Silt Curtain Protects Historic Blue Hole

Above: Silt curtains installed parallel between the Historic Blue Hole and the scour hole. Inset: Sections of silt curtain being joined together. Images courtesy of Granite Environmental, Inc.

In 2011, historic flooding occurred along the Mississippi River, including portions of Mississippi County, Missouri. Following procedures to alleviate pressure caused by high water levels, predetermined sections of the river's levee were detonated to allow water to flow into an adjacent floodway, known as the Birds Point New Madrid Floodway. The levee was detonated in three artificial crevasses referred to as the upper, center and lower crevasses.

Project to Repair the Levee

Once the floods had receded, the U.S. Army Corps of Engineers was sent in to relieve floodwater impact and restore the portions of the levee that had been detonated. The scope of the project was to repair the upper, center, and lower crevasses by filling scour holes, leveling ground and restoring detonated portions of the levee.

Repairing the Scour Hole & Levee at the Center Crevasse Location

While scouring and erosion occurred in many different areas, environmental concerns were raised at the center crevasse location. Here, a scour hole formed covering approximately 11.5 acres with depths up to 50 feet. The scour hole was so large that it connected to a pre-existing habitat known as the Historic Blue Hole. Home to many aquatic plants and vegetation, the Historic Blue Hole had become a protected and preserved area.

In order to repair the levee, plans were in place in fill the scour hole with sand and sediment from displaced farmlands and sand dredged from the bottom of the river. However, because the two holes were connected, measures had to be taken to ensure that displaced materials did not flow from the scour hole to the Historic Blue Hole.

To protect the area, a proposal was set in place to separate the two holes. In efforts to reduce installation time and costs to the taxpayer, a BMP known as the floating silt curtain was recommended to act as a temporary barrier between the two holes.

Location prior to installation of the turbidity curtain.

Silt Curtains

The silt curtain is an impermeable barrier made of a high-strength PVC fabric that floats along the surface of the water to contain silt and displaced materials above and below the water level. Built into the top of the fabric is a marine grade flotation device. This float allows the barrier to sit above water level to contain any materials floating on the surface of the water.

The silt curtain is available in three different models known as the Type 1, Type 2 and Type 3 curtain. The Type 1 is designed for calm water areas while the Type 2 and Type 3 are used in areas with any kind of current, water movement, waves or tidal action. Choosing the right model is based on specific site and water conditions. For

Silt curtain being deployed. Image courtesy of Granite Environmental, Inc.

separation of the scour hole, several factors were considered including movement of water while filling the hole, levels of sand required to fill the hole, adjusting water levels around the location, and typical water movement between the holes. In the end, a Type 2 Heavy Duty curtain was chosen. The Type 2 Heavy Duty is designed with a thicker fabric for moving waters and features additional tensions cables to keep the curtain in place while water moves around the barrier.

Underneath the surface of the water, a bottom skirt extends down towards the water bottom and sits approximately one foot from the floor. Skirts feature a bottom ballast chain that helps keep the curtain vertical. In the scour hole location, depths varied with some areas requiring skirt depths of 45 feet and others requiring depths of only 10 feet. To meet these requirements, depths on the silt curtains were tapered to match the depths of area. These sections were then joined together to match the depths required across the location. This allowed the barrier to match the contours of the location for the most effective containment possible.

Additionally, certain sections of the barrier also featured a reefing line. This would allow the bottom skirt to be raised up slightly in specific sections, providing for further adjustment of the skirt depth as needed.

Installing the Silt Curtain

Installation of the silt curtain occurred over a period of two days and involved debris cleanup, barrier connection, deployment and anchoring. The first step required for installation was setup and connection of the barrier. When shipped to the location, the silt curtains were packaged as bundles with each section of curtain tied together. Sections of the curtain were then placed along the shoreline in the order re-

Top: Filling of the scour hole. Right: Installed silt curtains help prevent spreading of materials during scour hole filling. Images courtesy of Granite Environmental, Inc.

quired to match the contours of the hole.

Once in place, each section was then connected together to form the total silt curtain length. Sections of the Type 2 curtain are typically connected together in three separate locations: section slide connectors, grommet eyes, and along the bottom chain. For ease of use, the curtains were first connected through the slide connectors. These connectors are designed to easily slide together with matching parts located on opposite ends of the curtain. Once together, a toggle pin was inserted to lock the connector in place.

Next, grommet eyes located on the section ends were aligned and tied together with zip ties. Finally, bottom chains were connected through snap hooks located along the bottom of the skirt. This process was completed throughout the length of the curtain until all the sections were connected.

The curtain was now ready for deployment. Before towing the curtain out, the skirt portion of the barrier was furled up to the top flotation. This made the curtain easier to tow and helped prevent the skirt from hitting any surrounding rocks or debris. The curtain was then towed out across the length of the hole. Ends of the barrier were anchored on one side to nearby trees and on the other side to concrete blocks. The curtain was additionally anchored periodically along the length of the barrier to help keep it in place during filling of the hole.

Anchoring

Due to the moving water conditions of the location, anchor kits were used along the curtain to further keep the barrier in place. The anchor kit used featured a 24 pound anchor, buoy, galvanized steel chain, painter rope, and polypropylene rope. Careful to keep pressure off the turbidity curtain, the anchor is first connected to the buoy and then connected to curtain through use of painter rope. After the curtain was fully deployed, the bottom skirt was then untied allowing the curtain to extend to the water bottom.

Challenges during Installation

During the flooding of the area, several different items became displaced in the location including large amounts of debris, trees, branches and even snakes. When towing the curtain out, care had to be taken to avoid large trees and debris had to be cleared in order to put the barrier in place.

In addition, the large levels of sand and sediment being used to fill the scour hole included fine sediment that created a high level of suspended solids. Due to the magnitude and quality of the silt and sand floating within the scour hole, a second barrier was installed parallel to the first barrier. This curtain acted as a second line of defense to further control materials and protect the Historic Blue Hole. In order to keep the two parallel curtains apart, each curtain was anchored separately with a rope strung between the two curtains.

Project Continuation & Completion

Once the silt curtain was in place, the scour hole continued to be filled until it reached pre-flood elevation and became level to the surrounding area. After this was completed, the levee could then be repaired. The project continued throughout the following years to restore the levees to pre-flood conditions.

When compared to other options, use of the silt curtain significantly reduced the cost and timeline of separating the holes. The silt curtain was installed over the course of the two days and helped save around one million dollars in cost to the taxpayer. Due to their impermeable structure, the silt curtain was able to float along the surface of the water, contain suspended materials, and protect the Historic Blue Hole's aquatic habitat. **L&W**

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