirements of Utah state water rights which have affected the flows in the Virgin River since before the turn of the 20<sup>th</sup> century as set forth below.**

**Long Term Flow History**

**The flow of the Virgin River is affected by diversions throughout the basin. Above the current Quail Creek Diversion (QCD), the complex interactions of small diversions and return flows result in a slight decrease in overall natural flows in the river. In the late 1800s two larger diversions dry-dammed the river at approximately the location of the QCD.**

The original Hurricane diversion, located about one-fourth mile below the present QCD, was completed in 1904, with a year-round diversion right of 33 cubic feet per second (cfs). An additional 63 cfs of lower priority water rights was perfected in the 1940's. When water was available, this diversion could take up to 96 cfs.

The original La Verkin diversion, located about three-fourths of a mile below the present QCD, was completed in 1891, with a year-round diversion right of 12 cfs. During the irrigation season, this diversion dry dammed the river except during floods, leaving no water in the river channel until La Verkin Springs (also known as Dixie Hot Springs or Pah Tempe).

An additional, non-consumptive water right was created with the construction of a Southern Utah Power Company power plant in the 1920's. The water was delivered through a pipeline from the La Verkin canal to the power plant, located about  $\frac{3}{4}$  mile below the bridge between Hurricane and La Verkin. As much as 50 cfs was diverted for power generation, although the non-consumptive water right was for 100 cfs.

Virgin River discharge below these diversions, derived from irrigation return flows, the La Verkin Springs, Ash Creek, La Verkin Creek, and other tributaries and springs along the river, were captured at the Washington Fields Diversion, operated by the St. George and Washington Canal Company with a year-long water right of 86 cfs. This water right shares an 1890 priority with the La Verkin and Hurricane irrigation water rights.

As a practical matter, natural flow was considered to be the water remaining in the river after satisfying the Hurricane and La Verkin water rights, along with discharge from La Verkin hot springs and other springs, the Southern Utah Power Company hydropower plant, tributaries and return flow from irrigation. Occasionally, it was necessary to curtail junior water rights at diversions other than these three major agricultural users.

The Washington County Water Conservancy District's Quail Creek project, including a diversion structure, pipeline, reservoir and hydropower plants, replaced the La Verkin and Hurricane Canal diversions in 1985 delivering the companies' water rights through the District system. As a result, the old diversions were abandoned.

The District must honor the 131 cfs of high priority water rights of Hurricane, La Verkin and St. George and Washington Canal Companies. The water rights acquired for the Quail Creek project have priority dates after 1921, much later than the pioneer era irrigation rights, and are thus considered "high water" rights available only if pre-existing rights have been satisfied, including specifically the 131 cfs of pre-1900 water rights noted above. The project was designed to divert water to District facilities during the winter and spring when flows exceed the level needed to meet the higher priority rights of the three irrigation companies. When flows drop to the point where all water is needed to meet the priority water rights, generally beginning by June of each year, no excess water is available and no diversions are made for District storage. On average, discharge does not exceed this number except during the winter and spring months, when the District is able to divert water for storage in the Quail Creek system.

### Quail Creek Operations

The Quail Creek pipeline is designed to divert up to 250 cfs but generally takes less water due to operational factors. Any water in excess of available capacity may bypass the diversion and flow down river. In addition, if water quality is compromised by silt and debris, characteristic of summer floods, the water may bypass the diversion and flow downstream. This water may be

rejected both because the debris creates hazards to the diversion structure and because the silty water is unsuitable for irrigation or reservoir storage. The flow duration statistics discussed above show that there is simply not base flow in the river that exceeds higher priority water rights, except during floods when water generally cannot be delivered to the Quail Creek pipeline. Current operations maintain a minimum bypass flow of 3 cfs at the QCD pursuant to the Spinedace Conservation Agreement.

When the district is not storing water, after diverted water is distributed to the Hurricane and La Verkin canal companies the remainder then flows through the Hurricane Hydropower Plant, located just upstream from the Hurricane-La Verkin Bridge, before returning to the river. The Hurricane Power Plant is designed for a flow of 30-40 cfs and is operated year long. This water use represents a portion of the old Southern Utah Power Company non-consumptive water right.

The Quail Creek Project continues to honor the legal rights represented by the pre-1900 131 cfs water rights of the three canal companies, in particular avoiding diversions that would reduce flows below the 86 cfs water right or natural flow, whichever is less, measured at the Washington Fields Diversion.

#### Pumpback System

Beginning in 2010, the Virgin River Program and the WCWCD began work on a pumpback system to augment river flow in the reach below the Hurricane Hydropower Plant in order to mitigate high water temperature conditions in the upper river during warm summer months. The system was completed in 2012 and is now available to augment river flows up to 28 cfs in the reach of river extending from the La Verkin hot springs to the Washington Fields Diversion. The system delivers stored water from Sand Hollow Reservoir to Hurricane irrigators, thus off-setting the irrigation demand from the river.

#### Washington Fields Diversion

The entire flow of the river has been diverted near the present site of the Washington Fields Diversion regularly and for long periods since the late 1890s through authorized water rights.

In 2004, USFWS issued a biological opinion for the construction of a fish screen on the St. George and Washington Canal Company diversion structure, commonly referred to as the Washington Fields Diversion. The biological opinion stated:

The amount of water diverted at WFD often represents the majority of the Virgin River flow, and at times the entire flow, resulting in a de-watered channel immediately downstream. Exceptions to this de-watered condition occur during spring period and during times when Virgin River flows exceed 172 cfs (i.e., twice the allocated 86 cfs). As recognized in the USFWS's 1982 Quail Lake opinion, delivery of flows to meet the water rights at WFD created a stretch upstream of the diversion structure that provided good habitat for the endangered Virgin River Fishes. [P. 15]

Further:

The proposed action also will require some level of re-operation of the District water control facilities upstream of the WFD to provide fish return flows at the fish screen facilities year round. This re-operation is interrelated with the proposed action. We anticipate that provisions of year-round fish return flows will require increased

winter storage of Virgin River flows, from water rights belonging to the District, through agreements to be negotiated with the District. The District will ensure that a minimum flow of 5 cfs (Program studies identified in Conservation Measure No. 2 will likely call for periods of flow greater than 20 cfs) is maintained in the river during the 5-year period commencing with operation of the fish screen. Beyond the 5-year study period, the District, in coordination with the Program, will implement the Program's Flow Management Plan for the Virgin River immediately downstream of the WFD, pursuant to appropriate legal agreements. [PP. 3, 5]

No agreement has been executed to implement the Program's flow management plan. The only legal commitments in connection with flows at the Washington Fields Diversion are contained in the 2004 agreement between USFWS, WCWCD, UDWR and the canal company pursuant to which the Program is obligated to provide water to operate the fish screens and the canal company would provide water from an adjacent well to wash the fish screens.

### **BLM 652**

The Final License Application (FLA) filed with FERC has the text referenced in BLM Comment No. 652 in Section 5.3.4.2.2.1, Chapter 5, Exhibit E. The "Clearing and Grading" portion of Section 5.3.4.2.2.1 - Construction Effects Chapter 5, Exhibit E of the License Application is revised to read: **Clearing and grading would reduce vegetation along the cleared sections of the right-of-way thereby increasing the exposure of underlying soils to erosion. Excavated loose soil could be transported into adjacent water bodies via wind and stormwater runoff resulting in increased sediment loading and salinity downstream, ultimately adversely affecting receiving waters. The use of heavy equipment for construction could result in increased compaction of the underlying soils which would have the potential to increase runoff into surface water bodies. The increased runoff could transport the sediment into the water bodies, resulting in increased turbidity levels and sediment recruitment rates in the receiving water body and also increased salinity. An increase in the suspended sediments would increase turbidity, reduce light penetration, and potentially reduce photosynthesis and oxygen production. Dissolved oxygen can be further reduced in affected areas from oxygen consumption by the organic components of the sediment matter. Clearing and grading operations that result in sediment transport into adjacent water bodies may degrade surface water quality of the receiving waters by increasing the salinity of those receiving waters. The short-term effects resulting from any increased salinity would not be measurable.**

The "Open-Cut Crossing" portion of Section 5.3.4.2.2.1 - Construction Effects Chapter 5, Exhibit E of the License Application is revised to read: **Construction of open-cut crossings disturbs channel banks and sediments and could increase sediment loading and increase salinity downstream, ultimately adversely affecting receiving waters. The extent of the effect would depend on the volume of sediments disturbed, composition of channel materials including sediment particle size, and volume of storm flows during construction activity. These factors would determine the density and downstream extent of sediment migration. Open-cut construction activity can also dislodge and transport channel bed sediments which could cause changes in downstream bottom contours and stream flow dynamics that could cause additional erosion and downstream sedimentation. Construction of open-cut crossings in areas with shallow groundwater may require trench dewatering and surface discharge operations that may degrade surface water quality of the receiving waters by increasing salinity through sediment transport. The short-term effects resulting from any increased salinity would not be measurable.**

The last sentence in the first paragraph in the "Trenchless Construction Techniques" portion of Section 5.3.4.2.2.1, Chapter 5, Exhibit E of the License Application is revised to read: **Therefore, it is not expected that the Utah Division of Water Rights would require compliance with UAC Section R655 National Resources, Water Rights, which requires trenchless crossings of natural streams with year-round flows.**

### **BLM 657**

1st bullet: During a meeting between the BLM and UDWRe on March 17, 2017, BLM clarified that the required 1/4 mile setback distance is intended to apply to "perennial" streams, i.e. the Paria River and Kanab Creek. UDWRe stated that their practice is to perform refueling operations at least 100 feet from ephemeral stream channels. BLM and UDWRe agreed that both practices are incorporated into the License Application.

2nd bullet: Regarding the location of land application, UDWRe identifies as described below that for public lands, UDWRe will obtain the prior approval of the land managing agency.

3rd bullet: UDWRE identifies as described below that the collected silt will be land applied and if on public lands, will obtain the approval of the land managing agency.

The sixth, seventh, and eighth items in the bullet list in Section 5.3.4.2.2.2, Chapter 5, Exhibit E of the License Application Effects correspond to the bullets identified by BLM and are revised to read:

- **All construction equipment refueling would be performed on upland areas at least 1/4 mile from perennial streams and 100 feet from ephemeral stream channels to prevent fuel spills from contaminating stream substrates and the dewatered stream reaches.**
- **Construction trenches within dewatered stream reaches would be pumped as necessary to remove subsurface water. The water would be pumped into settling ponds, and then disposed within the right-of-way away from the stream or land applied in areas approved by the landowners and/or land management agencies. Sites where the dewatering would be required and hence where the land application area(s) would be located are unknown at this time.**
- **Silt fences would be installed across the stream channels within the dewatered construction areas downstream of the pipeline crossing excavation to capture sediments that may be mobilized by precipitation events during construction activities. The silt fence toe would be anchored into the stream bed with native material. The silt fence would be removed following completion of the pipeline crossing construction and native material used to anchor the silt fence toe would be returned to approximate pre-construction conditions. The collected silt would be land applied in off-channel areas within the right-of-way with the approval of the land managing agency, but outside the boundaries of the stream channel. The land application would occur in areas approved by the landowners and/or land management agency.**

In addition, the last sentence in the fifth paragraph in Section 3.1.3.2.6, Chapter 3, Exhibit E of the License Application is revised to read: **Vehicle and equipment refueling and hazardous materials storage would not be allowed within 1/4 mile of perennial streams, and within 100 feet of any ephemeral stream or drainages.**

**BLM 667**

The No Action and action alternatives are described in Chapter 3; the No Action Alternative is described in Section 3.2. We agree with the BLM that the No Action Alternative does not mean nothing at all would happen. The commenter is correct that, if the No Action Alternative was selected, FERC and the DOI agencies would not grant their respective licenses and ROW grants for the LPP as currently described. The effect of the No Action Alternative condition on the counties is described in Sections 3.2.1 and 3.2.2. The water supply measures described for WCWCD in Section 3.2.1 would meet projected water demand through approximately 2033. These measures are considered to be reasonably foreseeable by the state and counties. Selection of the No Action alternative does not, however, result in the relinquishment of the UBRW's Lake Powell water rights.

