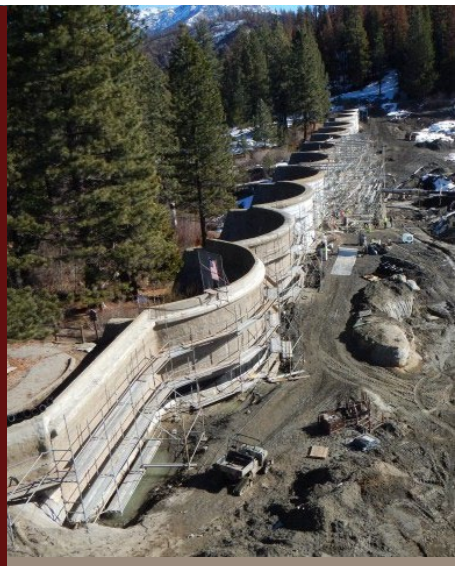


"The success of the Hume Lake Dam Rehabilitation project is not the result of any one person's efforts but the efforts of many folks with diverse skill sets aligning to overcome significant obstacles that manifested during the project. It is a testament to the power of working together."

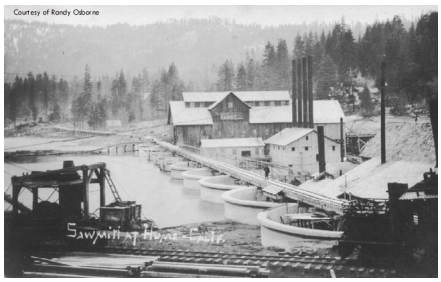
—TYRONE KELLEY
Director of Engineering, Pacific Southwest Region, U.S. Forest Service

Photos: Above, rehabilitation effort (photo courtesy MCS Construction); Hume-Bennett Lumber Company sawmill at Hume Lke Dam (photo courtesy USFS Randy Osborne); completed repairs prior to refilling lake (photo courtesy USFS)

106 SUCCESS STORY

Innovative Repairs, Engineering Result in Rehabilitation of Historic Dam

Hume Lake, Sequoia National Forest, California



THE STORY

Constructed in 1908, Hume Lake Dam created a log pond and water reservoir for the Hume-Bennett Lumber Company. Designed and built by John Eastwood, a renown American dam engineer, the structure would become the world's first reinforced concrete multiple arch dam. Costing a substantial $45,000, the dam's innovative design was actually less expensive than the more conventional rock fill dams of the time, which would have cost twice as much. Completed in only 114 days, the multiple-arch construction provided the necessary stability while utilizing far less concrete and materials than other dams at the time.

The dam and lake supported logging activities for the lumber industry for more than a decade. However, decreased profits and a devastating fire led to the cessation of logging operations around Hume Lake by the early 1920s. In 1935, the United States Forest Service (USFS) purchased the lumber company's complex and holdings, including the dam and forest surrounding Hume Lake, for incorporation into Sequoia National Forest.

Today, the lake and dam provide water to the National Forest and nearby residents along with numerous recreational opportunities serving as an economic driver for the camps along its shoreline. In 2014, USFS determined that the Hume Lake Dam was eligible for listing in the National Register of Historic Places. Additionally, the National Forest initiated the process for listing the dam as a National Historic Landmark (NHL) for its association with the history of hydraulic engineering and importance in the evolution of reinforced concrete technology. If successful, the dam would become one of the few NHLs in the National Forest System.

THE PROJECT

In 2015, inspections revealed significant foundation seepage and corrosion within western portions of the dam thought to be caused by the ongoing drought conditions affecting lake levels. Concerned about the long-term viability of the dam, USFS proposed a $3 million upgrade to the dam structure to reduce seepage through and under the dam. The proposed repairs included the installation of a waterproof membrane on the

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Photos: Left, HAER photo of lake and dam 1982; Right, installation of new membrane line to prevent seepage (photo courtesy USFS)

dam surface, grouting of damaged joints, placement of fill along the upstream foundation, and an intensive structural survey to identify other future deficiencies and projects.

THE 106 PROCESS

USFS, the federal agency carrying out this project, was responsible for conducting the Section 106 process under the National Historic Preservation Act. Section 106 requires that federal agencies identify historic properties and assess the effects of the projects they carry out, fund, or permit on those properties. Federal agencies also are required to consult with parties that have an interest in the outcome of the property when adverse effects are likely to ensue.

Consulting Parties:

Sequoia National Forest

California State Historic Preservation Officer

Recognizing the dam is a historic property, the USFS Heritage Program staff worked closely with their Engineering Division to ensure consultation occurred early with the California State Historic Preservation Officer (SHPO). Through these early discussions, the importance of retaining and preserving the historic fabric of the dam was made a key component of the project design, allowing the necessary repairs such as the installation of the new liner to be done in a reversible manner without damaging the structure or creating new visual effects. USFS in consultation with the SHPO was able to achieve an engineering solution meeting the Secretary of the Interior's Standards resulting in no adverse effects to the historic elements and, ultimately, the preservation of the first multi-arched reinforced concrete dam.

THE SUCCESS

Repairs on Hume Lake Dam commenced in 2015 with completion in mid-2016. With the seepage now under control, the dam's operational life has been extended for years to come preserving this historic structure and the lake it retains. The rehabilitation of Hume Lake Dam exemplifies the benefit of early consultation and collaboration between consulting parties and those responsible for designing and implementing an undertaking at the federal agency level. Coordination between the Sequoia National Forest Heritage staff and their engineers during consultation with the SHPO ensured the importance of retaining and preserving the historic fabric of the dam was a priority that was factored into the repairs. The repairs if not addressed, might have required the dam to be demolished, including complete draining of the lake. Instead, the work resulted in preserving a significant structure and sustaining a popular recreational economic resource for future generations to enjoy.

For more about Section 106 and the ACHP go to **www.achp.gov**

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