TOWN OF ARLINGTON

MASSACHUSETTS

Arlington Reservoir DAM REHABILITATION PROJECT 2006

RECIPIENT

APWA 2006 PUBLIC WORKS PROJECT OF THE YEAR

RECIPIENT

ACEC/MA 2006 ENGINEERING EXCELLENCE AWARD

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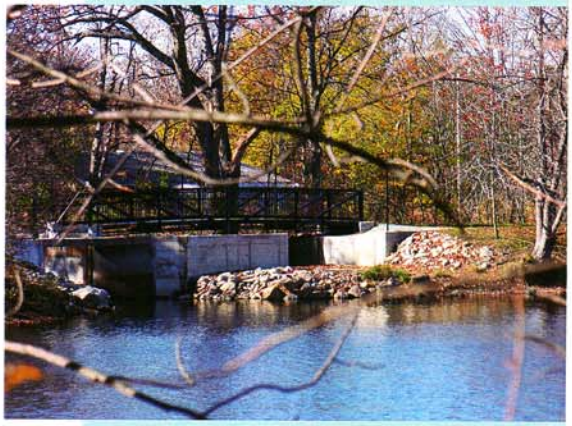
Arlington Reservoir Dam Project

Winner: Public Works Project of The Year for 2006, American Public Works Association
Winner: Engineering Excellence Award 2006, American Council of Engineering Companies of MA

Project Background

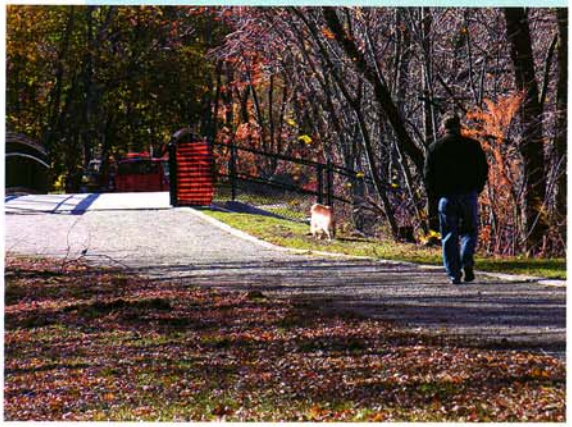
In the mid 1990s, the aging mechanical crest gate in the Primary Spillway of the Arlington Reservoir Dam failed, causing flooding in the downstream residential area of Colonial Village. Following a subsequent dam safety inspection, the Commonwealth of Massachusetts ordered the Town of Arlington to repair its aging dam. The Town of Arlington turned to Weston & Sampson to find a safe, economical solution for rehabilitating the structure, all under the watchful eye of residents who were adamant that the forested landscape and habitat of this popular recreational site in this residential neighborhood remain unchanged. Weston & Sampson's challenge was to reconcile the project's competing goals.

The Arlington Reservoir (Res) Dam consists of approximately 1,600 feet of 12-feet high earth embankments extending from two centrally located spillways. The dam was constructed in the 1870s to create a drinking water supply reservoir for the Town of Arlington, Massachusetts. The reservoir has not served as a water supply for over a century, but is a significant recreational feature within an active suburban neighborhood. As with many dams built during the industrial revolution, the embankments were overgrown with trees and other vegetation and there were areas where seepage through the embankments was evident. In addition, the hydraulic capacity of the dam was significantly undersized by current standards.



Weston & Sampson's original design included tree removal from the earthen embankment in accordance with traditional dam safety guidelines. However, the design encountered significant opposition from residents who use the dam for passive and active recreation, including walking, jogging, and bird watching. Removing all the trees that line the berm was completely unacceptable to the residents of Arlington. This opposition, forced the project's postponement for a few years.

In 2002, the project was revived as the town realized its obligation to rebuild the dam. Weston & Sampson had the unique opportunity to implement a dam rehabilitation engineering solution that had only been used once before in the United States. With the project at an impasse because of resident opposition to tree removal, Weston & Sampson identified a "win-win" solution based on a precedent set by a U.S. Army Corps of Engineers project in the Midwest. Using this innovative technology, Weston & Sampson designed a vertical interlocking steel sheetpile wall capped with a reinforced concrete beam (I-Wall) for installation along the length of the dam, including below the existing and new spillways. The I-Wall permitted the majority of trees to remain while protecting against dam breaching and uncontrolled seepage through the embankments.