The No Action Alternative is different than the No Lake Powell Water Alternative, described in Section 3.5. The No Action Alternative is required by CEQ rule and is intended to set the baseline condition for evaluation of the action alternatives. FERC, on the other hand, required that UBRW analyze the No Lake Powell Water Alternative. The studies on this alternative reflect one way in which the state and the counties may seek to meet essential water supply needs assuming the UBRW's water rights in Lake Powell would not be diverted and delivered for use as contemplated. This alternative relies upon aggressive water conservation and reuse, including the employment of conversion of agricultural water requiring costly and environmentally challenging reverse osmosis treatment techniques.

FERC established the parameters for study during the scoping and study plan development process, to include examination of the No Action Alternative, the Proposed Action and the most likely way that the counties would meet their needs without the project. FERC required that predictable actions that would result from selection of the No Action Alternative be evaluated in the study reports. These are described in the Sections 3.2.1 and 3.2.2 of the FLA. In accordance with FERC's instructions, UBRW determined that predictable actions were limited to water projects already underway and the Ash Creek Project that was already undergoing NEPA review.

As part of its study planning process, FERC also required the study reports to evaluate an action alternative that would examine "*the most likely*" ways the counties could meet their water needs without the LPP project. These actions are currently described in the No Lake Powell Water Alternative. They include elimination of outdoor residential watering and forced conversion to municipal use of Virgin River water rights now owned by agricultural users, necessitating very expensive reverse osmosis treatment of this Virgin River water along with expanded storage for reuse water. These possibilities may be technically feasible but under currently available technology they are likely to result in extensive environmental impacts and costs and leave Washington County dependent on one limited source of water to meet future needs. These approaches would also result in adverse socio-economic and operational impacts. The study reports provide information deemed sufficient to allow the final selection and description of alternatives to be evaluated in the EIS as determined by the federal agencies.

In order to clarify the No Action Alternative, Section 3.2, Chapter 3, Exhibit E of the License Application is revised to read:

**3.2 Description of No Action Alternative**

**If FERC selected the No Action Alternative, it would not issue a license for the LPP Project and UBRW could not generate electricity to help offset the cost and utilization of any electrical power consumed in pumping water from Lake Powell to St. George. Selection of the No Action Alternative by the NPS or BLM would mean that the UBRW would not obtain the ROWs required for construction and operation of the LPP Project on federal lands administered by these agencies. If Reclamation selected the No Action Alternative, the UBRW's 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 by the State of Utah through a means other than the construction of the LPP Project for which approvals are currently being sought. The No Action Alternative would not meet the identified needs of UBWR.

Section 3.2.1, WCWCD No Action Alternative, is revised to read:

### **3.2.1 Consequences to WCWCD of No Action Alternative**

Under the No Action Alternative, WCWCD would continue reliance on surface water supply from the Virgin River, completing the Ash Creek Project and planned groundwater development. It would also implement aggressive conservation programs. Wastewater reuse would be utilized to the maximum extent baseline approved storage and related infrastructure 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. This would exhaust all currently identified water planning reserves. (UDWRe 2016) 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 leave Washington County overly dependent on one source of water, the Virgin River. This alternative would not provide WCWCD with water to meet shortages arising from drought, ongoing climate change, as well as water supply losses due to emergencies arising from facility damage or outages. The No Action Alternative would not provide an 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.

Section 3.2.2, KCWCD No Action Alternative, is revised to read:

### **3.2.2 Consequences to KCWCD of 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 or system resiliency or redundancy (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.

To be consistent with the above clarifications, Section 2.2 Need for Action is revised to read:

The LPP Project will meet the following UBWR needs:

1. To develop additional water supplies available from the Colorado River system in order to meet the water demands of the existing and projected future population of Kane and Washington counties.
2. To maximize use of existing available and identified M&I water supplies in Kane and Washington counties to meet current and future population demands.
3. To ensure implementation of water conservation, reuse, and recycling measures by project water recipients to meet or exceed the State of Utah's goal of 25 percent reduction in per capita water use by 2025.



4. To develop clean, renewable energy sources wherever possible.
5. **To diversify the primary M&I water sources for the counties and build in more resiliency and redundancy given the risks of variability associated with both water supplies and water supply delivery systems.**

Section 5.3.2.2.5, Chapter 5, Exhibit E of the License Application is revised to read: **No Action Alternative. If FERC selected the No Action Alternative, it would not issue a license for the LPP Project and UBWR could not generate electricity to help offset the cost and utilization of any electrical power consumed in pumping water from Lake Powell to St. George. Selection of the No Action Alternative by the NPS or BLM would mean that the UBWR would not obtain the ROWs required for construction and operation of the LPP Project on federal lands administered by these agencies. If Reclamation selected the No Action Alternative, the UBWR's 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 by the State of Utah through a means other than the construction of the LPP Project for which approvals are currently being sought. The No Action Alternative would not meet the identified needs of UBWR.**

**2nd Comment:** This comment was discussed in the meeting between BLM and the proponent on March 17, 2017. As discussed in that meeting, FERC's guidance to license applicants on environmental effects analyses for Exhibit E is to separately address the effects of the alternatives (e.g. construction, operation and maintenance, mitigation measures). This is different than the analysis that will be prepared for the EIS, in which those measures will be built into the action alternatives upfront, a process with which BLM is more familiar. Section 5.3.4.3 Protection, Mitigation and Enhancement Measures separately addresses the mitigation measures along with potential protection and enhancement measures, following Section 5.3.4.2 Environmental Effects, to meet FERC's guidance for Preparing Environmental Documents (FERC 2008) available on the FERC website at [www.ferc.gov/industries/hydropower/gen-info/guidelines/eaguide.pdf](http://www.ferc.gov/industries/hydropower/gen-info/guidelines/eaguide.pdf). In the future BLM will have opportunities to work with FERC to determine the format and content of the EIS including those environmental protection measures that will be incorporated into the Proposed Action prior to the effects analysis. When the DEIS is prepared, FERC will analyze the Proposed Action with the environmental protection measures incorporated into it. BLM will also have the opportunity under the MOU with FERC to ensure the EIS meets the needs of the agencies involved.

### **BLM 694**

The effects of the No Lake Powell Water Alternative were discussed during the meeting between BLM and UDWR on March 17, 2017. Based on these discussions we understand that BLM's primary concern is that USGS documents cited in the analysis of changes to urban groundwater recharge appear to contradict the conclusions of the groundwater impact analysis in the environmental report. The impact analysis for the alternative is based on localized recharge of the shallow subsurface soils in the vicinity of the urban irrigation and describes the potential effects of changes to this groundwater resource from the alternative. UDWR agrees with BLM that these site-specific changes in groundwater conditions are not in total agreement with conditions described in the two USGS reports. We recognize these differences do exist and suggest the cited USGS documents describe groundwater conditions at a different scale than is described in the impact analysis for the alternative as the reason for the differences.

The following sentence is added as the first sentence of Section 5.3.5.2.5, Chapter 5, Exhibit E of the License Application: **The effects of the No Lake Powell Water Alternative presented below are localized, anthropomorphic changes imposed in addition to other natural and man-made conditions described in other reports.**

The Groundwater-Surface Water Interactions paragraph in Section 5.3.5.2.5.1, Chapter 5, Exhibit E of the License Application is revised to read: **The No Lake Powell Water Alternative would lead to an elimination of culinary water use for outdoor landscapes that would then in turn reduce groundwater discharge to surface water (i.e. Virgin River and its tributaries) throughout the urban portion of the St. George metropolitan area. The reduced groundwater discharge to surface waters would result in less groundwater-surface water interactions in the St. George metropolitan area and that could lead to reduced flows in the Virgin River and its tributaries.**

### **BLM 716**

The requested edit is made and the rating list for key factors is moved to the first paragraph of section 5.3. Section 5.3 Proposed Action and Alternatives, Chapter 5, Exhibit E of the License Application is revised as follows:

#### **5.3 Proposed Action and Alternatives**

**This section describes the anticipated effects of the Proposed Action and alternatives on environmental resources. The following topics are addressed for each affected resource: affected environment; environmental effects of the Proposed Action and alternatives; proposed protection, mitigation and enhancement (PM&E) measures and their effects; cumulative effects; and unavoidable adverse effects.**

**The significance of potential effects on resources considers both context and intensity. Context includes the duration (short-term or long-term) of the effect and the consequence of direct or indirect actions. Intensity refers to the actual severity of an effect. Intensity can be beneficial and/or adverse, be unique or universal and have regulatory or local implications. Intensity assessment can be subjective with regard to certainty or potential of an effect and can be an objective assessment for other issues and concerns.**

**Key factors that influence significance of most effects can include:**

- Magnitude (i.e., with this action element the value of resource)
- Duration or frequency (how long and how often)
- Global extent or areal implication
- Certainty or potential likelihood of actually occurring

**These key factors, when not quantifiable, are typically rated using a subjective analysis similar to the following:**

**Magnitude:**

- major
- moderate
- minor

**Duration:**

- long-term
- medium-term (intermittent)
- short-term

**Extent:**

- large
- medium (localized)
- small (limited)

**Likelihood:**

- probable
- possible
- unlikely

Specific significance criteria were established for individual resources based on the effect topics identified in the respective Study Plans.

**BLM 718**

Please see the response to BLM Comment No. 472 for an explanation of the differences between Exhibit E in the License Application and NEPA documents.

Discussion of Kanab Creek, Sand Hollow and the Virgin River is added. The following two paragraphs are added to Section 5.3.6.2.2, Chapter 5, Exhibit E of the License Application: **The Proposed Action construction would have no measurable effects on aquatic resources in Kanab Creek, the Virgin River, and Sand Hollow Reservoir. Construction would be performed during one of the periods when Kanab Creek is dry and has no surface flow. The Proposed Action operation would have no measurable effects on aquatic resources in Kanab Creek because temporary discharges from the penstock occurring in January of some years to drain the adjacent penstock segment would persist less than one week during a period when the creek typically has no flow. The Proposed Action would have no short term effects on aquatic resources in the Virgin River during construction because no construction would be performed in or near the river. Proposed Action construction would terminate at the east shoreline of Sand Hollow Reservoir, more than four miles from the Virgin River. Proposed Action construction would have no measurable effects on aquatic resources in Sand Hollow Reservoir because construction would be performed above the reservoir water surface along the east shoreline, with BMPs and SCPs for sediment control in place to avoid sediment recruitment to the reservoir.**

**The Proposed Action operation would have no measurable effects on aquatic resources in Kanab Creek, the Virgin River, and Sand Hollow Reservoir. Temporary discharges from the penstock into Kanab Creek occurring in January of some years to drain the adjacent penstock segment would persist less than one week during a period when the creek typically has no flow and no aquatic resources are present. The Proposed Action operation would not directly discharge any LPP water into the Virgin River, and the LPP would have no measurable effect on Virgin River flows throughout the St. George metropolitan area. The Proposed Action flows into Sand Hollow Reservoir during operation would have lower TDS concentrations, similar dissolved oxygen concentrations, and similar water temperatures resulting in no measurable effects on aquatic resources in the reservoir.**

The paragraph in Section 5.3.6.2.3, Chapter 5, Exhibit E of the License Application refers to the effects analysis in Section 5.3.6.2.2, as revised with the two paragraphs added above.

