



New spillway provides much-needed water to ranchers and farmers

Lovelock, Nevada

Rodgers Dam - North Spillway

Lovelock, Nevada – Rodgers Dam Spillway is located near the end of the 300-mile long Humboldt River, which runs through northern Nevada, and also is the longest river in the United States that does not ultimately reach the ocean. Rodgers Dam is one of the last structures on the river before it empties into the Humboldt Sink. In 2006, due to an unusually wet spring, the river sustained a continuous high rate of flow for three full months and on July 17, the 55-year-old dam failed. All of the water pressure caused the sub grade soil under the structure to give way and the concrete portion of the dam was completely under cut. The water rushed under the dam and through a gap that was five feet high and 80' wide. Luckily, no one was injured and no property damage was reported.

Since Rodgers Dam is a critical link in a system that delivers water via the Union-Rogers Canal to the farmers and ranchers in the lower valley, it needed to be replaced quickly. Without water, the farmers and ranchers would possibly suffer hardship and any losses they sustained could, in turn, significantly impact the local economy.

Within just a few days after the failure, both the Army Corps of Engineers and the State of Nevada approved replacing the failed structure and a permit was issued allowing two years to replace the facilities. In the mean time, the Pershing County Water Conservation District (PCWCD) constructed a temporary cofferdam upstream of the failed Rodgers Dam and flow was reestablished to the canal in less than two weeks. The Engineer and authorities were concerned that the 30' tall and nearly 350' long cofferdam may not withstand a flow increase from the coming spring run off so the construction of a bypass spillway was approved.

"If significant flows would come down the river, there was no place for the water to go," stated Walter Slack, PE for Dyer Engineering Consultants, Inc. (DEC). "It would have over-topped and washed out the cofferdam. The north bypass spillway was built to handle the flows in the interim and protect the cofferdam." The spillway



original spillway



installation of ArmorFlex



installation of A-Jacks

consists of a trapezoidal channel that has a top width of 72 feet, a bottom width of 40 feet, a depth of 10 feet, and a length of approximately 400 feet.

The North spillway is a gravel and clay structure with a gravel fuse plug over the top that serves as a road. Two 54" diameter steel pipes and one 6' diameter arch pipe pass through it. Removable planks installed over the pipe ends control the water flow out of the reservoir to the agricultural land below.

In addition, further safe guards were designed into the spillway project.

"If a big storm were to come through, the top of the gravel fuse plug was set low enough that the water, instead of going over the temporary cofferdam, would flow over the top of the north spillway road," stated Slack. "By design, the water would wash away the gravel fuse plug and pipes with the spillway handling the flow."

Initially the DEC considered gabion baskets to line the North spillway, but the gabions would be labor intensive. As an alternative, DEC also presented a concrete lined trapezoidal channel solution but the concern was that the soft sub grade soils would settle, move and erode significantly causing an inflexible structure to break up. At a December meeting, the PCWCD Board decided to seek another solution.

CONTECH presented the [ArmorFlex](#) Class 70T, articulating mat option for the spillway. Using a hydraulic engineering center-river analysis system (HEC-RAS) model of the channel provided by DEC, CONTECH value engineered a solution that could withstand the 3000 cubic feet per second (cfs) discharge and handle sub grade settlement without compromising the structure.

A 50' wide concrete structure at the top of the spillway transitions down to a trapezoidal channel 72' wide at the top with a 40' wide bed. It takes water from the upper part of the reservoir and lets it go down 350' to the bottom of the riverbed. Based on the model, the water velocity coming down the spillway is in the 20 ft per second (fps) range which determined the use of 70-T ArmorFlex tapered series. The 24,000 ArmorFlex blocks are installed bank to bank over a geotextile suited for the very fine soil conditions. The 8' wide and 26' long ArmorFlex mats were lifted into place by a crane and set on a prepared sub grade.

The water transitions from the spillway slope onto a flatter surface where the original plans called for a large concrete stilling basin to knock the energy out of the water. However, site accessibility and logistics were so challenging that DEC sought a different solution.

CONTECH recommended installing 24" [A-Jacks](#) the width of the spillway. The flow comes down the slope over the articulated ArmorFlex Class 70T. The water transitions to the flatter surface where it runs into a 38' long field of A-Jacks forcing a hydraulic



installation of A-Jacks continues



ArmorFlex installation complete



A-Jacks installation complete



spillway complete

jump that brings the water down to a sub critical flow. The water velocity coming into the field of A-Jacks is 20 fps and CONTECH achieved 3 fps on the outlet. The target outlet velocity was 4 to 5 fps.

At the bottom of the spilling basin, sheet piles were driven in to limit erosion and head cutting coming back upstream.

This project moved forward at a very fast pace due to the impending spring run off. When it was determined at the December 15 PCWCD Board meeting that gabions were out of the question, DEC and CONTECH went to work on a revised plans for the north spillway.

"By January 15 we had a revised set of plans ready to go and construction was underway. The entire structure was built by March 9," commented Slack. "We worked well with CONTECH and the Water District is very happy with the results and the speed of completion."

The new Rodgers Dam, a concrete structure with modern radial and slide gates, is now built and the temporary cofferdam was removed. The north bypass is a permanent structure that will likely remain in place.

Owner

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Engineer

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Spillway Contractor

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hydraulic jump