

GPS Guides Underwater Project

Sometimes droughts can be a good thing.

By G. C. Skipper

Such was the case in late 2007 when state park officials decided to rebuild the beach and swimming area at Smith Mountain Lake State Park in Huddleston, VA. For about ten years the sand at the beach, which is the only public access beach on the lake, had been slowly washing away. Some of the finer materials had eroded, leaving behind a coarse material along the beach and under the water, according to the project manager, Mark Womble, Virginia/Carolina Paving, that won the bid on the project. Virginia/Carolina Paving is a subsidiary of W. C. English, Inc.

“They wanted us to go in, excavate some of that coarse material out, and replace it with a finer sand than they had used before,” Womble said. “We provided them with a number of sand samples from different quarries in the area and they selected one from a quarry in Wythville, VA.”

Although the beach area was only about two and a half acres, Womble said, the problem he faced was that 40 percent of the work site was under water. At first, he said, he thought he would have to replace the berm under the water to allow his equipment, a 210 Series Komatsu (www.komatsu.com/ce) long-reach track hoe with a 50LF VS 60LF boom, to roll further out and deeper into the water.

As it turned out, however, it wasn't necessary to do that extra underwater construction due to the draught.

The machine was outfitted with spill kits as a protection against any oil leaks, which allowed the excavator to go out until the water reached the top of the tracks, but not the cab.

“We were lucky with the water lev-



Mounted in the cab, the control box includes a monitor that helps the operator maneuver the bucket.

els,” Womble explained. “Because of the dry conditions in 2007 the machine could reach everything without us having to build a dike or any kind of spillway. If the water level had been higher, the job would have taken longer.”

Assisting as back up for the machine in the water was a D6 LGP Caterpillar (www.govbidspec.com) that worked on the beach itself, Womble said.

Although low water levels helped the situation, Womble still faced the problem of knowing where and how much to excavate underneath the water. He had previously used lasers in grading operations, but he had never worked with GPS before, he said. That was about to change.

He contacted John McCormick, branch manager and machine control specialist for Atlantic Laser Supply, a

Topcon Positioning Systems (www.topconpositioning.com) dealer in Richmond, VA. McCormick, along with his co-worker Randy Blaine, who is also a machine control specialist from Atlantic's Chesapeake office, went out to meet Womble at the beach project.

“We had to come up with an idea of how to dig through the bottom, put sand in there, and get it packed at the place where the plans said it was suppose to be,” McCormick commented.

In the past Virginia/Carolina Paving had been interested in using lasers, but before now no project had warranted it, McCormick noted.

After reviewing the work site and its challenges, McCormick recommended equipping the excavator with a Topcon X63 positioning system (formerly branded as 3DXi). He explained the ter-

minology: “X is for excavator, the ‘6’ indicates the GX-60 control box, and the ‘3’ is for three dimensional,” he said.

The operator, who controls the excavator, said McCormick, sees different views of the work site, “sort of a birds-eye view,” on a control box mounted in his cab. “The monitor has an indicator on the right hand side that shows you where the bucket is going down the grade. That lets you know where you want to go and how far to go to get there,” he said.

“It was a learning experience,” said Womble. “It was my first job with Topcon. We had a surveyor on the job who went out and checked the existing grades to make sure the data on the CAD files were correct. Basically, we took the engineer’s CAD files and downloaded them into the Topcon system. The work area shows up on a screen in the excavator operator’s cab. The screen shows the limits of the project. If the operator goes outside those limits, he doesn’t have any elevations on the screen. As long as he stays inside the limits, he can take his bucket and place it anywhere on the ground inside the job. The system tells him if he has to fill three inches of material, for example, or tells him if he has to cut a foot of material out,” Womble explained.

The excavator operator lowers the bucket manually, Womble said, digs out the material, and continues to check until he has reached the desired elevation.

System Installation

To install the Topcon system took about a day and a half and called for setting up a base station on the beach, marking it with a rebar stub so the same position could be used every day. Control points also were set up in random locations around the job site.

“The beach was located in a cove,”

Womble said, “and that enabled us to go around and set up control points in different peninsulas and coves.”

As the operator dug the coarse material out of Smith Mountain Lake, he dumped it into an articulated dump truck that had been backed out into the water, said Womble. When the articulated dump was fully loaded, the vehicle hauled the material out of the water. The beach is “pretty shallow,” he added, with about 170 feet separating the most distant point where the water hits the sand on the beach from the point of disturbance in the water.

Meanwhile, regular road dump trucks were used on the beach itself to bring in sand. The trucks dumped the sand on the beach, a bulldozer pushed the sand down to the water level, and the long-reach turned around, scooped up the sand, turned back around, and dropped



Outfitted with spill kits to protect against oil leaks, the excavator waded out until water reached the top of the tracks, but not the cab.

it into the water, Womble said. Once the operator “got close to where he wanted to be, he would take the bucket and level, or smooth out, the sand under the water,” said Womble.

Because the work site involved a lake beach, there wasn’t much underwater current, Womble said. “Over time the wind will stir up a little current. That probably eroded the sand originally,” he said.

Nevertheless, to keep the new sand from washing away, Womble’s crew used a turbidity curtain that acted like a fence. The curtain was anchored around the perimeter of the job, where it floated, reducing the silt transfer from the job to outside the job. “It’s more like a heavy fabric screen that we put around the worksite,” Womble explained.

As with any job, the biggest challenge in rebuilding the beach at Smith Mountain Lake was to come in on time and under budget. Womble accomplished both, beating the schedule by 30 days. From start to finish, he said, took about 60 days.

“It was the Topcon Positioning System that enabled us to do it. It was almost a two-man operation. We had an operator on the long-reach machine with the Topcon and an operator in the dozer to push the sand out to the excavator and to dress up the sand on the beach.”

Without GPS, he explained, he would have had to call surveyors out and manually mark underwater points with buoys.

“We would have had to fill around the buoys, and to verify the work, we would have had to have a surveyor come back out and determine how much fill we had placed. Surveyors would have been out there frequently.”

Topcon’s system, he said, completely eliminated the surveying cost on this particular job.

Womble’s first experience with GPS worked

so well, in fact, that now he is considering a system for one of his bulldozers.

“We will probably stay with Topcon,” he said. “We think there is good value in the system we bought and more companies are using Topcon than any other system that I know of.”

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