**BLM 722a**

During a meeting between the BLM and UDWR on March 17, 2017, BLM clarified that the required 1/4 mile setback distance is intended to apply only to "perennial" streams, i.e. the Paria River and Kanab Creek. UDWR stated that their practice for refueling operations is also to stay back at least 100' from ephemeral stream channels and washes. BLM and UDWR agreed these practices are incorporated into the License Application.

The second bullet listed in Section 5.3.6.3, Protection, Mitigation and Enhancement Measures, Chapter 5, Exhibit B of the License Application Effects is revised to read: **Silt fences would be installed across the stream channels within the dewatered construction areas downstream of the pipeline crossing excavation to capture sediments that may be mobilized by precipitation events during construction activities. The silt fence toe would be anchored into the stream bed with native material. The silt fence would be removed following completion of the pipeline crossing construction and native material used to anchor the silt fence toe would be returned to pre-construction conditions. The collected silt would be land applied in off-channel areas within the right-of-way, but outside the boundaries of the stream channel. The land application would occur in areas approved by the landowners and/or land management agencies. Sites where the where the land application area(s) would be located are unknown at this time.**

The fifth bullet listed in Section 5.3.6.3, Protection, Mitigation and Enhancement Measures, Chapter 5, Exhibit B of the License Application Effects is revised to read: **Construction equipment working within the temporarily dewatered reaches of stream channels would be checked and regularly monitored for leaking hydraulic fluid, oil, grease, and fuel. Any visible leaks would result in immediate removal of the leaking equipment from the stream channel work area and containment of the leakage within a containment pad in an upland area at least 1/4 mile from perennial streams and 100' from ephemeral streams and washes to isolate potential contaminants and prevent spills on soil.**

The sixth bullet listed in Section 5.3.6.3, Protection, Mitigation and Enhancement Measures, Chapter 5, Exhibit B of the License Application Effects is revised to read: **All construction equipment refueling would be performed on upland areas within spill containment berms or pads to prevent fuel spills from contaminating stream substrates and temporarily dewatered stream reaches. All construction equipment refueling would be performed at least 1/4 mile from perennial streams and 100 feet from ephemeral stream channels and washes.**

The seventh bullet listed in Section 5.3.6.3, Protection, Mitigation and Enhancement Measures, Chapter 5, Exhibit B of the License Application Effects is revised to read: **Construction trenches within dewatered stream reaches would be pumped as necessary to remove subsurface water. The water would be pumped into settling ponds, and then disposed within the right-of-way away from the stream or land applied in areas approved by the landowners and/or land management agencies. Sites where the dewatering would be required and hence where the land application area(s) would be located are unknown at this time.**

The word "positive" is deleted as a qualifier on the effects. The first paragraph after the bullet list, section 5.3.6.3 Protection, Mitigation and Enhancement Measures, Chapter 5, Exhibit B of the License Application Effects is revised to read: **The effects of these BMPs on aquatic resources in perennial drainages would be short-term throughout the duration of construction and aquatic habitat restoration activities.**

**BLM 755**

The first paragraph in Section 5.3.7.1.1.9, Chapter 5, Exhibit E of the License Application is revised to read: **The USFWS listed woundfin as endangered on October 13, 1970 (35 FR 16047), and proposed critical habitat on November 2, 1977 (42 FR 57329). However, on March 6, 1979, the USFWS withdrew the proposal for critical habitat (44 FR 12382) due to the 1978 amendments to the Act, which required proposals to be withdrawn if not finalized within two years. A Woundfin Recovery Plan was originally approved in July 1979 and subsequently revised on March 1, 1984. The Recovery Plan for Virgin River Fishes was approved on April 19, 1995. The Virgin River Resource Management and Recovery Program was established in 2002 to implement actions to recover, conserve, enhance and protect native species, including woundfin, in the Virgin River Basin and to enhance the ability to provide adequate water supplies for sustaining human needs (UDNR 2002). The Recovery Action Plan includes the following objectives: describe baseline conditions, provide and protect instream flows, protect and enhance habitat, protect and enhance native species communities, maintain genetically appropriate brood stocks, determine ecological factors limiting abundance of native species, monitor habitat conditions and populations, and improve education and communication on resource issues (UDNR 2002). The species is listed as a species of concern by Arizona Game and Fish Department according to the Arizona Natural Heritage Listing on the AGFD website.**

Section 5.3.7.6, Chapter 5, Exhibit E of the License Application is revised to read: **Deacon, J.E. and W.G. Bradley. 1972. Ecological distribution of fishes of Moapa River in Clark County, Nevada. Trans. Amer. Fish. Soc. 101: 408-419.**

**BLM 768**

The requested corrections are made to the text regarding references cited.

The third sentence in the third paragraph in Section 5.3.7.2.1.1, Chapter 5, Exhibit E of the License Application is revised to read: **Such an act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (USFWS 1998).**

The fourth sentence in the fourth paragraph in Section 5.3.7.2.1.1, Chapter 5, Exhibit E of the License Application is revised to read: **The statement includes the amount or extent of anticipated take due to the Federal action, reasonable and prudent measures to minimize the take, and terms and conditions that must be observed when implementing those measures (USFWS 1998).**

The third sentence in the fifth paragraph in Section 5.3.7.2.1.1, Chapter 5, Exhibit E of the License Application is revised to read: **If the USFWS makes a jeopardy determination, the Federal agency has several options (USFWS 2017):**

The following references are added to Section 5.3.7.6, Chapter 5, Exhibit E of the License Application and read:

**U.S. Fish and Wildlife Service (USFWS). 1998. Endangered Species Act Consultation Handbook, Procedures for Conducting Section 7 Consultations and Conferences. U.S. Fish and Wildlife Service, National Marine Fisheries Service. March 1998. Final.**

\_\_\_\_\_. **2017. Endangered Species, Section 7 Consultation.**  
<https://www.fws.gov/midwest/endangered/section7/section7.html>. Downloaded March 2, 2017.

## **BLM 770**

The requested section re-organization of the aquatic special status species section is provided.

### **5.3.7.2.2 Proposed Action.**

#### **5.3.7.2.2.1 Threatened, Endangered and Candidate Species.**

##### **Apache Trout**

Apache trout (*Oncorhynchus apache*) is historically and currently distributed in rivers and streams that would not be directly or indirectly affected by Proposed Action or LPP alternative construction or operation. The Verde River and several tributary streams including North Canyon on the Kaibab National Forest are the closest habitat and location of known populations, which extend into southern Coconino County south of the Grand Canyon. The Proposed Action and LPP alternative features would cross through the northern half of Coconino County north of the Grand Canyon. The Proposed Action and LPP alternative construction and operation would have no effect on Apache trout or its habitat. Potential effects of the Proposed Action and LPP alternatives on Apache trout and its habitat are eliminated from further analysis.

##### **Kanab Ambersnail**

Kanab ambersnail (*Oxyloma haydeni kanabensis*) is currently distributed in three known locations, including two springs within the Grand Canyon and at springs near Three Lakes six miles north of Kanab, Utah. The Proposed Action and LPP alternative construction would not occur within ten miles of any known Kanab ambersnail population. Proposed Action and LPP alternative operation would not measurably affect Colorado River flows in the Grand Canyon and would not affect the spring flows at known population locations. The Proposed Action and LPP alternative construction and operation would have no effect on Kanab ambersnail or its habitat. Potential effects of the Proposed Action and LPP alternatives on Kanab ambersnail and its habitat are eliminated from further analysis.

##### **Colorado River Listed Species**

###### ***Construction Effects***

Construction activities in Lake Powell would occur at the Water Intake System approximately 2,100 feet northwest of Glen Canyon Dam on the right bank of the reservoir. These construction activities would include completion of six horizontal borings with a six-foot diameter micro-tunnel boring machine (MTBM) at three elevations within Lake Powell. Each time the MTBM completes a tunnel excavation through the Navajo sandstone bedrock, the MTBM breakthrough would cause approximately 0.5 cubic yard of sandstone rock to fall into Lake Powell. The MBTM would be attached to a cable and hoisted up through the water to a barge for transport to Wahweap Marina and reuse for excavating the next tunnel at the intake site.

The four Colorado River federally listed fish species include bonytail chub (*Gila elegans*), Colorado pikeminnow (*Ptychocheilus lucius*), humpback chub (*Gila cypha*), and razorback sucker (*Xyrauchen texanus*). Two of these species (Colorado pikeminnow and razorback sucker) are documented in Lake Powell in the San Juan arm, near the San Juan River confluence with the reservoir. Critical habitat for Colorado pikeminnow, humpback chub, and razorback sucker is designated in the San Juan arm of Lake

Powell at Neskahai Canyon, approximately 83 river miles upstream from the LPP water intake site, and extends upstream into the San Juan River. Critical habitat for bonytail chub and humpback chub is designated in the upper Colorado River approximately 139 river miles upstream from the LPP water intake site, and extends upstream in the Colorado River. The minimum distance of at least 83 miles from the water intake site to documented occurrence of these species in Lake Powell supports the conclusion that LPP construction activities would have no effect on the listed species. The minimum distance of at least 83 miles from the water intake site to their critical habitat supports the conclusion that LPP construction activities would have no effect on the designated critical habitats.

Downstream releases from Lake Powell through Glen Canyon Dam to the Colorado River in Glen Canyon would occur during the LPP water intake construction. The MTBM breakthrough from the Navajo sandstone bedrock tunnel excavations into the reservoir would not result in measurable turbidity or other water quality effects in the Colorado River downstream of Glen Canyon Dam. There would be no effect on the Colorado River federally listed fish species or their designated critical habitat downstream from Glen Canyon Dam.

The reach of the lower Paria River which maintains perennial stream flow without interruption and contains suitable habitat for federally listed aquatic species is located miles downstream from Highway 89 where the Proposed Action and alternative alignments would cross the river. The federally listed aquatic species known to inhabit the lower Paria River is razorback sucker (*Xyrauchen texanus*). The Paria River is listed as a perennial stream by the U.S. Geological Survey (USGS), however, the USGS streamflow records for the Paria River at Highway 89 demonstrate the river has sustained periods during the summer months when there is no flow. The only potential effect of the temporary construction on the Paria River would be changes in water quality that could affect fish and habitat in downstream reaches. Construction of the pipeline crossing of the Paria River at Highway 89 would be performed during the summer period when there is no flow or low flow to avoid effects on surface water quality (turbidity and sediment transport). If the Paria River has low flows during the temporary construction of the pipeline crossing, then a temporary cofferdam would be constructed to divert the flow to another part of the 340-foot wide river bottom to avoid active construction in the flowing portion of the river. The Paria River channel bed and banks would be restored to original conditions following the temporary construction activities. Construction of transmission lines across the lower Paria River would have no effect on razorback chub or its designated critical habitat. The LPP construction would have no effect on razorback chub or its critical habitat in the lower Paria River. More detailed stream flow information, data and analyses are provided in the final Surface Water Resources Study Report (UBWR 2016a). More detailed water quality information, data and analyses are provided in the final Surface Water Quality Study Report (UDWRe 2016b)

### ***Operations and Maintenance Effects***

The proposed LPP diversions and depletion from Lake Powell could potentially affect federally listed aquatic resource species and critical habitats in the Colorado River downstream from Glen Canyon Dam. The federally listed species with critical habitat downstream of Glen Canyon Dam include bonytail chub, Colorado pikeminnow, humpback chub, and razorback sucker. Measurable changes in Glen Canyon Dam releases and water quality could affect these listed species and their designated critical habitat.

