Seepage System Key Component of Northern California Dam Reconstruction

By Steve Cooper, SCA Communications

The rebuilding of the dam here proved to be successful when in February 2017 unprecedented storm water runoff and snow melt flowed into Bass Lake, nearly prompting an emergency evacuation of the area.

The Crane Valley Dam is located about 40 miles northeast of Fresno in Madera County, California on the North Fork of Willow Creek, a tributary of the San Joaquin River. The dam was built between 1902 and 1911 when little was known about the region's seismic activity. The dam is a 145-foot high, hydraulic earth and rock fill embankment, with a thin central concrete core wall. The dam is 1,880 feet long, and its crest is at 3,380 feet elevation.

Crane Valley Dam consists of two distinct dams separated by a rock knoll. The Main Dam is located in the main channel of the creek, and has earth fill on the upstream side of the core wall and rock fill on the downstream side. The West Dam is located adjacent to the main dam in a smaller side channel west of the creek, and has earth fill on both sides of the core wall. The spillway is located on a saddle about 500 feet to the east of the dam.

In addition to the spillway, a network of underground pipe was also buried to help control any seepage from the lake. High-density polyethylene (HDPE) pipe was used to create an underground drainage system that helps to prevent erosion of the earthen dam from seeping water. More than 4,200 feet of the pipe from Advanced Drainage Systems, Inc. (ADS) (WMS: NYSE) was used on the dry side of the dams to pull groundwater away from the bottom of the structures.

Owned by PG&E - Pacific Gas and Electric - , the retrofit design to modify the Crane Valley Dam was done to increase the stability of the dam structures to meet state and federal safety guidelines. Analysis showed that in the event of an earthquake, the dam could slump and allow water to flow over the top, causing flooding downstream. The dam modification would consist of the addition of approximately 253,000 cubic yards of rock fill to selected areas on the upstream and downstream faces of the dam.

The seismic retrofit project included installation of rockfill buttresses on the sections of the dam with hydraulic fill on the upstream and downstream sides of the concrete core wall. The downstream shell consists of a massive rockfill embankment and with the crest raised to elevation 3387, about seven feet above present minimum crest elevation in order to provide more freeboard. Kiewit Infrastructure West Co., (Fairfield. CA) was the contractor.

ADS N-12® soil tight perforated and watertight corrugated HDPE pipe was used to create the toe drain and to provide drainage under other areas of the dam.

Nearly 1,600 feet of perforated 12-inch diameter corrugated HDPE pipe was installed to allow water to infiltrate the pipe system.

To convey the water, 2,500 feet of 8-inch diameter, several hundred feet of 24-inch and 18-inch diameter watertight pipe was used.

ADS N-12® soil tight perforated and watertight corrugated HDPE pipe was used to create the toe drain and to provide drainage under other areas of the dam. This included 2,500 feet of 8-inch diameter, several hundred feet of 24-inch and 18-inch diameter watertight pipe to convey the water and 1,600 feet of perforated 12-inch diameter corrugated HDPE pipe that would allow water to infiltrate the pipe system. The pipe was selected due to its long life and ease of installation because of the dam's rugged terrain that included large slopes.

With a corrugated exterior and smooth interior, ADS N-12 watertight HDPE pipe provides both strength and optimum hydraulic capacity. Because it has an integral bell and spigot plus factory installed gasket, the pipe requires no extra couplers, grout or other sealants. ADS N-12 WT IB pipe meets ASTM watertight standards.

Because it is lightweight, ADS corrugated pipe can be easily handled with minimal equipment by a one or two-person crew, providing a favorable alternative to concrete pipe. And with a long 'stick' length, the number of joints are reduced, which also saves labor and installation time.

Named for its excellent Manning's "n" rating of 0.012, the N-12 pipe was designed in 1987 by ADS specifically for culverts, storm sewers, highways, airports and other civil design construction. The pipe's strength is due to its design, HDPE resin, and manufacturing process according to ADS. The structural integrity of corrugated HDPE pipe can be validated using the design procedures outlined in the AASHTO Load Resistance Factor Design (LRFD) Bridge Design Specifications. AASHTO LRFD Section 12 is a strain-based design procedure suitable for thermoplastic pipes such as HDPE, polypropylene, and PVC. The AASHTO LRFD code considers the actual failure modes of thermoplastic pipe such as thrust, wall buckling, as well as combined strain to ensure a viable design. Deflection is considered as a service limit and serves as confirmation of the design and ensures suitable long-term performance. ADS pipe is available in diameters from four to 60 inches.

This federally supervised project with a major energy company for a seismic retrofit project corrected build

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High-density polyethylene (HDPE) pipe was used to create an underground drainage system that helps to prevent erosion of the earthen dam from seeping water. More than 4,200 feet of the pipe from ADS was used on the dry side of the two dams to pull groundwater away from the bottom of the structures.

A network of underground pipe was buried to create a toe drain that would help control any seepage from the lake.

deficiencies from the early 1900's, and provided protection for the area and residents during a near cataclysmic flooding event.

Additional information can be found at www.ads-pipe.com.

About Advanced Drainage Systems, Inc.:

Advanced Drainage Systems (ADS) is the leading manufacturer of high performance thermoplastic corrugated pipe, providing a comprehensive suite of water management products and superior drainage solutions for use in the construction and infrastructure marketplace. Its innovative products are used across a broad range of end markets and applications, including non-residential, residential, agriculture and infrastructure applications. The Company has established a leading position in many of these end markets by leveraging its national sales and distribution platform, its overall product breadth and scale and its manufacturing excellence. Founded in 1966, the Company operates a global network of approximately 60 manufacturing plants and over 30 distribution centers. To learn more about the ADS, please visit the Company's website at www.ads-pipe.com. Cc

The dam modification used an additional 253,000 cubic yards of rock fill to selected areas on the upstream and downstream faces of the dam.

ADS N-12 HDPE pipe provides both strength and optimum hydraulic capacity.

The seismic retrofit project included rockfill buttresses hydraulic fill on the upstream and downstream sides of the concrete core wall.