Lake Powell Pipeline Project
FERC Request for Clarification Schedule A – Item 3

Exhibit E
Water Resources

3. In response to our comment 29 on the PLP, you state that a discussion of Kanab Creek as a likely location for shallow groundwater has been added to section 5.3.5.2.2.1 of exhibit E. Please clarify where you discuss this topic in exhibit E or provide this information.

UBWR Response:

Estimated depth to groundwater and estimated dewatering rates for Kanab Creek alignment alternative crossings of the penstock are shown in Table 2-1. The estimated depth to groundwater is based on soil survey data obtained from the Natural Resources Conservation Service (NRCS) and field reconnaissance of each alignment alternative crossing. Field reconnaissance information used to estimate the depth to groundwater included surrounding geological features visible at the ground surface, soils observed, and presence/absence of riparian vegetation within the Kanab Creek channel and associated floodplain.

The Hydro System Existing Highway Alternative alignment would cross Kanab Creek near Fredonia, Arizona approximately 1.5 miles upstream (north) of the Highway 389 bridge. Kanab Creek flows across a broad alluvial floodplain at this crossing site. Depth to groundwater at this alignment alternative crossing site is estimated at approximately 10 feet. Estimated dewatering rates for the penstock trench range from 2 to 9 gallons per minute, based on the assumptions and equation shown in the attached Table 2-1 notes.

The Proposed Action (South) alignment would cross Kanab Creek south of the Kaibab-Paiute Indian Reservation immediately upstream of the Jacob Canyon confluence with Kanab Creek. Depth to groundwater is not applicable at this crossing site because the Kanab Creek channel occurs over bedrock that exhibits no discharging aquifer. Kanab Creek canyon at this crossing site is a headcut into layers of surrounding bedrock extending downstream to the Grand Canyon. Therefore, no groundwater would be encountered during excavation for the penstock at this crossing site and negligible or no dewatering is anticipated.

Table 2-1
Estimated Depth to Groundwater and Potential Dewatering Rates at Kanab Creek Alignment Alternative Crossings

LPP System: Alignment Alternative	Crossing Location	Trench Length, x (ft)	Trench Length Rationale	Soil Type(s)[1]	Depth of Soil[1] (ft)	Depth to Groundwater[1,2] (ft)	Hydraulic Conductivity, Ksat[1] (gal/day/ft^2)	Saturated Thickness of Aquifer, H[3] (ft)	Saturated Thickness at Trench When Dewatered, h[4] (ft)	Distance from Maximum Drawdown to Zero Drawdown, L_0[5] (ft)	Estimated Dewatering Rate, Q[6] (gpm)	Comments
Hydro System: Existing Highway	Kanab Creek	50	floodplain	Glenyon silty clay loam; Jocity loamy fine sand	>6.6	10	88; 19	20	16	50	2 - 9	Range of flow for each soil type. May be negligible flow.
Hydro System: South, Southeast Corner	Kanab Creek	50	floodplain	Rock Outcrop	0	Not Applicable	Not Applicable	0	0	Not Applicable	0	Bedrock; likely negligible flow.

Notes:
1) NRCS, 2016. Web Soil Survey. http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx
2) Assumed depths to groundwater based on site conditions because in all cases groundwater is deeper than NRCS estimated maximum value of 6.6 feet.
3) Assumed based on estimated effective saturation of upper aquifer; no data available.
4) Assumed; no data available. Assumes drawdown dewaters aquifer to 2 feet below bottom of trench.
5) Assumed (conservative).
6) Driscoll, F.G. 1995. *Groundwater and Wells.* Johnson Screens, St. Paul, MN., 1089 pp. Equation 22.7: $Q = [2x(Ksat)(H^2 - h^2)]/[(2880)(L_0)]$, flow from both sides of trench.