UDWRe contracted with the Department of the Interior's designated expert agency, the Bureau of Reclamation (Reclamation) to simulate the potential effects of the LPP diversions and depletion from Lake Powell on reservoir levels, Glen Canyon Dam releases, and water quality in Lake Powell and in releases from Glen Canyon Dam. Reclamation performed multiple hydrologic modeling runs using their long-term planning model, CRSS. The results of these model runs were provided to UDWRe for use in its planning studies for the LPP to determine potential effects on the hydrology of the Colorado River

system. Reclamation also provided water quality modeling results to UDWR for use in its planning studies for the LPP to determine potential effects on water quality of the Colorado River system.

The results of hydrologic modeling runs are summarized in the following sections. More detailed analyses are provided in the final Surface Water Resources Study Report (UDWR 2016a) and the final Surface Water Quality Study Report (UDWR 2016b).

**Colorado River Hydrologic Simulation Methodology.** Hydrologic modeling of the Colorado River system for the period 2015 through 2060 was performed to determine the potential hydrologic effects of the alternatives. Modeling provides projections of potential future Colorado River system conditions (i.e., reservoir elevations, reservoir releases, river flows) for comparison of those conditions under the No Action alternative to conditions under the Proposed Action and other LPP alternatives. These comparisons are typically expressed in terms of the relative differences in probabilities between the No Action alternative and the LPP action alternatives. Hydrologic modeling also provides the basis for the analysis of the potential effect of each alternative on other environmental resources such as water quality and hydropower. Multiple simulations were performed in order to quantify the uncertainties of future conditions and as such, the modeling results are expressed in probabilistic terms because of the uncertainty with regard to future inflows into the system.

*Two inflow hydrology data sets were modeled for the Proposed Action analyses and No Action alternative. The DNF inflow scenario uses data from the observed stream flow record (1906-2010). The climate change (CC) inflow scenario uses hydrologic data derived from climate change driven stream flow projections<sup>1</sup> to represent a range of possible future inflows under the assumption of climate change in the Colorado River Basin.*

**Proposed Action Analysis.** The Proposed Action analysis assumes water use in the Colorado River basin would remain constant at current levels, except for depletions resulting from reasonably foreseeable (pursuant to 43 CFR 46.30) future projects. Under the regulatory definition, a reasonably foreseeable future depletion is one which has state legislation, or a tribal resolution or federal Indian water settlement, or a federal finding of no significant effect (FONSI) or record of decision (ROD). In the No Action analysis, the No Action alternative assumes that if the Lake Powell Pipeline is not developed, that water will not be developed somewhere else in the state. This analysis isolates the effect of adding a new project (Lake Powell Pipeline) to the mix of existing and reasonably foreseeable depletions in the Colorado River system. It should be noted that the CRSS modeling assumption for the No Action Alternative artificially increases the elevations in Lake Powell over the period from 2024 through 2060, with the unused UBWR water rights continuing to be stored in the reservoir each successive year. If the LPP water is not depleted from Lake Powell, UBWR would use the water rights for another purpose and would not leave their water in the reservoir. UDWR has performed a post-processing analysis that corrects the Lake Powell elevations from the CRSS model results provided by Reclamation, assuming UBWR would use their water right for another purpose.

The Proposed Action and LPP alternatives would each annually divert and deplete 86,249 acre-feet of water from the Colorado River system at Lake Powell. Diversions and depletions would begin in 2024 with an annual volume of 15,468 ac-ft per year and increase each year through 2048 to 86,249 acre feet. Diversions and depletions would be constant at 86,249 ac-ft per year from full build-out until the end of the model run (2048 through 2060).

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<sup>1</sup>Climate change data and information available at: [http://gdo-dcp.ucllnl.org/downscaled\\_cmip\\_projections/dcpInterface.html#Welcome](http://gdo-dcp.ucllnl.org/downscaled_cmip_projections/dcpInterface.html#Welcome)



**No Action Alternative Analysis.** The No Action alternative provides a baseline for comparison with the LPP action alternatives. The No Action alternative represents a projection of future conditions that could occur during the life of the proposed federal action without an action alternative being implemented. The No Action alternative assumes all Upper Basin depletions except those deemed reasonably foreseeable are held constant at 2015 depletion levels for the entire model run. UDWR performed a post-processing analysis that corrects the Lake Powell elevations from the CRSS model results provided by Reclamation, assuming UBWR would use their water right for another purpose under the No Action alternative.

**Summary of Potential Hydrologic Effects - Lake Powell Elevations.** Under the Proposed Action and No Action alternatives, the Lake Powell elevations are projected to fluctuate between full and lower levels during the period of analysis (2015 through 2060). DNF was the primary inflow dataset used for the 2007 Shortage EIS and therefore the results of this analysis are more comparable to those performed for that EIS. The year 2027 is when reservoir operations in the simulation revert to the 2007 Shortage EIS No Action Alternative. Under the DNF inflow scenario for the 90<sup>th</sup> and 50<sup>th</sup> percentile probabilities, there would be 0.57 ft and 0.74 ft average differences, respectively, in Lake Powell levels between the Proposed Action and No Action. Under the CC inflow scenario for the 90<sup>th</sup> and 50<sup>th</sup> percentile probabilities, there would be 0.60 ft and 0.92 ft average differences, respectively, in Lake Powell levels between the Proposed Action and No Action. Most of the Lake Powell elevation differences round to 0 percent elevation change between the Proposed Action and No Action under the DNF and CC inflow hydrology. This results from the fact that the annual depletion of 86,249 ac-ft is a relatively small volume of water compared to the volume of water stored in and passing through Lake Powell at the 90<sup>th</sup>, 50<sup>th</sup> and 10<sup>th</sup> percentile probabilities. The DNF inflow hydrology for No Action would have an average 1.09-foot higher annual elevation difference than the Proposed Action at the 10<sup>th</sup> percentile probability, with the elevation at approximately 3,567.24 ft MSL. The CC inflow hydrology would have an average annual elevation difference of 3.04 ft at the 10<sup>th</sup> percentile probability between the Proposed Action and No Action, with the elevation at approximately 3409.72 ft MSL. The primary factor affecting the elevation at the 10<sup>th</sup> percentile probability would be the reduction of inflow into Lake Powell under CC inflow hydrology, resulting in low storage below the minimum power pool elevation. The elevation differences in Lake Powell would be on an annual basis (over a one-year period) and not absolute or instantaneous.

The LPP operations effects on Lake Powell elevations under DNF inflow hydrology at the 90<sup>th</sup>, 50<sup>th</sup> and 10<sup>th</sup> percentile probabilities would be within the normal operation fluctuations of the reservoir. There would be no measurable effects on the federally listed Colorado River fishes or their designated critical habitat upstream of the LPP water intake site. The LPP operations effects on Lake Powell elevations under CC inflow hydrology at the 90<sup>th</sup> and 50<sup>th</sup> percentile probabilities would be within the normal operation fluctuations of the reservoir. There would be no measurable effects on the federally listed Colorado River fishes or their designated critical habitat upstream of the LPP water intake site. The LPP operations effects on Lake Powell elevations under CC inflow hydrology at the 10<sup>th</sup> percentile probability would be substantially below the minimum power pool elevation because of the effect of CC inflow hydrology, and these conditions would affect designated critical habitat for the federally listed Colorado River fish in the San Juan arm of Lake Powell and at the confluence of the Dirty Devil River with the Colorado River.

**Summary of Potential Hydrologic Effects - Glen Canyon Dam Releases.** Direct natural flow (DNF) was the primary inflow dataset used for the 2007 Shortage EIS and therefore the results of this analysis are more comparable to those performed for that EIS. The year 2027 is when reservoir operations in the simulation revert to the 2007 Shortage EIS No Action Alternative. For the 10<sup>th</sup> and 50<sup>th</sup> percentiles, there would be no difference in releases between the Proposed Action and No Action under the DNF inflow scenario. There would be minimal differences in high flow releases between the Proposed Action and No Action alternatives at the 90<sup>th</sup> percentile under the DNF inflow scenario. Flow release differences under DNF inflow hydrology would be within normal operation release fluctuations and there would be no

measurable flow effects on the federally listed Colorado River fishes or their designated critical habitat downstream from Glen Canyon Dam.

The CC inflow simulations for the 86,249 ac-ft Proposed Action (pipeline) depletion and No Action alternative were simulated for the 10<sup>th</sup>, 50<sup>th</sup> and 90<sup>th</sup> percentiles from 2015 through 2060. For the 50<sup>th</sup> percentile, there would be no distinguishable difference in releases between the Proposed Action and No Action under the CC inflow hydrology scenario. There would be minimal differences in releases between the Proposed Action and No Action alternatives at the 10<sup>th</sup> and 90<sup>th</sup> percentiles under the CC inflow scenario. Flow release differences under CC inflow hydrology between the Proposed Action and No Action alternative would be within normal operation release fluctuations and there would be no measurable flow effects on the federally listed Colorado River fishes or their designated critical habitat downstream from Glen Canyon Dam.

Differences in annual Glen Canyon Dam releases were analyzed at the 10<sup>th</sup>, 50<sup>th</sup>, and 90<sup>th</sup> percentiles for the DNF and CC inflow hydrology scenarios under the Proposed Action and No Action. Most of the differences summarized round to 0 percent when compared with the large volume of water released to the Colorado River from Glen Canyon Dam. The DNF inflow hydrology for No Action would release an average of 69,202 ac-ft per year more than the Proposed Action at the 90<sup>th</sup> percentile, a -0.5 percent change. The CC inflow hydrology would have minimal differences between the Proposed Action and No Action. The CC inflow hydrology for No Action would release an average of 80,846 ac-ft per year more than the Proposed Action at the 10<sup>th</sup> percentile, a -1.2 percent change. The CC inflow hydrology for No Action would release an average of 61,593 ac-ft per year more than the Proposed Action at the 90<sup>th</sup> percentile, a -0.5 percent change. The CC inflow hydrology would yield slightly higher average differences at the 10<sup>th</sup> percentile compared to the DNF inflow hydrology.

Releases of greater than the annual minimum objective release of 8.23 million acre-feet would occur with nearly the same frequency (within 2.3 percent of the time) between the Proposed Action and No Action Alternative under the DNF inflow hydrology. Releases of greater than the annual minimum objective release of 8.23 million acre-feet would occur with nearly the same frequency (within 0.4 percent of the time) between the Proposed Action and No Action Alternative under the CC inflow hydrology.

**Reclamation Water Quality Modeling Results.** Computer modeling was utilized by Reclamation to evaluate potential effects of the Proposed Action and LPP alternatives on temperature, TDS, and other water quality parameters. The CRSS and Lake Powell CE-QUAL-W2 models were used to simulate water quality parameters in and below Lake Powell for the No Action Alternative and the Proposed Action (86,249 ac-ft per year) diversion from Lake Powell. Results of the Reclamation surface water quality modeling runs are summarized in the following sections. More detailed analyses are provided in the final Surface Water Quality Study Report (UDWRe 2016b).

