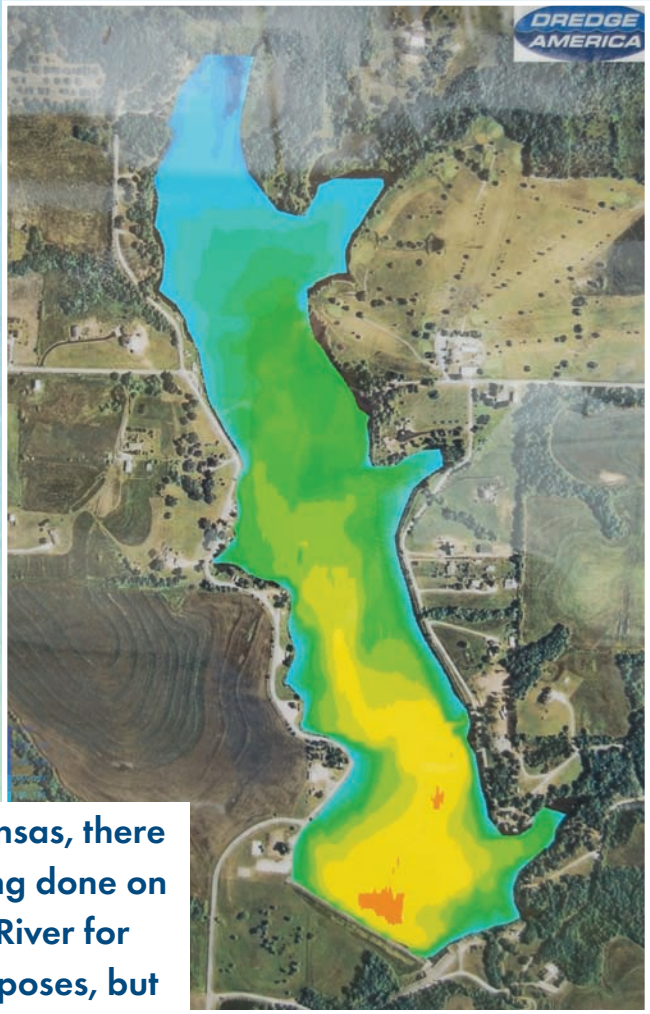
By Douglas Helmke, LG

Dredging: Kansas Takes First Steps to Reclaim Reservoirs



The map above shows the bathymetry of Mission Lake. The blue shades represent water depths of zero to four feet; the greens represent four to eleven feet. The orange color represents depths of thirteen to fourteen feet.

To prepare for this article, I did a little searching on the Internet to get some idea on how dredging, as we know it today, got started. The *Cheasepeake Bay Journal* provided an overview of this history in an article from their July/August, 2000 issue (http://www.bayjournal.com/article.cfm?article=1322). Harbors that were naturally swept clean of sediment by tides and currents are probably fewer in number than demand currently "requires". This has probably been true since man started trading goods by ship. The article I found states that the principal port of ancient Rome, Lido di Ostia, was subjected to sedimentation and that Roman engineers likely attempted to keep the harbor open. How this was accomplished is not clear. Better information is available that shows that human and horse-powered chains of buckets were used in the 1600's in the old ports of Europe. It is documented that sediments were being removed (or likely just moved) in Chesapeake Bay in 1783 and that taxes were being imposed on ships to pay for it.

In and near Kansas, there is some dredging done on the Missouri River for navigation purposes, but the main use has been to recover sand and gravel from the river bottoms and the adjacent floodplains.

Dredging is primarily done for two purposes today. Navigation continues to be the primary reason and mining is probably a close second. Dredging technology has advanced to the point that amateur gold prospectors are using backpack models weighing as little as 40 pounds in small streams. In and near Kansas, there is some dredging done on the Missouri River for navigation purposes, but the main use has been to recover sand and gravel from the river bottoms and the adjacent floodplains. Last year, a new kind of dredging project was started in Kansas. This project is water supply restoration.

