EPA United States Environmental Protection Agency

Total Maximum Daily Loads
TMDLs at Work in Ohio

Letting the Middle Cuyahoga River Run

TMDL Implementation Restores Flow, Improves Water Quality, and Preserves a Community's Sense of History

The total maximum daily loads (TMDLs) for the Middle Cuyahoga River watershed revealed that residents in the watershed had a tough choice to make if they wanted to improve local water quality conditions. They could either (1) invest in expensive upgrades to the local wastewater treatment plants to reduce the pollutants affecting dissolved oxygen levels, even though the investment might not produce sufficient water quality improvements to meet water quality standards, or (2) spend time and effort in crafting a voluntary approach involving modification and removal of local dams that would improve the river's natural flow, restore riverine habitat, allow for fish passage, and increase dissolved oxygen (DO) levels. Wanting to avoid costly upgrades that might not produce results, stakeholders in the Middle Cuyahoga River watershed chose to cooperatively explore the innovative voluntary option in a manner that could restore water quality, preserve local history, and create a significant water feature. The result was the modification of the Kent Dam and the removal of the Munroe Falls dam Implementation of this voluntary option produced immediate, measurable water quality benefits. In addition to achieving environmental goals, the TMDL implementation approach allowed stakeholders to leverage financial resources and avoid costly wastewater treatment plant upgrades and associated operation and maintenance costs. Efforts in the Middle Cuyahoga River watershed also established important partnerships that would benefit future TMDL efforts in other parts of the Cuyahoga River watershed.

TMDL at a Glance

Middle Cuyahoga River TMDL
(approved January 2001)

www.epa.state.oh.us/dsw/tmdl/CuyahogaRiverMiddleTMDL.aspx

- **Factors causing impairment:** Warmwater aquatic life use impaired by low dissolved oxygen resulting from three key factors: (1) excess nutrients; (2) changes in the natural flow pattern of the river; and (3) poor riverine habitat
- **Sources contributing to impairment:** Municipal wastewater treatment plant discharges, dams, flow alteration
- **Restoration options:** Reduce pollutant loadings from local wastewater treatment plants or increase flows from a surface impoundment and modify dams to increase natural river characteristics
- **Stakeholder involvement:** Middle Cuyahoga Watershed Stakeholder Forum; Kent Dam Advisory Council; local nongovernmental organizations; local cities and counties; state and federal agencies
- **Status of waterbody:** Full attainment of Warmwater Habitat designated use near the Kent Dam and anticipated full attainment near the Munroe Falls Dam
- **Benefits to stakeholders:** Water quality, economic, historic preservation, recreation, funding, partnerships

How are TMDLs at work in the Middle Cuyahoga River watershed?

The TMDLs developed by the Ohio Environmental Protection Agency (EPA) for the Middle Cuyahoga River watershed presented two possible options for decreasing excessive nutrients and improving dissolved oxygen levels to restore the biological integrity of the watershed. The TMDL report demonstrated that while local wastewater treatment plants in the watershed are contributors to water quality problems, solely focusing on more stringent permit limits for these point sources would not result in attainment of water quality standards due to the conditions in the watershed. Through the technical analysis, stakeholders were provided with evidence to support the need for voluntary watershed efforts.

What is a total maximum daily load (TMDL)?

It is a study or analysis that calculates the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards. The TMDL establishes a pollutant budget and then allocates portions of the overall budget to the pollutant's sources. For more information on TMDLs, visit EPA's website at ***www.epa.gov/owow/tmdl***.

Who were the participating stakeholders and key partners?

Ohio EPA was responsible for the development of the Middle Cuyahoga River watershed TMDLs, with participation from key stakeholders and partners. Unlike TMDL development, TMDL implementation is in the hands of local stakeholders and partners. Local stakeholders that participated in TMDL development, and led subsequent implementation activities, include residents and officials from the cities of Akron, Kent, Massillon, Munroe Falls, and Ravenna; Portage and Summit, counties; the Summit County Department of Environmental Services (DOES); the Northeast Ohio Four County Regional Planning and Development Organization (NEFCO); and nongovernmental organizations such as the Kent Environmental Council, the Kent Historical Society, the Friends of the Crooked River, and American Whitewater. Key state partners included the Ohio EPA, the Ohio Department of Natural Resources (ODNR), and the Ohio Historic Preservation Office. Federal partners included the U.S. EPA, U.S. Army Corps of Engineers, and U.S. Fish and Wildlife Service.

How did stakeholders participate in the TMDL process?

The overall TMDL process includes the following elements: Clean Water Act (CWA) section 303(d) listing decisions, TMDL development, and TMDL implementation. Each element of the TMDL process provided stakeholders with an opportunity to express concerns and share information about the water quality problems in the Middle Cuyahoga River with Ohio EPA and other key state and federal partners. A description of each element of the TMDL process is provided below.

Section 303(d) listing decisions

If a waterbody does not meet water quality standards (i.e., numeric or narrative criteria) for one or more pollutants, it goes on a state's CWA section 303(d) list of impaired waterbodies and will require a TMDL for each pollutant contributing to the impairment. Stakeholders have the opportunity to provide input during the CWA section 303(d) listing process. Ohio EPA conducts water quality assessments for each watershed and creates technical support documents (TSDs). The draft TSDs are available to interested parties for review and comment. Once finalized, Ohio EPA issues a press release and makes the final TSD available for public review.