**CRSS Salinity Modeling Methods.** The CRSS model is a rule-based simulation of operations in the Colorado River Basin based in the Riverware™ Modeling framework developed by CADSWES at the University of Colorado at Boulder. The version of the CRSS model that was used for the hydrological and operational simulations of the Lake Powell Pipeline was also used to simulate salinity, or TDS, in the Colorado River Basin. The salinity model routes salinity through major stream reaches and seven reservoirs (Flaming Gorge, Starvation, Navajo, Powell, Mead, Mohave, and Havasu) in the Colorado River Basin. The model is intended for long-term simulations of salinity (15 to 20 years). The model simulated the period 2015 to 2060 using two inflow hydrology scenarios, DNF and projected climate change inflows (CC). In the DNF scenario the historic record 1906-2006 was used to generate 101 simulations of the period 2015 to 2060. The CC scenario inflow hydrology was derived from climate

change driven stream flow projections<sup>2</sup> to represent a range of possible future inflows under the assumption of climate change in the Colorado River Basin.

**CE-QUAL-W2: Water Quality Modeling Methodology.** CE-QUAL-W2 is a water quality model developed by the US Army Corps of Engineers for simulating hydrodynamics and water quality in long, narrow waterbodies such as reservoirs. The Lake Powell CE-QUAL-W2 Model calibrated to the historic time period 1989-2010 was used as the base for simulations of the LPP. The model simulates temperature, TDS, dissolved oxygen, nutrients, and algae in the reservoir and releases from Glen Canyon Dam.

The CE-QUAL-W2 simulations used results from the CRSS DNF hydrology simulations as inputs for tributary inflows and dam outflows in the water quality model scenarios. One of the 101 CRSS DNF hydrology simulations was selected to determine these inputs. From the simulation period 2015 to 2060, the years 2039 to 2060 were selected to use directly in the CE-QUAL-W2 model. This period was selected because the simulation years 2039 to 2060 corresponded to the natural flow years 1989-2010. This allowed other CE-QUAL-W2 inputs such as meteorology to use historical data.

**Water Quality Modeling Results.** Water quality results from the Proposed Action diversion scenario were compared to the No Action Alternative scenario to determine effects, if any, on water quality. Water quality modeling results included temperature and dissolved oxygen in Lake Powell at three locations, temperature, TDS, and dissolved oxygen below Glen Canyon Dam from the CE-QUAL-W2 modeling, and TDS along the Lower Colorado River from the CRSS modeling. Other water quality parameters were simulated by the CE-QUAL-W2 model including nutrients and phytoplankton but quantitative results are not presented for these parameters. Additionally, CE-QUAL-W2 modeling of Glen Canyon Dam release temperatures at varying elevations was performed as part of the “Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead, Final Environmental Effect Statement” or Shortage Criteria EIS (DOI 2007). Results from that modeling are interpreted based on the projected changes in Lake Powell water surface elevations as a result of the proposed LPP.

**Lake Powell.** Lake Powell temperature and dissolved oxygen concentrations were evaluated at five day intervals for three reservoir locations and five depths. The three locations were above the dam, below the confluence of the San Juan River, and the upstream reservoir. The five depths were 5, 10, 25, 50, and 100 meters. Simulated reservoir temperatures for the 86,249 acre-foot Proposed Action simulation were compared with the No Action Alternative simulation. Average temperatures at each depth modeled are between 0.04 and 0.19°C colder. Simulated reservoir dissolved oxygen (DO) concentrations for the 86,249 acre-foot Proposed Action simulations were compared with the No Action Alternative simulation and were 0.1 mg/L lower at 25 meters, 0.2 mg/L lower at 50 meters and 0.1 mg/L higher at 100 meters (Reclamation 2016). The DO concentrations for the 0 meter and 10 meter depths modeled for the pipeline simulation were the same as the No Action alternative. Appendix A in the Final Surface Water Quality Study Report presents the Reclamation Water Quality Modeling Documentation (UDWRe 2016b).

**Glen Canyon Dam Releases.** Modeled release results from Glen Canyon Dam for the No Action Alternative and Proposed Action pipeline simulations were evaluated for effects on temperature, TDS, and dissolved oxygen concentrations. Simulated mean dam release temperatures for the period 2045 to 2060 are shown in Table 5-74 by month. Generally, the Proposed Action scenario dam release temperatures are slightly colder in winter and spring months (colder by approximately 0.1°C) and slightly warmer (warmer by approximately 0.1°C) in summer and fall months compared with the No Action

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<sup>2</sup>Climate change data and information available at: [http://gdo-dcp.ucllnl.org/downscaled\\_cmip\\_projections/dcpInterface.html#Welcome](http://gdo-dcp.ucllnl.org/downscaled_cmip_projections/dcpInterface.html#Welcome)

Alternative scenario. The temperature modeling results indicate the differences between the No Action Alternative and the Proposed Action would be 0.5°C or less, which would not be measurable in the Colorado River downstream of Glen Canyon Dam.

Month	No Action	Proposed Action	Difference
January	9.48	9.43	0.05
February	8.44	8.40	0.04
March	8.40	8.39	0.01
April	8.90	8.94	0.04
May	9.74	9.88	0.14
June	10.50	10.69	0.19
July	11.16	11.40	0.24
August	11.87	12.41	0.54
September	12.16	12.46	0.30
October	12.32	12.60	0.28
November	12.04	12.22	0.18
December	11.18	11.20	0.02

Glen Canyon Dam release temperatures often peak in October and simulated results for that month (Table 5-75) show that when the reservoir is at or near full pool elevations, as predicted from 2050 to 2056, water temperatures of releases from the dam for the Proposed Action scenario would be colder than in the No Action Alternative scenario. The release temperatures from the dam in the pipeline scenarios would be colder when the reservoir is near full capacity because of the removal of warm water from the upper, warm layer of the reservoir by the pipeline. Simulated release temperatures for the Proposed Action scenario would be warmer than the No Action Alternative scenario during summer and fall months when reservoir pool elevations would be below full pool. The largest differences between the Proposed Action scenario and the No Action Alternative scenario coincide with the lowest reservoir pool elevations. On average, the modeled results for the Proposed Action compared with the No Action Alternative would be within 0.29°C for the 2045-2060 period. For individual years, differences of up to 0.65°C are predicted. Appendix A in the Final Surface Water Quality Study Report presents the Reclamation Water Quality Modeling Documentation (UDWRe 2016b).

Month	No Action	Proposed Action	Difference
Oct-41	11.67	11.89	0.22
Oct-42	11.60	11.81	0.21
Oct-43	11.59	11.92	0.33
Oct-44	11.39	11.61	0.22
Oct-45	12.74	13.17	0.43
Oct-46	10.41	10.56	0.15
Oct-47	10.75	10.91	0.16

<b>Month</b>	<b>No Action</b>	<b>Proposed Action</b>	<b>Difference</b>
Oct-48	10.36	10.43	0.07
Oct-49	10.89	11.02	0.13
Oct-50	10.24	10.37	0.13
Oct-51	9.78	9.91	0.13
Oct-52	11.19	11.31	0.12
Oct-53	13.73	13.87	0.14
Oct-54	16.93	17.58	0.65
Oct-55	15.45	15.91	0.46
Oct-56	14.34	14.45	0.11
Oct-57	13.46	13.98	0.52
Oct-58	13.40	13.76	0.36
Oct-59	13.09	13.45	0.36
Oct-60	13.39	14.03	0.64
<b>Average</b>	<b>12.32</b>	<b>12.60</b>	<b>0.29</b>

TDS results from the No Action alternative and Proposed Action models indicate that the average release TDS concentrations from 2045-2060 for the results of the three models would all be within 0.7 mg/L of each other. The Proposed Action average TDS values would be slightly higher than the No Action alternative. Appendix A in the Final Surface Water Quality Study Report presents the Reclamation Water Quality Modeling Documentation (UDWRe 2016b).

Dissolved oxygen results from the No Action alternative and Proposed Action models indicate that the average release dissolved oxygen concentrations from 2045-2060 for the two models would not vary. Appendix A in the Final Surface Water Quality Study Report presents the Reclamation Water Quality Modeling Documentation (UDWRe 2016b).

**Summary of Reclamation Water Quality Modeling Results.** Reclamation water quality modeling of Lake Powell and Glen Canyon Dam releases demonstrate that the water quality effects of the Proposed Action and LPP alternatives would not be measurable, especially within the variation of conditions resulting from Glen Canyon Dam water releases. Reclamation water quality modeling results indicate that the Proposed Action and LPP alternatives would not measurably or adversely affect water quality in the Colorado River downstream from Glen Canyon Dam. The Proposed Action and LPP alternatives would have no effect on the four listed fish species in the Colorado River and would have no effect on their critical habitat. The potential water quality effects of the Proposed Action and LPP alternatives on the listed aquatic species and their critical habitat in the Colorado River are eliminated from further analysis.

**Interbasin Transfer of LPP Water to Tributaries.** Interbasin transfer of LPP water from Lake Powell to tributaries such as the Paria River with downstream federally listed species and designated critical habitat could occur through a pipeline and could result in transfer of undesirable and invasive aquatic organisms from the upper Colorado River basin to the Paria River basin. However, no LPP water would be discharged into the Paria River or any of its tributary streams as part of regular operation. All of the LPP water conveyed through the pipeline would flow into Sand Hollow Reservoir for the specific purpose of providing municipal and industrial (M&I) raw water supply for treatment in a water treatment facility and distribution as culinary water. The LPP would be designed to avoid transfer of aquatic organisms

from Lake Powell to tributaries crossed by the pipeline. The intake water would be dosed with an EPA-approved molluscicide in the intake tunnels and passed through 25-micron filters in the intake pump station (or other approved action would be taken) to remove undesirable and invasive aquatic organisms from the diverted water. Inspection and maintenance shutdowns of the LPP during two weeks in January each year could result in temporary release of LPP water to the Paria River through a manual drain valve at the Highway 89 crossing. This temporary water release to the Paria River could occur at 5 cfs for 4.5 days during winter periods with historical river flows at the Highway 89 gage ranging from 20 to 260 cfs and would not result in measurable flow changes in the lower Paria River where razorback sucker and designated critical habitat occur. There would be no measurable effects on razorback sucker or designated critical habitat in the lower Paria River from LPP operation and maintenance resulting from potential interbasin transfer of water, and no effects from invasive aquatic species resulting from pipeline drainage release of LPP water in the Paria River.

**Paria River Effects.** The LPP would not deliver or discharge any water to the Paria River under daily operations. Inspection and maintenance shutdowns of the LPP during two weeks in January each year could result in temporary release of LPP water to the Paria River through a manual drain valve at the Highway 89 crossing. This temporary water release to the Paria River could occur at 5 cfs for 4.5 days during winter periods with historical river flows at the Highway 89 gage ranging from 20 to 260 cfs and would not result in measurable flow changes in the lower Paria River where razorback sucker and designated critical habitat occur. There would be no measurable effects on razorback sucker or designated critical habitat in the lower Paria River from LPP operation and maintenance temporary drainage water releases from the pipeline.