For a number of years, Kansans have recognized that the relative health of the federal reservoirs is declining. It's not so much that they are sick, although there have been some issues with herbicides, algae, phosphorus and zebra mussels in the past, it's the age of the reservoirs that is the issue. Most are middle-aged and headed for the twilight years. The engineers recognized that sediment was a problem and they allowed for it in their designs. How we wish that there were a way for them to have considered a 200-year life instead of only 100 years. The smaller

Photo courtesy of Dredge America, Inc.

The dredge on Mission Lake works on the sediment in the upper reaches of the lake. Notice the dead aquatic vegetation in the undredged section of the lake.

city-owned lakes are probably older on average and probably had less thought put into their designs than the federal ones. We need something to increase the vitality of these sources of water for public water systems, and we need it quickly.

In 2005, the law that created the Clean Drinking Water Fee (K.S.A. 82a-2101) was amended to allow almost 2.43 cents of every $.03 cents per 1,000 gallons of water collected by the fee to be used for the restoration and protection of lakes used as sources of water by public water systems. The State Conservation Commission (SCC) was charged with the responsibility to manage the program, to adopt regulations and to work with the Kansas Water Office (KWO) to establish application evaluation criteria. In 2008, the regulations to administer the Water Supply Restoration Program were adopted. These regulations allow for funding of engineering work, repairs of structures and appurtenances, mobilization of equipment, dredge and sediment disposal facilities and watershed protection and restoration.

Ranking projects

A priority scoring sheet was released soon after the regulations were adopted, which is used to screen all applications. A total of 55 points are available based on five elements: public water supply, project condition, recreational need, available studies and plans, and sponsor funding contribution. An application filed by the city of Horton, in Brown County, was approved to be the first project funded under this program.

The city of Horton owns Mission Lake, which was formed when a dam installed on Mission Creek in 1924. The city used this lake as its source of water for almost 80 years. Because the storage in the reservoir was

Photo courtesy of Hakim Saadi, P.E., State Conservation Commission.

Slurry from the first days of dredging is delivered to the Confined Settling Basin, October 12, 2009.

As the hydraulic dredge is prepared for repositioning, the cutter-head is raised to the surface of the Mission Lake for inspection by the crew.

This view of the Confined Settling Basin (CSB) from the northwest shows the results of at least a month's worth of dredging. Note that the upper end of Mission Lake is visible in the upper right corner of the photograph. Highway 73 is visible on the west side (lower right quadrant)of the of the basin.

For progress updates on the Mission Lake Dredging Project, visit the Kansas Water Office website at http://www.kwo.org/MissionLake.htm. For information on the Mission Lake Dredging Project and the Water Supply Restoration Program of the State Conservation Commission, contact Program Manager Hakim Saadi, P.E. at 109 SW 9th Street, Suite 500, Topeka, Kansas 66612, by telephone at 785/291-3099, by e-mail at hakim.saadi@scc.ks.gov or visiting their Web site at http://scc.ks.gov.

significantly reduced by sedimentation, Horton drilled a number of water wells outside of town for their primary supply about eight years ago. There was no guidance available to determine if dredging their own lake was feasible at that time, but they never gave up hope. If it were to become possible, the city would save their lake.

Original engineering plans estimated that Mission Lake had a capacity of 1,866 acre-feet of water when it was built in 1924. A bathymetric survey by the Kansas Biological Survey (KBS) in 2007 however, estimated that the lake's capacity was reduced by sedimentation to 1,036 acre-feet, or only 56% of original capacity.

To get this project started, the city of Horton approved the issuance of a bond to raise needed funds. It is estimated that this project will cost approximately $6 million. The application approved by the SCC came with funding for $2.6 million. The balance of this will be paid by the city of Horton. The city is exploring the possibility of securing federal loan and grant funds after completion of a water system review by B.G. Consultants, Lawrence, KS.

