

2011 WEDA ENVIRONMENTAL EXCELLENCE AWARD NOMINATION PROPOSAL FOR CONSIDERATION

Environmental Dredging of Kinnickinnic River, Wisconsin: A Model for Multi-Stakeholder Collaboration, Technical Innovation, Workforce Development, and Waterfront Revitalization

Nomination submitted by
WEDA members CH2M HILL and Ryba Marine Construction Company

May 2, 2011



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Summary

The Kinnickinnic (KK) River in Milwaukee, Wisconsin, is part of the Milwaukee Estuary Area of Concern (AOC), one of 30 U.S. and Binational designated impaired areas in the Great Lakes under the Great Lakes Water Quality Agreement, because of environmental contamination. The successful dredging of 167,000 cubic yards of PCB- and PAH-contaminated sediment from the KK River in 2009 removed 1,200 pounds of PCBs and 13,000 pounds of PAHs, contributing greatly to the eventual delisting of the following Beneficial Use Impairments:

- Restrictions on Fish and Wildlife Consumption
- Degradation of Fish and Wildlife Populations
- Degradation of Benthos
- Restriction on Dredging Activities
- Degradation of Aesthetics

The primary objective of this Great Lakes Legacy Act project was to reduce risk to human health and

the environment, but the project also served as a great catalyst to revitalize business and economic development along the river's waterfront. The former navigational channel was restored, allowing three marinas full use of their facilities again, prompting a brownfield redevelopment and addition of a brew pub with boat access on the restored waterway.

The dredging was technically challenging, with 3 vehicular bridges and one 100-year old swinging railroad bridge crossing the 200-foot wide project area, and 9 underwater utility crossings. An innovative air bubble curtain was employed in lieu of a traditional silt curtain to inhibit suspended sediment transport downstream and allow unimpeded boat traffic. The work was completed 1 month ahead of schedule and on budget, and it supported local youth workforce development through job shadowing. Lessons learned on the project have been transferred to others through multiple venues.



A sunken vessel illustrates the blighted condition of the Kinnickinnic River prior to the cleanup project.

Before Cleanup: A Waterfront in Decline

- Contaminated mud flats.
- Restricted navigation.
- Dilapidated shoreline.
- Blighted and aesthetically unpleasing.
- Limited redevelopment potential.



After cleanup, the members of local businesses are seeing economic revitalization along the Kinnickinnic River.

After Cleanup: A Waterfront Restored

- Contaminants removed.
- Navigation channel fully restored.
- Upgraded seawalls and shoreline features.
- Improved aesthetics and river access.
- Increased redevelopment potential.

Project Team Members

Project Owners: U.S. EPA Great Lakes National Program Office (Ajit Vaidya, Diana Mally, Marc Tuchman, Susan Prout) and Wisconsin Department of Natural Resources (Xiaochun Zhang, Marsha Burzynski, Deb Johnson), jointly funded under the Great Lakes Legacy Act.

Project Stakeholders: **U.S. Army Corps of Engineers Detroit District-WEDA member** (Dave Bowman, Kerry Williams, Tom Johnson, John Pelke), Confined Disposal Facility (CDF) operator; Port of Milwaukee (Larry Sullivan), CDF owner; City of Milwaukee (Jeff Delleman and Paul Novotny), bridge openings/traffic control; Business Improvement District 35 (Chris Svoboda, Dave Ferron), project-specific tax assessment district partnered with City of Milwaukee to invest in shoreline stabilization.

Design Engineer/General Construction Contractor: **CH2M HILL-WEDA member** (George Hicks, Rob Stryker, Gina Bayer, Dan McGregor, Mike Lehman).

Dredging and Dredge Material Transfer Subcontractor: **Ryba Marine Construction Company-WEDA member** (Zac Morrish, Tom Bajko, JoAnne Gareau).

Shoreline Stabilization/CDF Unloading Dock Construction Subcontractor: Gillen Company.

CDF Special Cell Construction Subcontractor: Freeman Environmental Services.