### *Effects Summary*

LPP construction would have no measurable effects on documented occurrence of federally listed fish species or their designated critical habitat at a minimum of 83 river miles upstream of the water intake site. LPP construction would have no measurable effects on documented occurrence of federally listed fish species or their designated critical habitat downstream of Glen Canyon Dam. LPP operation and maintenance would have no measurable effects on documented occurrence of federally listed fish species or their designated critical habitat at a minimum of 83 river miles upstream of the water intake site. LPP operation and maintenance would have no measurable effects on documented occurrence of federally listed fish species or their designated critical habitat downstream of Glen Canyon Dam. LPP operation and maintenance would have no measurable effects on razorback sucker or its designated critical habitat in the lower Paria River.

### **Virgin River Listed Species**

#### *Construction Effects*

LPP construction would have no effect Virgin River listed species including Virgin River chub (*Gila seminuda* (=robusta)) and woundfin (*Plagopterus argentissimus*) or their designated critical habitat because the construction activities would terminate at the east edge of Sand Hollow Reservoir with construction of the Sand Hollow Hydro Station. The LPP construction activities at Sand Hollow Reservoir would be more than four miles east of the Virgin River.

#### *Operations and Maintenance Effects*

Critical habitat for Virgin River chub (*Gila seminuda* (=robusta)) and woundfin (*Plagopterus argentissimus*) in the Virgin River would not be directly or indirectly affected by the LPP operation. LPP operation would supply raw water to Sand Hollow Reservoir for conveyance to and treatment in the Quail Creek Water Treatment Plant before distribution throughout the WCWCD service area. Following use in homes, businesses and institutions, the wastewater would be treated in wastewater treatment facilities and then further treated in the wastewater reclamation facility for reuse as secondary irrigation water. This

water would be stored in existing and approved reservoirs in the St. George metropolitan area and used for outdoor watering. UDWR has modeled the Virgin River using the Virgin River Daily Simulation Model (VRDSM) for future scenarios involving no LPP water and with LPP water to determine the potential for return flows to the Virgin River that could potentially affect designated critical habitat and riparian areas. The VRDSM results indicate that LPP return flows to the Virgin River would be within the measurement accuracy of the USGS gages on the Virgin River and changes in river flows would not be measurable. The VRDSM model results demonstrate no measurable changes (increases or decreases) in streamflows from the USGS gage at Virgin to the USGS gage near the Utah-Arizona state line by comparison of base case (full utilization of Virgin River water rights with current facilities) and LPP water deliveries to Sand Hollow Reservoir. Flow duration curves at key simulation nodes in the Virgin River compared between the future without the LPP and future with the LPP are statistically identical, indicating there would be no measurable difference in return flows to the river (see Section 5.3.3.2.2.2 in this chapter). The LPP operation would have no effect on Virgin River chub or woundfin and would have no effect on critical habitat for Virgin River chub and woundfin. A detailed description and analysis of the VRDSM model results is included in the final Surface Water Resources Study Report (UDWR 2016a).

### ***Effects Summary***

LPP construction would have no direct or indirect effects on federally listed fish species or their critical habitat in the Virgin River. LPP operation would have no direct effects on federally listed fish species or their critical habitat in the Virgin River. LPP operation would not have any measurable indirect effects on federally listed fish species or their critical habitat in the Virgin River.

### ***5.3.7.2.2 Sensitive Species and Species of Concern.***

#### **Paria River Fishes**

##### ***Construction Effects***

The reach of the lower Paria River which maintains perennial stream flow without interruption and contains suitable habitat for aquatic sensitive species and aquatic species of concern is located miles downstream from Highway 89 where the Proposed Action and alternative alignments would cross the river. The sensitive and aquatic species of concern known to inhabit the lower Paria River include flannelmouth sucker (*Catostomus latipinnis*), bluehead sucker (*Catostomus discobolus*) and speckled dace (*Rhinichthys osculus reliquus*). The Paria River is listed as a perennial stream by the U.S. Geological Survey (USGS), however, the USGS streamflow records for the Paria River at Highway 89 demonstrate the river has sustained periods during the summer months when there is no flow. The only potential effect of the temporary construction on the Paria River would be changes in water quality that could affect fish and habitat in downstream reaches. Construction of the pipeline crossing of the Paria River at Highway 89 would be performed during the summer period when there is no flow or low flow to avoid effects on surface water quality (turbidity and sediment transport). If the Paria River has low flows during the temporary construction of the pipeline crossing, then a temporary cofferdam would be constructed to divert the flow to another part of the 340-foot wide river bottom to avoid active construction in the flowing portion of the river. The Paria River channel bed and banks would be restored to original conditions following the temporary construction activities. Construction of transmission lines across the lower Paria River would have no effect on flannelmouth sucker, bluehead sucker or speckled dace. The transmission lines would span across the Paria River canyon from towers constructed more than 200 feet from the canyon edge. The LPP construction would have no effect on flannelmouth sucker, bluehead sucker and speckled dace or their habitat in the lower Paria River. More detailed stream flow information, data and analyses are provided in the final Surface Water Resources Study Report (UBWR 2016a). More detailed water quality information, data and analyses are provided in the final Surface Water Quality Study Report (UDWR 2016b).

### ***Operations and Maintenance Effects***

The LPP would not deliver or discharge any water to the Paria River under daily operations. Inspection and maintenance shutdowns of the LPP during two weeks in January each year could result in temporary release of LPP water to the Paria River through a manual drain valve at the Highway 89 crossing. This temporary water release to the Paria River could occur at 5 cfs for 4.5 days during winter periods with historical river flows at the Highway 89 gage ranging from 20 to 260 cfs and would not result in measurable flow changes in the lower Paria River where sensitive and aquatic species of concern including flannelmouth sucker, bluehead sucker and speckled dace occur. There would be no measurable effects on flannelmouth sucker, bluehead sucker and speckled dace or their habitat in the lower Paria River from LPP operation and maintenance temporary drainage water releases from the pipeline.

### ***Effects Summary***

LPP construction would have no measurable effect on aquatic sensitive species and aquatic species of concern or their habitat in the lower Paria River. LPP operation and maintenance would have no measurable effects on aquatic sensitive species and aquatic species of concern or their habitat in the lower Paria River.

### **Virgin River Fishes**

#### ***Construction Effects***

LPP construction would have no effect Virgin River aquatic sensitive species and aquatic species of concern including desert sucker (*Castostomus clarkia*) and Virgin spinedace (*Lepidomeda mollispinus*) or their crucial habitat because the construction activities would terminate at the east edge of Sand Hollow Reservoir with construction of the Sand Hollow Hydro Station. The LPP construction activities at Sand Hollow Reservoir would be more than four miles east of the Virgin River.

#### ***Operations and Maintenance Effects***

Crucial habitat for desert sucker (*Castostomus clarkia*) and Virgin spinedace (*Lepidomeda mollispinus*) in the Virgin River would not be directly or indirectly affected by the LPP operation. LPP operation would supply raw water to Sand Hollow Reservoir for treatment in the Quail Creek Water Treatment Plant before distribution throughout the WCWCD service area. Following use in homes, businesses and institutions, the wastewater would be treated in wastewater treatment facilities and then further treated in the wastewater reclamation facility for reuse as secondary irrigation water. This water would be stored in existing and approved reservoirs in the St. George metropolitan area and used for outdoor watering. The UDWRe has modeled the Virgin River using the Virgin River Daily Simulation Model (VRDSM) for future scenarios involving no LPP water and with LPP water to determine the potential for return flows to the Virgin River that could potentially affect designated critical habitat and riparian areas. The VRDSM results indicate that LPP return flows to the Virgin River would be within the measurement accuracy of the USGS gages on the Virgin River and changes in river flows would not be measurable. The VRDSM model results demonstrate no measurable changes (increases or decreases) in streamflows from the USGS gage at Virgin to the USGS gage near the Utah-Arizona state line by comparison of base case (full utilization of Virgin River water rights with current facilities) and LPP water deliveries to Sand Hollow Reservoir. Flow duration curves at key simulation nodes in the Virgin River compared between the future without the LPP and future with the LPP are statistically identical, indicating there would be no measurable difference in return flows to the river (see Section 5.3.3.2.2 in this chapter). The LPP operation would have no effect on crucial habitat for desert sucker and Virgin spinedace. A detailed description and analysis of the VRDSM model results is included in the final Surface Water Resources Study Report (UDWRe 2016a).



***Effects Summary***

LPP construction would have no effects on aquatic sensitive species and aquatic species of concern or their crucial habitat in the Virgin River. LPP operation would have no direct effects on aquatic sensitive species and aquatic species of concern or their crucial habitat in the Virgin River. LPP operation would not have any measurable indirect effects on aquatic sensitive species and aquatic species of concern or their crucial habitat in the Virgin River.

**5.3.7.2.3 Existing Highway Alternative.*****5.3.7.2.3.1 Threatened, Endangered and Candidate Species.***

The Existing Highway Alternative would have the same construction and operation and maintenance effects on federally listed threatened, endangered and candidate species as described for the Proposed Action in Section 5.3.7.3.2.1.

***5.3.7.2.3.2 Sensitive Species and Species of Special Concern.***

The Existing Highway Alternative would have the same construction and operation and maintenance effects on aquatic sensitive species and aquatic species of concern as described for the Proposed Action in Section 5.3.7.3.2.2.

**5.3.7.2.4 Southeast Corner Alternative.*****5.3.7.2.4.1 Threatened, Endangered and Candidate Species.***

The Southeast Corner Alternative would have the same construction and operation and maintenance effects on federally listed threatened, endangered and candidate species as described for the Proposed Action in Section 5.3.7.3.2.1.

***5.3.7.2.4.2 Sensitive Species and Species of Special Concern.***

The Southeast Corner Alternative would have the same construction and operation and maintenance effects on aquatic sensitive species and aquatic species of concern as described for the Proposed Action in Section 5.3.7.3.2.2.

**5.3.7.2.5 No Lake Powell Water Alternative.*****5.3.7.2.5.1 Threatened, Endangered and Candidate Species.***

The No Lake Powell Water Alternative construction could have direct effects on Virgin River chub (*Gila seminuda* (=robusta)) and woundfin (*Plagopterus argentissimus*) and their designated critical habitat in the Virgin River from pipeline crossings and upgrade of the Washington Fields diversion.

The No Lake Powell Water Alternative operation could have significant indirect effects on Virgin River chub and woundfin *and their designated critical habitat* in the Virgin River from reduced non-sewered return flows resulting from eliminating residential outdoor irrigation.

Virgin River chub in the Virgin River from Hurricane, Utah to the Utah-Arizona state line could be adversely affected by reduced streamflows, increased stream temperatures, and changes in food supply resulting from eliminating residential outdoor irrigation. Virgin River streamflows in the St. George metropolitan area would be reduced during the summer and fall months because of the reduced groundwater recharge from eliminating residential outdoor irrigation. Critical habitat for the Virgin River chub could be adversely affected by reduced streamflows and a diminished riparian corridor along both sides of the river. These effects could adversely affect Virgin River chub and its designated critical habitat.

Woundfin in the Virgin River from Hurricane, Utah to the Utah-Arizona state line could be adversely affected by reduced streamflows, increased stream temperatures, and changes in food supply resulting from eliminating residential outdoor irrigation. Virgin River streamflows in the St. George metropolitan area would be reduced during the summer and fall months because of the reduced groundwater recharge from eliminating residential outdoor irrigation. Critical habitat for woundfin could be adversely affected by reduced streamflows and a diminished riparian corridor along both sides of the river. These effects could adversely affect woundfin and its designated critical habitat.

