Using Hi-Tech Visualization Tools to Improve Understanding of the New Bullards Bar Dam, Yuba County, CA

Frederic Snider, PG, Schnabel Engineering

Tim Truong, PE, PMP, Yuba County Water Agency

The 50-year old New Bullards Bar Dam is a variable-radius, double curvature concrete arch dam on the North Yuba River in northern California. At 645 feet high, it is the second tallest arch dam in the US. Following a finite element analysis of the dam to assess seismic stability, concerns were raised that the foundation conditions were not fully understood and the potential for sliding failure could not be thoroughly evaluated. In response, the Agency embarked on an ambitious program of collecting all available pre-construction and construction data regarding foundation investigations, preparation and treatment. A tremendous quantity of information was collected, scanned and digitized, creating a large and unwieldy data set that was difficult to display, interpret and communicate both internally and to outside stakeholders. Two approaches were completed in parallel. A detailed, electronic 3D Model of the dam and foundation was developed to allow visualization of the extent and nature of site investigations and foundation preparation, and a â€˜virtual tour' of the dam was created using 360-degree video cameras within the extensive internal galleries and exploration tunnels in the dam and abutments. The 3D Model was provided to the Agency as a 3D PDF file, and includes integrated links to the original boring logs, tunnel maps, and instrumentation data. The 3D Model provides an effective visualization tool and provides a point-and-click 3D portal to the original investigative data files and current instrumentation data. The Virtual Tour provided photographic evidence of the current state of the dam and its galleries. The internal galleries and adits can be traveled through similar to "Google Maps Street Viewâ€, or users can jump directly to a certain location via prepositioned hot spots. This feature helps answer questions without the need for additional site inspections. The images also provides a baseline condition for comparison with future updates. The interactive Virtual Tour videos and the 3D Model were used during the recent Part 12D inspection of the dam and Potential Failure Mode Analysis (PFMA) workshop. All of the participants agreed that these visualization tools were extremely useful in communicating key issues, rapidly answering questions as they arose, and improved the quality of both the inspection and PFMA workshop outcomes. PFMA workshop leaders also expressed pleasure in that the 3D Model combined with the Virtual Tour made the entire PFMA process more efficient, faster, less stressful on all the participants, and allowed focused and higher quality results.