Early native vegetation is established on the Geoweb walls.

A NATURAL BARRIER TO FLOODS

VEGETATED RETAINING WALL SYSTEM PROTECTS RECONSTRUCTED LEVEE FROM EROSION.

By David Haas, P.E., Jim Blazek, and Patricia Stelter

TO MEET FEDERAL requirements for flood mapping of levee protected areas, a levee reconstruction project for the Indianapolis Southport Advanced Wastewater Treatment (AWT) plant, owned by Citizens Energy Group, was initiated along Little Buck Creek. Reconstruction of the levee was part of a more extensive Deep Rock Tunnel Connector project, one of the largest combined sewer overflow projects for the City of Indianapolis. Construction of this project is planned over a several year timeframe, with combined wastewater from four other connector tunnels, and is just one part of a 20-year plan to reduce raw sewage overflows.

To protect the Southport AWT plant and wastewater processing pond from a 500-year flood event from the adjacent Little Buck Creek and West Fork White River, a vegetated retaining wall system allowed the city to maintain the levee elevation by opening up the creek's water capacity.

The Geoweb retaining wall protects the toe of the reconstructed levee from erosion by the Little Buck Creek.

Construction of the Geoweb retaining wall system is performed in layers. A topsoil/aggregate mix is placed in the front cells to support vegetation and resist erosive forces. Aggregate is placed in the back cells to facilitate drainage.

The levee embankment along the north side of the wastewater treatment plant had significant toe erosion as a result of flood events and high water flow from the adjacent creek. Some type of protection system was needed to prevent future erosion from the creek's varying depths and flows. Little Buck Creek is known to flow as low as a 1 foot depth and have a velocity of approximately 3 feet per second (fps) to as much as 8 fps with a depth of 12 to 15 feet during a flooding event.

The project engineer, Christopher B. Burke Engineering, LLC, preferred a wall system that would incorporate native vegetation along the levee as well as be sustainable enough to control erosion caused by Little Buck Creek. Little Buck Creek flows westward into the White River, which flows south along the west edge of the Southport AWT Plant, and is scrutinized due to the environmental concerns of the White River.

The Geoweb retaining wall system was proposed as a green solution to provide natural vegetation that could reduce the environmental impact and satisfy Indiana Department of Environmental Management requirements. The green solution was observed as a self-mitigating impact on the stream, and also provided the levee embankment protection from scour and erosion. The Geoweb system's flexibility allows conformance to the creek's geometry and ability to support vegetation along the vertical river bank through its open fascia cells.

Geoweb walls can be designed as gravity wall structures or can incorporate geogrid earth reinforcement layers similar to mechanically stabilized earth (MSE) block walls. In this case, a gravity wall was built. The open cells of the front Geoweb sections are filled with a blend of topsoil and #2 stone to achieve the desired base for vegetation as well as provide stability during larger storm events.

Because of their light weight, Geoweb retaining walls maintain their structural integrity and can perform well in soft soil environments. Stormwater can infiltrate through the open fascia cells, making them a low-environmental impact solution.

A river bank stabilization system with native vegetation proved to be an attractive solution and minimized environmental and permitting impacts. The Geoweb system was accepted and construction began in August 2012.

LEVEE RECONSTRUCTION

The Geoweb retaining wall was constructed by a DOT erosion control contractor, Earth Images, which was unfamiliar with the Geoweb wall system. The prime contractor, Summit Contracting, responsible for excavation and placement of the levee fill, was also unfamiliar with the wall system. D2 Land and Water worked closely with the engineers, contractors, and inspectors to ensure installation was completed smoothly, efficiently, and to specification.

Approximately 12,000 square feet of wall face area was constructed with the Geoweb retaining wall system. Wall length is almost 1,500 feet; heights vary from 5 to 12 feet.

"Construction was completed in approximately three months, with some delays due to rainfall and flooding," said Laura Yurs, president of Earth Images. "A combination of four laborers and a foreman from Earth Images, as well as two laborers and an operator from Summit Construction, performed the installation. Although none of us had installed this wall system in the past, the overall construction went smoothly."

Since installation in late 2012, the Geoweb wall system has performed well during several rain events. Although it was a significantly less expensive solution than rip rap, due to long-term U.S. Army Corps of Engineers acceptance practices, rip rap was still used along much of the levee in other locations. The Corps will be evaluating performance of this green solution for future levee applications.

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