The bid to do the actual dredging was won by Dredge America, Inc. of Kansas City, Missouri. They delivered a hydraulic suction dredge with a rotating cutter-head to loosen and remove sediment that has settled on the lake bottom. With sophisticated computers and global positioning

Slurry continues to be delivered to the settling basin in the early days of dredging in October 2009. This basin will contain one million cubic yards of sediment when the project is completed in the latter half of 2010.

system equipment, they are able to position the dredge and remove sediment without disturbing the original lake bottom. On average, the pump on the dredge is able to move a slurry comprised of approximately 72 percent water and 28 percent sediment to the Confined Settling Basin (CSB). The Confined Settling Basin is located less than one-half mile upstream from the original lake. Some parts of the lake over a mile away from the CSB were dredged.

The slurry of water and sediment is pumped through a temporary pipeline to the settling basin. Because the sediment could have unacceptable levels of contaminants like herbicides, PCB's, heavy meals and nutrients, it is not possible to spread this sediment on agricultural fields, even if someone was willing to take it. Storing the sediment in the settling basin should secure it for generations. The surrounding berm of the settling basin is basically a dam. It contains water long enough for the sediment to settle out of the slurry to the bottom. The water used to carry the sediment is allowed to flow over a riser and return to Mission Lake. As the sediment rises, so does the water level at the riser.

The city and project managers hope to remove a million cubic yards, or 619 acre-feet, of sediment from the lake, resulting in 1,655 acre-feet of water storage in the reservoir. Dredge America's latest estimate is that this will be accomplished by late summer, 2010.

This pilot dredging project is providing the State Conservation Commission with valuable information needed to complete additional projects in the future more efficiently. It is believed that Kansas is the only state in the country with a program to reclaim small public water supply lakes. Hopefully, the information that is obtained from this and the projects to come can be used to justify restoration of our federal reservoirs. If water storage space is allowed to decrease, so do our chances at succeed in the global economy.

If water storage space is allowed to decrease, so do our chances to succeed in the global economy.

Douglas S. Helmke has been the Water Rights Tech at KRWA since June 2000, and also Wellhead / Sourcewater Protection Tech since 2003. He holds professional geologist certification in Kansas and Missouri. Doug received a B.S. degree in geology from Kansas State University.

Photo courtesy of Dredge America, Inc.

The dredge on Mission Lake works on the sediment in the upper reaches of the lake. Notice the dead aquatic vegetation in the undredged section of the lake.

city-owned lakes are probably older on average and probably had less thought put into their designs than the federal ones. We need something to increase the vitality of these sources of water for public water systems, and we need it quickly.

In 2005, the law that created the Clean Drinking Water Fee (K.S.A. 82a-2101) was amended to allow almost 2.43 cents of every $.03 cents per 1,000 gallons of water collected by the fee to be used for the restoration and protection of lakes used as sources of water by public water systems. The State Conservation Commission (SCC) was charged with the responsibility to manage the program, to adopt regulations and to work with the Kansas Water Office (KWO) to establish application evaluation criteria. In 2008, the regulations to administer the Water Supply Restoration Program were adopted. These regulations allow for funding of engineering work, repairs of structures and appurtenances, mobilization of equipment, dredge and sediment disposal facilities and watershed protection and restoration.

Ranking projects

A priority scoring sheet was released soon after the regulations were adopted, which is used to screen all applications. A total of 55 points are available based on five elements: public water supply, project condition, recreational need, available studies and plans, and sponsor funding contribution. An application filed by the city of Horton, in Brown County, was approved to be the first project funded under this program.

The city of Horton owns Mission Lake, which was formed when a dam installed on Mission Creek in 1924. The city used this lake as its source of water for almost 80 years. Because the storage in the reservoir was

Photo courtesy of Hakim Saadi, P.E., State Conservation Commission.

Slurry from the first days of dredging is delivered to the Confined Settling Basin, October 12, 2009.

As the hydraulic dredge is prepared for repositioning, the cutter-head is raised to the surface of the Mission Lake for inspection by the crew.