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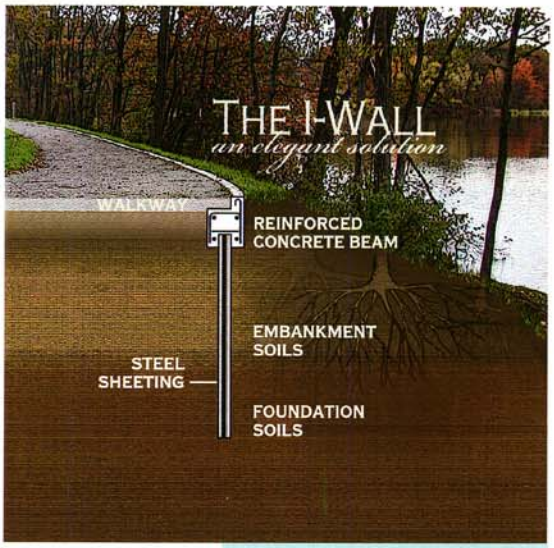
Innovative Approach

The Res Dam rehabilitation is the first dam repair project completed in the eastern half of the United States (U.S.) to use the I-Wall approach. The only other U.S. project to use this technique was implemented by the Army Corps of Engineers on the Pine River Dam at the headwaters of the Mississippi River in Minnesota.

Similar to the Res Dam project, there was strong opposition to tree removal on the Pine River Dam. The position of most dam safety regulatory agencies is that trees should not be allowed to grow on earthen dams for a variety of reasons. Given this regulatory position, approval of this project required extensive discussion and collaboration with the Massachusetts Office of Dam Safety to educate them on the I-Wall's functions relative to dam safety and to assure them that this technique was constructible at the Res Dam site.



Environmental Considerations

The Res Dam Rehabilitation project offers the engineering community a new alternative to dam repair that can sustain a forested landscape while avoiding the time and expense of environmental permitting. Implementing the I-Wall solution also avoided the environmental and aesthetic impacts associated with removing trees, some as large as 24 inches in diameter, both upstream and downstream of the 1,600-feet long embankment.

Without the use of the innovative I-wall approach, thousands of trees would have been destroyed, leaving a barren embankment with rock covered slopes extending almost the entire length of the reservoir – all in the middle of an active urban residential neighborhood. Weston & Sampson's alternative solution displaced only 150 trees of more than five inches in diameter. **"Nobody could imagine losing all of these trees,"** said Leslie Mayer, co-chairman of Vision 2020's Reservoir Committee. **"From a recreational aspect and a habitat aspect, it really would have destroyed it."**

The project also maintained the wildlife habitat, including its resident turtle, within this urban neighborhood. According to Reservoir Committee member Elizabeth Karpati, more than 130 species of birds frequent the reservoir, including great blue heron and sandpipers that nest in the mudflats. She said they would have become sparser with disruptions to the surrounding vegetation. The Arlington 2020 web site described the project's progress as **"a major accomplishment for a technique that hasn't been employed in this area of the country. And the good news on the environmental impact — there are trees and wildlife everywhere!! ... The Reservoir will continue to be an Arlington gem for many years!"**

Aside from gaining widespread public acceptance, this innovative approach, which spares the time and cost of extensive environmental permitting while maintaining natural landscapes, will be especially important for Areas of Critical Environmental Concern (ACEC).

