Nothing Boring about Boring and Jacking

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Boring and jacking of new principal spillway conduits during rehabilitation of NRCS-Assisted Flood Control Dams has been the preferred alternative in Oklahoma for the past 10 years. This operation involves the use of a machine to bore through the embankment while installing a steel carrier pipe. The reinforced concrete principal spillway pipe is then pushed through the carrier pipe. The first use of boring and jacking in Oklahoma was in 2009 on Sallisaw Creek Site 16. Boring and jacking was the chosen alternative for the principal spillway replacement due to the concerns that an open cut would subject the downstream community to potential flooding and damages during construction. This paper will include a brief history and summary of NRCS rehabilitation in Oklahoma. Since 2009, NRCS has evaluated and will discuss the advantages and disadvantages of the boring and jacking technique of principal spillway placement. To date, all boring and jacking installations have been through exclusively earthfill material as would be expected in an existing dam. All except for one dam, Cottonwood Creek Site 54. This structure is a high hazard earthen embankment dam originally constructed in 1973 as a significant hazard dam. The dam is 50 feet high and 1335 feet long. Major development has occurred around the reservoir pool area, which limited rehabilitation alternatives. The dam was approved for rehabilitation in 2008; however, litigation ensued over land rights and construction was delayed until 2019. Boring and jacking was the selected alternative for principal spillway replacement due to potential downstream impacts. Those same concerns had to be addressed in the redesign. The main topic of discussion for this paper is regarding conditions encountered during rehabilitation of this site. Just 40 feet into the boring operation, the auger hit rock raising a number of questions: How much rock are we dealing with? Can we change boring operation for rock removal? Can we alter our elevations? Can we find a new bore location? Can we use conventional excavation? Who’s paying for all the extra work? Several innovative techniques (including electrical resistivity imaging) were used and explored, all of which factored into the final design for completing the rehabilitation of this dam. We will discuss the rehab design, the unexpected encounter with bedrock, finding a solution to complete the project, the redesign, and lessons learned.