Environmental Benefits

The KK River discharges into Lake Michigan through a federal navigation harbor. The project area is within the Milwaukee Estuary AOC and thus one of the Great Lakes areas identified in the U.S. as requiring cleanup of toxic pollution to improve water quality in the Great Lakes, which holds 95 percent of the nation's surface fresh water and supports 30 million citizens. The 2,000-foot-long and 200-foot-wide section of the KK River dredged for the project had been designed to accommodate deep draft navigation. Although routine dredging stopped in the 1940s, the USACE continued to maintain a federal navigational channel just downstream of the reach. As an industrialized urban stream, the KK River was subject to point discharges, combined sewer overflows, accidental spills, and stormwater runoff. Maximum concentrations of 36 mg/kg PCBs and 244 mg/kg PAHs were detected in 2002 in an investigation funded by a USEPA GLNPO grant. The PCB input into Lake Michigan from the KK River was thought to be one of the

contributors of the fish consumption advisories in the Milwaukee region.

Removal of 167,000 yd³ of contaminated sediment from the river with a level cut environmental bucket also removed an estimated 1,200 pounds of PCBs and 13,000 pounds of PAHs from the ecosystem. Post-dredging confirmation sampling was conducted to confirm that remedial action levels were achieved. If sediment sampling results showed that the undredged inventory or the dredging residuals contained PCBs or PAHs at concentrations above remedial action levels, additional dredging plus sand cover placement, or sand placement only, was performed, depending on proximity to bulkheads or bridge structures. The surface-weighted average concentration of contaminants of concern is a common metric used to quantify the average concentration to which aquatic receptors would be exposed. The calculated post-dredging surface-weighted average concentration for the KK River was 0.44 mg/kg for PCBs and 3.7 mg/kg for PAHs, significantly below the remedial action level goals of 1 mg/kg for PCBs and 37 mg/kg for PAHs.

Several environmental challenges were addressed while achieving the environmental benefits. As typical of an urban waterway that had not been dredged for more than 60 years, debris was expected. It included a half-sunken abandoned tugboat, old wooden piles, numerous drums including three that contained hazardous materials, steel, chains, cables, engine blocks, tires, shopping carts, and bowling balls. When drums containing material were encountered and removed, they were staged at the CDF, placed in overpack drums, and sampled. Analytical results found the materials to be hazardous, and the drums were transported and disposed of at a licensed hazardous waste disposal facility.

A conventional clamshell bucket was used in areas of significant debris or sand. The deteriorated condition of aging timber walls and bridges also presented challenges. The project owners collaborated with local property owners to assist them in upgrading their seawalls before dredging began, allowing the removal of contaminated sediments up to the seawalls, rather than leaving some of the sediments in place. To safely complete dredging near the pier of a 100-year old swinging railroad bridge, the project team negotiated with the railroad and installed scour protection around the pivot pier. Scour protection also was installed at one of the City of Milwaukee's bascule bridges.



Screened dredge material as it comes down the chute.



Spreading dredge material across the Confined Disposal Facility.

Four existing utilities required relocation as part of the project. Three are owned by the City: the bridge control cables for the S. 1st Street Bridge, the bridge control cables for the Kinnickinnic Avenue Bridge, and a fiber optic line providing 911/police/fire communications for the City. The fiber optic line was removed from service temporarily because it is a redundant system, but it was reinstalled in 2010. The bridge control cables were replaced during the dredging effort. The fourth utility was a fiber optic line; it was relocated during the dredging project and is now well below the dredge elevation.

Finally, a unique arrangement was reached between the USEPA, USACE, and the Port of Milwaukee that allowed local disposal of the dredge material into a specially-built cell within the CDF. Underdrains were installed below the cell bottom and to collect water draining from the dredge material. The water was pumped to a nearby Milwaukee Metropolitan Sewage District manhole for treatment by the District. Turbidity, PCBs, and other contaminants were monitored in accordance with the District's discharge permit.

Innovation

The project incorporated the following innovative aspects.

- Design, fabrication, installation, and operation of an air bubble curtain in lieu of a traditional silt curtain to control turbidity. The air curtain allowed unimpeded barge and boat traffic, which was necessary because of the tight physical constraints of the project area. The curtain's effectiveness was unaffected by the constant change in water velocity and direction. The air bubble curtain enabled the project



Ryba designed and installed an air bubble curtain at the downstream end of the project area to control suspended solids migration, as the use of silt curtains would have been problematic given the sudden increase in river velocity during storm events and the need to allow boat traffic to pass frequently during dredging operations.

turbidity control requirements to be achieved and allowed boat access for three local marinas.