This view of the Confined Settling Basin (CSB) from the northwest shows the results of at least a month's worth of dredging. Note that the upper end of Mission Lake is visible in the upper right corner of the photograph. Highway 73 is visible on the west side (lower right quadrant)of the of the basin.

For progress updates on the Mission Lake Dredging Project, visit the Kansas Water Office website at http://www.kwo.org/MissionLake.htm. For information on the Mission Lake Dredging Project and the Water Supply Restoration Program of the State Conservation Commission, contact Program Manager Hakim Saadi, P.E. at 109 SW 9th Street, Suite 500, Topeka, Kansas 66612, by telephone at 785/291-3099, by e-mail at hakim.saadi@scc.ks.gov or visiting their Web site at http://scc.ks.gov.

significantly reduced by sedimentation, Horton drilled a number of water wells outside of town for their primary supply about eight years ago. There was no guidance available to determine if dredging their own lake was feasible at that time, but they never gave up hope. If it were to become possible, the city would save their lake.

Original engineering plans estimated that Mission Lake had a capacity of 1,866 acre-feet of water when it was built in 1924. A bathymetric survey by the Kansas Biological Survey (KBS) in 2007 however, estimated that the lake's capacity was reduced by sedimentation to 1,036 acre-feet, or only 56% of original capacity.

To get this project started, the city of Horton approved the issuance of a bond to raise needed funds. It is estimated that this project will cost approximately $6 million. The application approved by the SCC came with funding for $2.6 million. The balance of this will be paid by the city of Horton. The city is exploring the possibility of securing federal loan and grant funds after completion of a water system review by B.G. Consultants, Lawrence, KS.

The bid to do the actual dredging was won by Dredge America, Inc. of Kansas City, Missouri. They delivered a hydraulic suction dredge with a rotating cutter-head to loosen and remove sediment that has settled on the lake bottom. With sophisticated computers and global positioning

Slurry continues to be delivered to the settling basin in the early days of dredging in October 2009. This basin will contain one million cubic yards of sediment when the project is completed in the latter half of 2010.

system equipment, they are able to position the dredge and remove sediment without disturbing the original lake bottom. On average, the pump on the dredge is able to move a slurry comprised of approximately 72 percent water and 28 percent sediment to the Confined Settling Basin (CSB). The Confined Settling Basin is located less than one-half mile upstream from the original lake. Some parts of the lake over a mile away from the CSB were dredged.

The slurry of water and sediment is pumped through a temporary pipeline to the settling basin. Because the sediment could have unacceptable levels of contaminants like herbicides, PCB's, heavy meals and nutrients, it is not possible to spread this sediment on agricultural fields, even if someone was willing to take it. Storing the sediment in the settling basin should secure it for generations. The surrounding berm of the settling basin is basically a dam. It contains water long enough for the sediment to settle out of the slurry to the bottom. The water used to carry the sediment is allowed to flow over a riser and return to Mission Lake. As the sediment rises, so does the water level at the riser.

The city and project managers hope to remove a million cubic yards, or 619 acre-feet, of sediment from the lake, resulting in 1,655 acre-feet of water storage in the reservoir. Dredge America's latest estimate is that this will be accomplished by late summer, 2010.

This pilot dredging project is providing the State Conservation Commission with valuable information needed to complete additional projects in the future more efficiently. It is believed that Kansas is the only state in the country with a program to reclaim small public water supply lakes. Hopefully, the information that is obtained from this and the projects to come can be used to justify restoration of our federal reservoirs. If water storage space is allowed to decrease, so do our chances at succeed in the global economy.

If water storage space is allowed to decrease, so do our chances to succeed in the global economy.

Douglas S. Helmke has been the Water Rights Tech at KRWA since June 2000, and also Wellhead / Sourcewater Protection Tech since 2003. He holds professional geologist certification in Kansas and Missouri. Doug received a B.S. degree in geology from Kansas State University.