**5.3.7.2.5.2 Sensitive Species and Species of Special Concern.**

The No Lake Powell Water Alternative construction could have direct effects on desert sucker (*Catostomus clarkii*) and Virgin spinedace (*Lepidomeda mollispinus*) and their crucial habitat in the Virgin River from pipeline crossings and upgrade of the Washington Fields diversion.

The No Lake Powell Water Alternative operation could have significant indirect effects on desert sucker and Virgin spinedace and their crucial habitat in the Virgin River from reduced non-sewered return flows resulting from eliminating residential outdoor irrigation.

Desert sucker in the Virgin River from Hurricane, Utah to the Utah-Arizona state line could be adversely affected by reduced streamflows, increased stream temperatures, and changes in food supply resulting from eliminating residential outdoor irrigation. Virgin River streamflows in the St. George metropolitan area would be reduced during the summer and fall months because of the reduced groundwater recharge from eliminating residential outdoor irrigation. Crucial habitat for desert sucker could be adversely affected by reduced streamflows and a diminished riparian corridor along both sides of the river. These effects could adversely affect desert sucker and its crucial habitat.

Virgin spinedace in La Verkin Creek and the Virgin River from Hurricane, Utah to the Utah-Arizona state line could be adversely affected by reduced streamflows, increased stream temperatures, and changes in food supply resulting from eliminating residential outdoor irrigation. Virgin River streamflows in the St. George metropolitan area would be reduced during the summer and fall months because of the reduced groundwater recharge from eliminating residential outdoor irrigation. Crucial habitat for Virgin spinedace could be adversely affected by reduced streamflows and a diminished riparian corridor along both sides of the river. These effects could adversely affect Virgin spinedace and its crucial habitat.

**5.3.7.2.6 No Action Alternative.**

The No Action Alternative would have no effects on the Colorado River federally listed species or their designated critical habitats. The No Action Alternative would have no effects on razorback sucker and its designated critical habitat in the lower Paria River. The No Action Alternative would have no effects on aquatic sensitive species or aquatic special status species or their habitats in the lower Paria River. The No Action Alternative would have no effects on Virgin River chub and woundfin or their designated critical habitat. The No Action Alternative would have no effects on desert sucker and Virgin spinedace or their crucial habitat in the Virgin River corridor.

**5.3.7.3 Protection, Mitigation and Enhancement Measures**

**5.3.7.3.1 Proposed Action.**

The Proposed Action construction and operation would have no measurable effect on listed aquatic species or their designated critical habitat in the Colorado River, Paria River and Virgin River. No conservation measures for protection of these species and designated critical habitat have been identified. The Proposed Action construction and operation would have no measurable effects on sensitive aquatic species or their crucial habitat. No protection, mitigation or enhancement measures have been identified.

**5.3.7.3.2 Existing Highway Alternative.**

The Existing Highway Alternative construction and operation would have no measurable effect on listed aquatic species or their designated critical habitat in the Colorado River, Paria River and Virgin River. No conservation measures for protection of these species and designated critical habitat have been identified. The Existing Highway construction and operation would have no measurable effects on sensitive aquatic species or their crucial habitat. No protection, mitigation or enhancement measures for protection of these species or their crucial habitat have been identified.

**5.3.7.3.3 Southeast Corner Alternative.**

The Southeast Corner Alternative construction and operation would have no measurable effect on listed aquatic species or their designated critical habitat in the Colorado River, Paria River and Virgin River. No conservation measures for protection of these species and designated critical habitat have been identified. The Southeast Corner construction and operation would have no measurable effects on sensitive aquatic species or their crucial habitat. No protection, mitigation or enhancement measures for protection of these species or crucial habitat have been identified.

**5.3.7.3.4 No Lake Powell Water Alternative.**

There are no conservation measures that would mitigate the potential significant, long-term, adverse indirect effects of the No Lake Powell Water Alternative on Virgin River chub and woundfin. Populations of these listed species could decrease in size and health within the Virgin River in the St. George metropolitan area. There are no mitigation measures to avoid, minimize or reduce the significant, permanent, adverse indirect effects of the No Lake Powell Water Alternative on desert sucker and Virgin spinedace. Populations of these species of concern could decrease in size and health within the Virgin River and its tributary streams in the St. George metropolitan area.

**5.3.7.3.5 No Action Alternative.**

No protection, mitigation, or enhancement measures would be implemented with the No Action Alternative.

**BLM 774**

The Final License Application (FLA) filed with FERC shows the text referenced in BLM Comment No. 774 in Section 5.3.7.2.2.3, Chapter 5, Exhibit E of the License Application.

During a meeting between the BLM and UDWRe on March 17, 2017, BLM clarified that the required 1/4 mile setback distance is intended to apply only to "perennial" streams, i.e. the Paria River and Kanab Creek. UDWRe stated that their practice for refueling operations is also to stay back at least 100' from ephemeral stream channels and washes. BLM and UDWRe agreed these practices are incorporated into the License Application.

The second bullet listed in Section 5.3.7.2.2.3, Chapter 5, Exhibit B of the License Application Effects is revised to read: **Silt fences would be installed across the stream channels within the dewatered construction areas downstream of the pipeline crossing excavation to capture sediments that may be mobilized by precipitation events during construction activities. The silt fence toe would be anchored into the stream bed with native material. The silt fence would be removed following completion of the pipeline crossing construction and native material used to anchor the silt fence toe would be returned to pre-construction conditions. The collected silt would be land applied in off-channel areas within the right-of-way, but outside the boundaries of the stream channel or direct stream channel drainage area. The land application would occur in areas approved by the**

**landowners and/or land management agencies. Sites where the land application area(s) would be located are unknown at this time.**

The fifth bullet listed in Section 5.3.7.2.2.3, Chapter 5, Exhibit B of the License Application Effects is revised to read: **Construction equipment working within the temporarily dewatered reaches of stream channels would be checked and regularly monitored for leaking hydraulic fluid, oil, grease, and fuel. Any visible leaks would result in immediate removal of the leaking equipment from the stream channel work area and containment of the leakage within a containment pad in an upland area at least 1/4 mile from perennial streams and 100' from ephemeral streams and washes to isolate potential contaminants and prevent spills on soil.**

The sixth bullet listed in Section 5.3.7.2.2.3, Chapter 5, Exhibit B of the License Application Effects is revised to read: **All construction equipment refueling would be performed on upland areas within spill containment berms or pads to prevent fuel spills from contaminating stream substrates and temporarily dewatered stream reaches. All construction equipment refueling would be performed at least 1/4 mile from perennial streams and 100 feet from ephemeral stream channels and washes.**

The seventh bullet listed in Section 5.3.6.3, Chapter 5, Exhibit B of the License Application Effects is revised to read: **Construction trenches within dewatered stream reaches would be pumped as necessary to remove subsurface water. The water would be pumped into settling ponds, and then disposed within the right-of-way away from the stream or land applied in areas approved by the landowners and/or land management agencies. Sites where the dewatering would be required and hence where the land application area(s) would be located are unknown at this time.**

The second to last sentence of Section 5.3.7.2.2.3 Chapter 5, Exhibit E of the License Application is revised as follows to show the correct citation: **More detailed stream flow information, data and analyses are provided in the final Surface Water Resources Study Report (UDWRe 2016a).** The correct citation is listed in Section 5.3.7.6. Chapter 5, Exhibit E of the License Application.

**RESOLUTION OF THE GOVERNING BODY  
OF THE KAIBAB BAND OF PAIUTE INDIANS**

**K-30-12**

**(Responds to BLM Comment No. 364)**

# Kaibab Band of Paiute Indians

## RESOLUTION OF THE GOVERNING BODY OF THE KAIBAB BAND OF PAIUTE INDIANS



**K-30-12**

### Permission for Lake Powell Pipeline Project To Cross Kaibab Indian Reservation Lands

- WHEREAS, the Kaibab Band of Paiute Indians ("Tribe") is an Indian Tribe as defined under the Indian Reorganization Act of June 18, 1934 as amended and operates and functions in accordance with the terms and conditions of the Kaibab Ordinances and Resolutions; and
- WHEREAS, the Tribal Council is the recognized governing body responsible and authorized by the constitution to exercise all of the powers possessed by the band; and
- WHEREAS, the Tribe has engaged in an extensive analysis of the proposed alignments for the proposed Lake Powell Pipeline Project, one of which would cross the Kaibab Indian Reservation following Arizona State Highway 389 and one of which would run to the south of the Reservation just outside Reservation boundaries, as those routes affect the Tribe's interests; and
- WHEREAS, the Tribe has convened various meetings of the Tribe's members to discuss the potential impacts of the proposed Lake Powell Pipeline Project on the Tribe, its lands, its interests which lie outside the boundaries of the Reservation, and its members; and
- WHEREAS, the Tribe has engaged in negotiations with the State of Utah regarding the appropriate consideration to be provided to the Tribe for permitting the proposed Lake Powell Pipeline Project to cross the Kaibab Indian Reservation, and will continue to engage in such negotiations; and
- WHEREAS, the Federal Power Act requires that appropriate compensation be provided to the Tribe for permitting the Lake Powell Pipeline Project to cross the Kaibab Indian Reservation; and
- WHEREAS, as a result of the Tribe's analysis and receipt of input from the Tribe's members, the Kaibab Paiute Tribal Council has determined to permit the proposed Lake Powell Pipeline Project to follow an alignment which crosses the Kaibab Indian Reservation following Arizona State Highway 389.

Tribal Affairs

HC 65 Box 2  
Fredonia, Arizona 86022

Phone (928) 643-7245  
Fax (928) 643-7260



NOW THEREFORE BE IT RESOLVED BY THE TRIBAL COUNCIL OF THE KAIBAB BAND OF PAIUTE INDIANS OF THE KAIBAB INDIAN RESERVATION AS FOLLOWS:

That the Tribal Council hereby gives its consent that the Lake Powell Pipeline Project may cross the Kaibab Indian Reservation following Arizona State Highway 389; and

BE IT FURTHER RESOLVED:

That the exact alignment of the Lake Powell Pipeline Project as it crosses the Kaibab Indian Reservation, and lying within the Area of Potential Effect, shall be determined in consultation and cooperation with the Tribe; and

BE IT FURTHER RESOLVED:

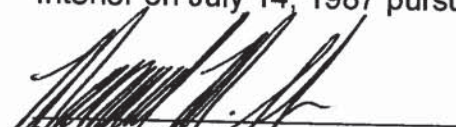
Appropriate compensation shall be provided by the State of Utah to the Tribe in exchange for the Tribe's grant of permission for the Lake Powell Pipeline Project to cross the Kaibab Indian Reservation; and


BE IT FINALLY RESOLVED:

The Chairman is hereby authorized to submit a copy of this resolution to the State of Utah and the Bureau of Indian Affairs.

#### CERTIFICATION

I hereby certify that the foregoing resolution was regularly adopted by the Kaibab Paiute Tribal Council on **May 17, 2012** at a regular meeting at which a quorum was present with **3** in **Favor**, **1** **Absent**, **1** **Abstaining**, **1** **Vacant** pursuant to the Authority vested in the Kaibab Paiute Tribal Council of Article VI, Section 1 (a) of the Tribal Constitution and By-Laws ratified by the Tribe on June 20, 1987 and approved by the Secretary of the Interior on July 14, 1987 pursuant to Section 16 of the Act of June 18, 1934.

