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Technical Memorandum

Subject: **Hetch Hetchy Communication System Technical Requirements**

The Proposed Project would provide the foundation system to expand communication coverage into the Cherry Lake, Lake Eleanor, and O'Shaughnessy Dam area. This as a whole would improve communications between O'Shaughnessy Dam and the Warnerville Switchyard site, as well as the efficiency of the HHW&P staff in the future. The system upgrade would provide the foundation system that could allow for improved radio communications vital to the operation and security of HHW&P's utilities and support of FS and NPS operational activities, such as law enforcement, search and rescue, fire management, visitor and staff safety, and protection of forest and park resources. Currently HHW&P staff makes trips to many of the sites for data (i.e. dam water level measurements). The system upgrade would serve to streamline and eliminate some manual tasks and automate data transmission to staffed sites.

Timberline Engineering, Inc. prepared a planning and study report for the Hetch Hetchy Communication System Upgrade Project (2004) to evaluate system configurations that would replace the communications between Moccasin Powerhouse, Warnerville Switchyard, and Intake Switchyard. The study also looked at configurations to extend communications into the O'Shaughnessy and Cherry Lake areas where there are currently no reasonable fiber optic options. This memo is a summary of the microwave route planning conducted by Timberline to determine the sites for the Proposed Project.

The current microwave system backbone does not have sufficient capacity to provide the bandwidth required to support the needs of HHW&P (please refer to Section 1.0 for details of the Purpose and Need). The current microwave system backbone consists of Moccasin Powerhouse, Warnerville Switchyard, and Intake Switchyard through Moccasin Powerhouse Passive Reflector, a passive reflector at Warnerville Switchyard, and repeaters at Moccasin Peak, Duckwall Mountain, and Jones Point. A fiber optic cable is installed to connect Intake Switchyard with Holm Powerhouse and Kirkwood Powerhouse, and on HHW&P distribution lines between Intake Switchyard and Intake Radio Site.

Communication and connection between Moccasin Powerhouse (24/7 control point) and Intake Switchyard would require the identification of microwave repeater sites since these sites do not have a line-of-sight with one another. Operational selection criteria for microwave repeater site include a prominent location with line-of-sight to other project sites within its system, road access or foot access from a road turnout, and access to utility power. For the first hop out of Moccasin Powerhouse, the existing Moccasin Peak site was determined to

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be the only practical alternative.¹ Jones Point is the current solar-powered repeater site used for the first hop out of Intake Switchyard. Intake Radio Site is an existing utility-powered communications site (voice and SCADA radios) with fiber optic communications to Intake Switchyard, and is therefore identified as a candidate repeater site to replace the Jones Point site. For purposes of the new system, Jones Point would be replaced by Intake Radio Site, which is a site already developed with utility power, though currently not an existing microwave communication site. A new communication tower, modular communication shelter, and emergency generator would be installed in the undeveloped western portion of the Intake Radio Site. In addition, an existing transmission line connects Intake Radio Site and Intake Switchyard, allowing for the installation of fiber optic communications between these sites.

Duckwall Mountain is a solar-powered site with poor winter access and currently links Moccasin Peak and Intake Switchyard via the Jones Point site. A replacement site for Duckwall Mountain would need to have a line-of-sight to Moccasin Peak, Intake Switchyard, Cherry Tower Site, Lake Eleanor Dam Level Gauge, and O'Shaughnessy Dam Gallery. From an operational perspective, the Burnout Ridge site is proposed because it would have a line-of-sight to all of the sites noted above except for O'Shaughnessy Dam Gallery and Intake Switchyard. As mentioned above, the Intake Switchyard site can be connected to the Intake Radio Site via fiber optic communications, which in turn would connect to the Burnout Ridge site. The Burnout Ridge site has good access from Cherry Lake Road (Cherry Oil Road) and is reasonably close to an existing HHW&P electrical distribution line. Meeting the operational criteria listed above, Burnout Ridge is a suitable site to provide the communications needs for the Cherry and Eleanor areas while providing a link between Moccasin Powerhouse and Intake Switchyard. This site would replace the existing microwave radio repeaters on Duckwall Mountain and Jones Point, which have poor winter access and are served exclusively by solar power. The improved access and more reliable power would reduce risk to employees and improve reliability of the system. In addition, Burnout Ridge could be equipped with a voice radio repeater to provide improved two-way radio coverage into the Cherry Lake and Lake Eleanor areas.

Based on the selection of Burnout Ridge, a microwave repeater site is needed to communicate between Moccasin Powerhouse and O'Shaughnessy Dam. Because the O'Shaughnessy Dam Gallery does not have a line-of-sight to Burnout Ridge or any developed sites, it would be necessary to develop a new repeater site in a previously undisturbed area. It was considered desirable to select a site that would not be highly visible to the public, yet outside of designated Wilderness Area. Timberline determined that based on these criteria, a repeater site would need to be located in the vicinity of Poopenaut Pass. Poopenaut Pass is located in Yosemite National Park between the Hetch Hetchy Station Entrance near Camp Mather and O'Shaughnessy Dam. Poopenaut Pass would have a line-of-sight to O'Shaughnessy Dam Gallery to the northeast, and to Burnout Ridge to the northwest. The Poopenaut Pass site is located near a HHW&P electrical distribution line and an existing access road that is maintained year-round. The site would be located in an area within Yosemite National Park that would provide improved communications for the NPS and HHW&P. The Poopenaut Pass

¹ The connection between two microwave sites is called a "link" or a "hop".

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site would repeat the microwave signal from Burnout Ridge to the O'Shaughnessy area and provide the NPS and HHW&P with a voice radio repeater site for their needs.

The new sites would provide the foundation system to expand communication coverage into the Cherry Lake, Lake Eleanor, and O'Shaughnessy Dam area. The Proposed Project provides the bandwidth to allow for future installation of voice and radio systems to areas currently not served. The Proposed Project's foundation system would provide the following:

- Allow future connection of Moccasin Powerhouse to Warnerville Switchyard and Moccasin Peak.
- Allow Moccasin Powerhouse to connect to Intake Switchyard. Intake Switchyard is connected to Kirkwood Powerhouse and Holm Powerhouse via fiber optics. The Burnout Ridge site would serve to connect Moccasin Powerhouse to the new sites subsystem (described next).
- The new sites subsystem would use Burnout Ridge as a junction to connect Cherry Lake, Lake Eleanor, and O'Shaughnessy Dam to Moccasin Powerhouse.