- Adapting technology from the timber industry to spread the dredge material into the CDF. A dragline system was set up which used a yarder tower, a series of winches, pulleys, anchors, and a Sauerman bucket to spread the dredge material evenly throughout the 600-by-1,000-foot cell.
- Prior to implementation, years of planning and extraordinary collaboration was conducted by the lead project owner, USEPA GLNPO, and its nonfederal sponsor, the WDNR. They solicited

input and assistance from the USACE, the Port of Milwaukee, and the City of Milwaukee, and facilitated a grant for the local Business Improvement District to gain its involvement. Strong community support made the project happen.

- Green remediation and sustainability principles were incorporated into the project as possible. Debris was screened, washed, and recycled as appropriate. Dredge material in the CDF was used to build the berms around the KK River cell. A large percentage of the work was performed by local contractors.

Economic Benefits

The incorporation of innovative, environmentally friendly practices and procedures also produced cost-saving project efficiencies. The design, fabrication, installation and operation of a specially designed debris separator at the unloading site made it possible to separate material greater than 24 inches into three categories: steel to be recycled, tires, and debris to be hauled away to an approved landfill. This allowed cost savings for material disposal and reduced the impact at the landfill.

The prime contractor and subcontractor shared office space in an empty manufacturing building, which greatly reduced the environmental footprint of the project and saved costs for the project. Shared utilities and equipment were cost-effective for both parties, and thus for the overall project.

The use of a drip tray at the CDF unloading platform eliminated the need for a silt curtain at the CDF. This eliminated the need for the constant adjustment and movement of a silt curtain, provided savings in man-hours and also reducing risk to the safety of crew members.

The cost to install and operate the air curtain was offset by hours saved from not having to remove and reinstall a turbidity curtain for barge movements and local marina boat traffic. Had traditional silt curtains been used, hours would have been lost displacing the curtain for every barge movement, and marinas would have had to wait for passage until the curtain was removed. Having to wait would have caused negative economic impact for the local stakeholders. The silt curtains certainly would have been displaced and damaged during the several rain storms that occurred during the project. Damaged silt curtains would have been replaced several times during the project. The air curtain did not yield a product that

would have eventually ended up in a landfill. An added environmental benefit of the air curtain was that movement of silt curtains following the project inevitably would have released some of the suspended solids built up on the curtain into the water column.

The project had a significant impact on the local economy and waterfront revitalization. In fact the project was featured in the Great Lakes Restoration Initiative Action Plan (February 2010) and in a 4-page EPA Fact Sheet titled, Cleanup of Great Lakes Sediment: A Catalyst for Waterfront Revitalization (February 2011).

With the restored draft, business increased for the shoreline commercial property owners, including a yacht storage boatyard, a restoration and remodeling firm, and a brew pub/nightspot. Property owners made improvements to their properties, including investment in a brownfield redevelopment.



Drip tray installed at unloading platform directs spills and drips into a contained area.



Unloading platform with installed drip pan.



Business at Pier Milwaukee has flourished since completion of the Kinnickinnic River environmental restoration project:

- Restored access for deep-draft vessels
- Elimination of operating restrictions
- Increased demand for vessel storage
- New seasonal boat slips

“Without the dredging and cleanup of the Kinnickinnic River, this boatyard would be out of business.”

—Chris Svoboda, Owner, Pier Milwaukee

Transferability

As the dredging and residual sand cover placement was coming to a close in the fall of 2009, actions were already in motion to transfer the knowledge learned during the project to others addressing similar sites. Four presentations on various aspects of the project and a tour of the project were offered at the fall 2009 Annual Area of Concern Conference in Milwaukee. Milwaukee Community Services Corp., described in detail below, CH2M HILL, and the University of Wisconsin–Extension developed a presentation titled *The Milwaukee Model – An Intersection of GLLA and Workforce Development*, and presented it to various departments of the USEPA (GLNPO, Brownfields, Superfund) and to the hundreds of participants at the fall 2010 Healing Our Waters conference. The KK River project was the feature article of Volume 45, Nos. 7/8 of the journal, *World Dredging*. The project was also featured during the spring 2010 Midwest Chapter WEDA conference in Chicago, and the February 2011 Remediation of Contaminated Sediments Battelle conference in New Orleans. At the least, GLNPO, CH2M HILL, and Ryba are all transferring lessons learned from the project to other dredging projects, and several efforts have been made to make the project details available to the broader sediment community.