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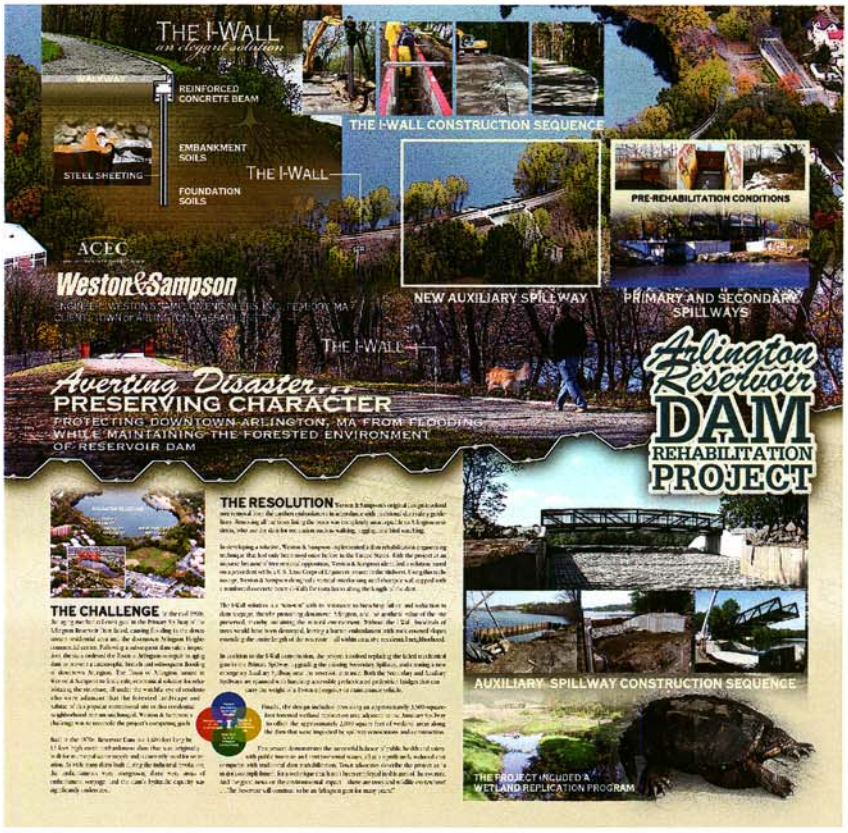
Additional Benefits

While the Res Dam redesign was not intended necessarily as a flood control project, operation of the Primary Spillway has always played a role in flood mitigation in downtown Arlington. The spillway gate is opened in advance of storms to increase storage capacity then closed to contain water in the reservoir until flooding from other sources has subsided. At that point, the gate is incrementally opened to release the contained water in a controlled manner. In the mid 1990s, the old gate failed and the reservoir water was released all at once flooding the downstream area and causing substantial damage. The operation of the reservoir for flood control was severely impacted. The new and improved gate is stainless steel and has an updated operating mechanism making gate operation for flood control and reservoir level management much simpler and effective.

Perhaps best of all, and somewhat unexpected, was a substantial cost savings in construction cost. Because construction activities in wetland resource areas were limited to work around the spillways, the wetland impacts of the project were dramatically reduced resulting in significant cost and time savings with regard to environmental permitting. Significant savings were also realized by not excavating hundreds of trees and roots, reshaping the embankment slopes, and installing riprap protection. The original 2001 estimated construction cost was $2.2 million for the traditional dam repair option. The actual 2005 cost was $1.6 million, saving the town $600,000.

This project demonstrates the successful balance of public health and safety with public interests and environmental issues. Weston & Sampson's solution is a "win-win" with its resistance to breaching failure, significant reduction in dam seepage, thereby protecting Arlington, and the aesthetic and recreational value of the site preserved, thereby sustaining the natural environment.

John Sanchez, Arlington's Director of Public Works, praised Weston & Sampson for developing an innovative solution that protected Arlington from devastating flooding while saving the trees and sustaining the natural environment. **"This was a great compromise,"** he said in a recent article published in the Lexington Minuteman.



Awards

The Arlington Reservoir dam project was recently selected as one of the American Public Works Association's **Public Works Projects of the Year for 2006**. This national award will be presented in September at the 2006 International Public Works Congress and Exposition in Kansas City, Missouri. In addition, the project was selected by the American Consulting Engineers Council of Massachusetts (ACEC/MA) to receive a **2006 Engineering Excellence Award**. These prestigious awards honor projects that achieve professional design excellence and innovation.

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