  
Manuel Savala  
Chairman  
Kaibab Paiute Tribal Council

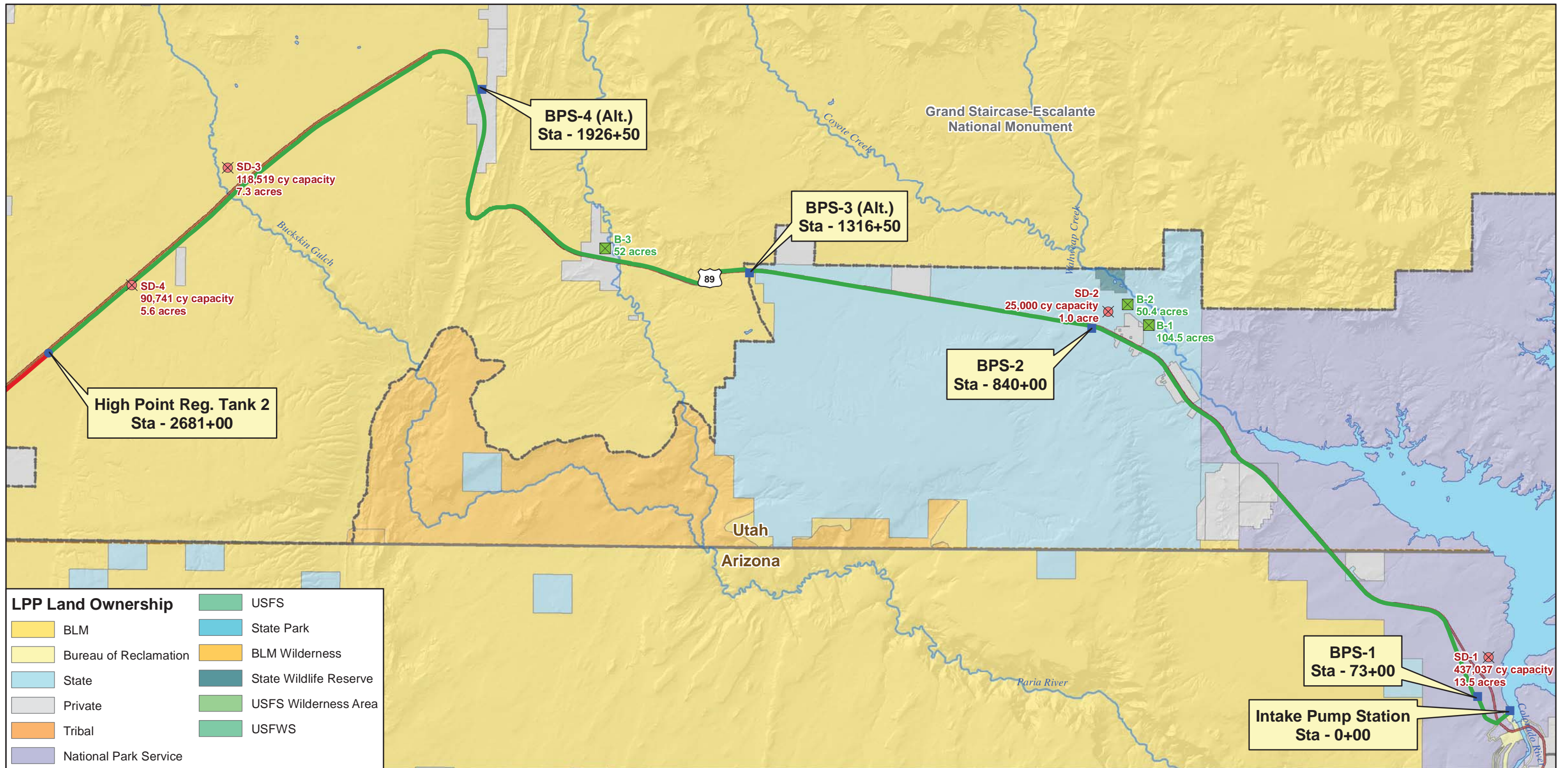
Attest:  
  
Jacqueline Spute  
Secretary  
Kaibab Paiute Tribal Council



## **FIGURES**

**(Figure 2-5 responds to BLM Comment No. 522)**  
**(Figure 2-6 responds to BLM Comment Nos. 522 and 541)**





**LPP Land Ownership**

BLM	USFS
Bureau of Reclamation	State Park
State	BLM Wilderness
Private	State Wildlife Reserve
Tribal	USFS Wilderness Area
National Park Service	USFWS

SD-# Spoil Disposal Site	Water Conveyance System	Interstate	Lakes & Reservoirs
B-# Borrow Source	Hydro System - Proposed Action	US Highway	Major Rivers & Streams
Project Pump Station	KCWCD System	ST Highway	National Park/Monument
Project Regulating Tank	Hydro System, Existing Highway Alternative	Hwy	GSENM-Boundary
Project Hydro Station	Hydro System, Southeast Corner Alternative	Major Road	State Boundaries

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

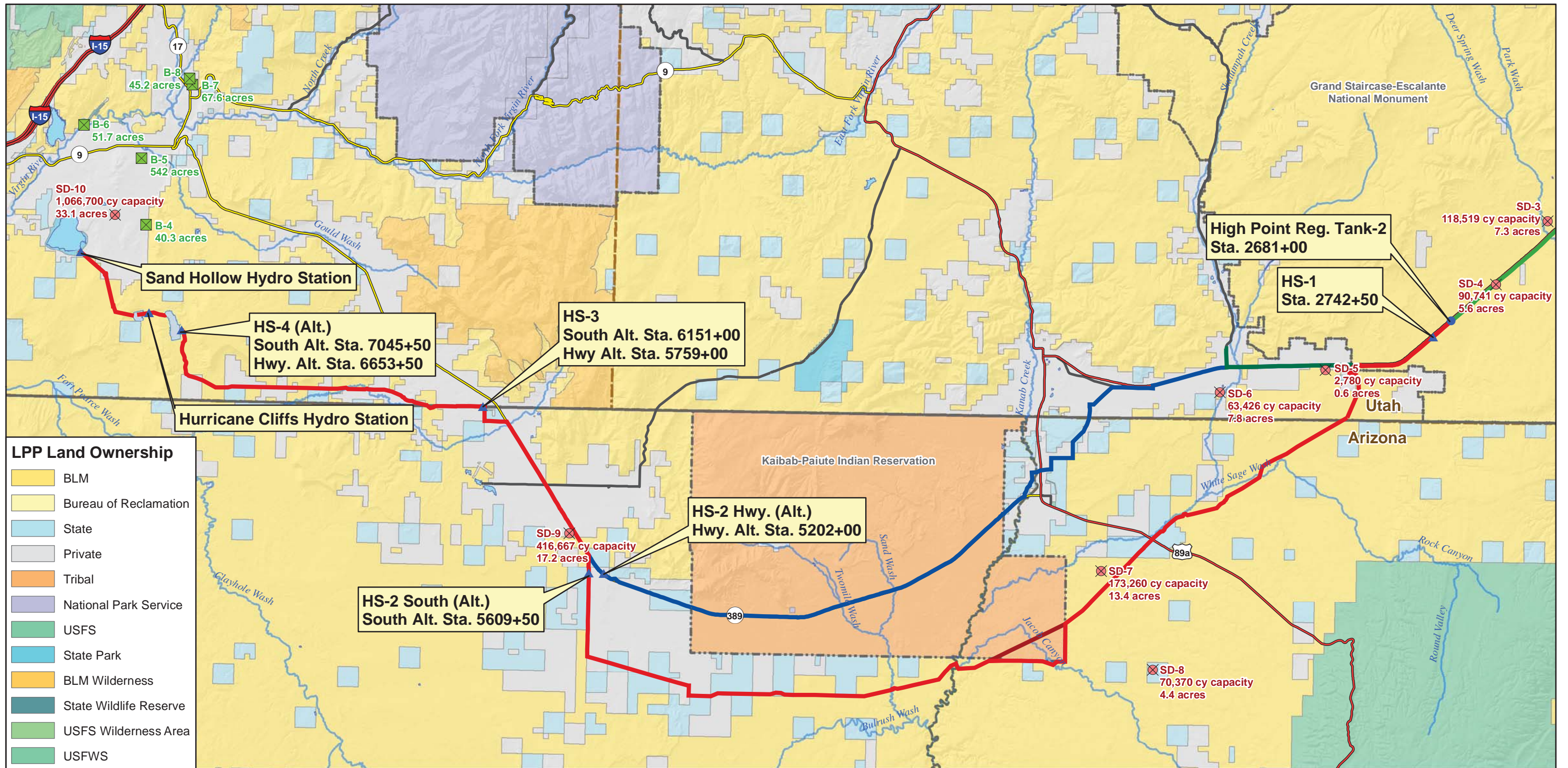


**Lake Powell Pipeline Project**  
Spatial Reference: UTM Zone 12N, NAD-83

UDWRe **Figure 2-5** MWH

**Lake Powell Pipeline  
Borrow and Spoil Locations  
Water Conveyance System**





**LPP Land Ownership**

- BLM
- Bureau of Reclamation
- State
- Private
- Tribal
- National Park Service
- USFS
- State Park
- BLM Wilderness
- State Wildlife Reserve
- USFS Wilderness Area
- USFWS

<ul style="list-style-type: none"> <li><span style="color: red; font-weight: bold;">⊗</span> SD-# Spoil Disposal Site</li> <li><span style="color: green; font-weight: bold;">⊠</span> B-# Borrow Source</li> <li><span style="color: blue; font-weight: bold;">■</span> Project Pump Station</li> <li><span style="color: blue; font-weight: bold;">●</span> Project Regulating Tank</li> <li><span style="color: blue; font-weight: bold;">▲</span> Project Hydro Station</li> </ul>	<ul style="list-style-type: none"> <li><span style="color: green; font-weight: bold;">—</span> Water Conveyance System</li> <li><span style="color: red; font-weight: bold;">—</span> Hydro System - Proposed Action</li> <li><span style="color: green; font-weight: bold;">—</span> KCWCD System</li> <li><span style="color: blue; font-weight: bold;">—</span> Hydro System, Existing Highway Alternative</li> <li><span style="color: red; font-weight: bold;">—</span> Hydro System, Southeast Corner Alternative</li> </ul>	<ul style="list-style-type: none"> <li><span style="color: red; font-weight: bold;">—</span> Interstate</li> <li><span style="color: red; font-weight: bold;">—</span> US Highway</li> <li><span style="color: yellow; font-weight: bold;">—</span> ST Highway</li> <li><span style="color: grey; font-weight: bold;">—</span> Hwy</li> <li><span style="color: grey; font-weight: bold;">—</span> Major Road</li> </ul>	<ul style="list-style-type: none"> <li><span style="border: 1px dashed black; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> National Park/Monument</li> <li><span style="border: 1px dashed black; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> GSENM Boundary</li> <li><span style="border: 1px dashed black; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> Tribal Lands</li> <li><span style="border: 1px solid black; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> State Boundaries</li> <li><span style="border: 1px dashed orange; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> County Boundaries</li> </ul>	<ul style="list-style-type: none"> <li><span style="background-color: lightblue; border: 1px solid black; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> Hurricane Cliffs Forebay/Afterbay</li> <li><span style="background-color: cyan; border: 1px solid black; display: inline-block; width: 15px; height: 10px; margin-right: 5px;"></span> Lakes &amp; Reservoirs</li> <li><span style="color: blue; font-weight: bold;">—</span> Major Rivers &amp; Streams</li> </ul>
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**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 2-6**

**Lake Powell Pipeline  
Borrow and Spoil Locations  
Hydro System**