The GLLA-funded cleanup of Milwaukee's Kinnickinnic River has spurred new development along the water, including the opening of a brew pub that features boat slips, an outdoor bar, and an extensive riverfront patio.

Action Illustration: Contaminated Sediment Cleanup Can Also Provide Benefits to Environmental Justice Areas

Contaminated sediment is a significant source of fish contamination, which can disproportionately impact women of childbearing years, subsistence anglers and communities in areas of Environmental Justice concern. In 2009, the U.S. EPA Great Lakes National Program Office, Wisconsin Department of Natural Resources and other partners conducted a Great Lakes Legacy Act cleanup of heavily contaminated sediments in a section of Milwaukee's Kinnickinnic River. The project removed around 167,000 cubic yards of sediment contaminated with PCBs and polycyclic aromatic hydrocarbons, which were available to resident fish and had worked their way downstream to Lake Michigan, causing environmental harm and impeding commercial and recreational navigation. This project was in a section of the City of Milwaukee considered to be an area of potential Environmental Justice concern. Although the project was not carried out as an Environmental Justice project, nor was it in response to specific Environmental Justice concerns, the cleanup resulted in improved environmental health for the area, and it received support from local environmental groups and community health advocates. The cleanup also spurred economic revitalization efforts in this urban river community. Yet another benefit was that the cleanup provided job training opportunities to disadvantaged youth.

The KK River project was included as an Action Illustration example in the Great Lakes Restoration Initiative Action Plan for FY2010 – FY2014, the master plan that is the basis for a \$2 billion funding proposal.

Outreach and Education

A job training partnership was arranged with the local nonprofit group Milwaukee Community Services Corp., a workforce development organization for youth. Two members gained on-the-job skills by shadowing CH2M HILL construction managers, and sampling teams. The experience led directly to a permanent job offer for one of the young adults.



Participants at the KK River Cleanup Celebration Event on November 2, 2009, included (former) Wisconsin Governor Jim Doyle (speaking), Senior Advisor to the EPA Administrator Cameron Davis (behind former Governor Doyle), USACE Detroit District Deputy Commander LTC Michael Brooks, and Milwaukee Mayor Tom Barrett.

Several outreach activities were held before, during, and after the project, including a public meeting, an open house at which displays explained the differences between navigational dredging and environmental dredging, a facilitated partnering meeting with the multiple players at which a chartering agreement was signed, and public opening and closing ceremonies. As noted, a tour of the project was provided as part of the Annual Area of Concern conference in Milwaukee in the fall 2009. The project was presented at several conferences, including the AOC conference Milwaukee fall 2009, the Midwest Chapter WEDA conference Chicago spring 2010, the Healing Our Waters conference Buffalo October 2010, and the Remediation of Contaminated Sediments Conference, New Orleans February 2011.

Other

One important aspect of the project was attention to health and safety. Tailgate safety meetings were held at the start of every workday for all shifts by all subcontractors working on the project. Activity hazard analyses were required to be reviewed for all distinct tasks as well. The effort paid off. Through the completion of dredging and sand placement activities, a total of 39,000 hours were worked without a lost time incident.

Before the project began, a meeting was held that included all team members, including the project crew. The project description, requirement and expectations were clearly outlined, and a question and answer period took place. The entire project team was well-informed before the project began. Armed with information, the team was able to handle unforeseen issues and to find solutions for problems encountered in the field.

Lines of communication were kept open among all stakeholders, and the unyielding cooperation of all involved was a huge factor in the success of the project. This project had one ultimate goal – to clean up the KK River with the support and involvement of the public. Remediation of the urban body of water exceeded expectations. The collaboration and patient coordination efforts of the project stakeholders, contractors, and subcontractors, along with innovations such as the air bubble curtain and dragline/Sauerman bucket dredge material disposal method at the CDF, delivered a successful project that was completed ahead of schedule and under budget. The successful implementation of the remedial activities is spurring further improvement efforts on the river, including plans to remove concrete channel upstream of the remediated area for flood protection and habitat restoration.

Local property owners are already reaping benefits with the return of a navigable, usable waterway. The KK River cleanup contributes greatly to the eventual delisting of the Milwaukee Estuary BUIs and ultimately the delisting of the Area of Concern designation. The project has been promoted by various organizations for various project aspects as a model to be copied on other dredging projects.