For the Middle Cuyahoga River, the Ohio EPA asked the public to provide comments during the development of the 1996 and 1998 CWA section 303(d) lists. Stakeholders had the opportunity to provide feedback on the information contained in the list, such as: 1) water bodies included or not included, 2) pollutant and other causes of failure to fully support designated uses, 3) validity of data and information used, 4) submission of additional data relevant to whether should be listed, and 5) the data interpretation rules employed by the state. Stakeholders had participated in field surveys within the watershed and Ohio EPA used the information provided in the technical analysis. The experiences and concerns of these citizens complimented the data Ohio EPA collected.

TMDL development

The Ohio EPA initiated the TMDLs for Middle Cuyahoga River watershed to address impairments related to excessive nutrients and low DO, as well as habitat and flow alteration. Pollutants addressed by the TMDLs include carbonaceous biochemical oxygen demand (CBOD), total nitrogen, and ammonia; these pollutants contribute to violations of Ohio water quality standards for DO and biocriteria in the Middle Cuyahoga River watershed. Ohio EPA used the DO water quality criteria to assess progress towards conditions supportive of the warmwater habitat designated use. To directly determine attainment of this designated use, Ohio EPA assesses the health of fish and bug communities in the watershed.

Through the TMDL development process, Ohio EPA determined that local wastewater treatment plants were the point sources contributing to the impairment. The analysis indicated that no nonpoint sources made significant contributions contributed to the impairment. However, in addition to the point sources, changes to the natural flow of the river due to water consumption, dams, and impoundments also contributed to the impairment. Based on conditions in the watershed and the sources and causes of impairment, Ohio EPA selected the QUAL2E computer model to simulate DO, temperature, phosphorus, CBOD, total nitrogen, and ammonia in the Middle Cuyahoga River watershed. Information from the model helped Ohio EPA calculate the wasteload allocations (WLAs) for the wastewater treatment plants for each pollutant.

The final TMDL report presents a tiered approach for calculating the WLAs, based on two sets of assumptions regarding flow conditions in the watershed. Level 1 of the tiered approach calculated TMDLs for CBOD, total nitrogen, and ammonia on the basis of assumed changes in the flow of the Middle Cuyahoga River through voluntary actions, including modification of the Kent and Munroe Falls dams. Ohio EPA predicted attainment of water quality standards in the near-term under the Level 1 scenario. WLAs under the Level 1 scenario would essentially allow the wastewater treatment plants to preserve existing permit limits. (This scenario also required a minimum release from Lake Rockwell, a water supply reservoir on the Cuyahoga River for the city of Akron, and minor loading reductions from the wastewater treatment plants.)

If voluntary actions to change flow conditions did not take place within a specified time frame, the TMDL report specified the Level 2 WLAs that Ohio EPA would enforce as more stringent permit limits for wastewater treatment plants. The TMDL report stated, however, that the more stringent permit limits generated under the Level 2 scenario would not result in attainment of water quality standards. Even though hydromodifications and habitat alteration are not pollutants, the TMDL analysis indicated that stakeholders would have to voluntarily address this issue to attain water quality standards in the Middle Cuyahoga River watershed.

The Ohio EPA worked with NEFCO and the Middle Cuyahoga Watershed Stakeholder Forum, established in the 1990s as a way to foster regional cooperation, to ensure stakeholder involvement in the TMDL process. Over the 17 month TMDL development process, Ohio EPA facilitated public meetings to educate stakeholders and obtain their input. Forum participants and the public had the opportunity to express their concerns about conditions in the watershed and the TMDL process, as well as provide information on the causes and sources of impairment.

TMDL implementation

Upon approval of the TMDL for the Middle Cuyahoga River in 2000, local stakeholders initiated efforts to evaluate the recommendations put forth in the TMDL report and develop a locally-led implementation strategy. Based on the costs associated with wastewater treatment plant upgrades and the uncertainty over whether the investment would produce environmental results, stakeholders opted to pursue the recommended dam modification activities under the Level 1 scenario in the TMDL.

- **Kent Dam.** The Kent City Council convened the Kent Dam Advisory Council (KDAC), which included many participants of the Forum. The 19 participants on the KDAC evaluated the alternatives included in the final TMDL analysis and designed a plan to modify the Kent Dam in a manner that would preserve the historic nature of the structure and the overall historic district.

  The implementation approach created by the KDAC, referred to as the Middle Cuyahoga River Restoration Project, incorporated both water quality and cultural preservation components. The project focused on preserving the arched dam structure—one of the oldest arched dams in the country—while removing an old canal

lock to allow the river to flow freely. Preserving the structure, as well as constructing a waterfall, developing Heritage Park, and providing educational information on the historical aspects of the area, were all requirements under the National Historic Preservation Act (NHPA). In addition to the dam modification and Heritage Park, the project also incorporated stream channel and streambank restoration activities.

- **Munroe Falls Dam.** The Summit County DOES led the Munroe Falls Dam modification project. DOES staff presented three options to the public for their consideration. The City of Munroe Falls wanted to maintain a significant water feature in the river. Stakeholders selected an option that involved lowering the dam and building a fish passage structure around the dam. Conditions at the site, however, led to changes in the initial dam modification plans and resulted in removal of the dam. Through this project, stakeholders discovered a rock ledge in the river that had been hidden for over 100 years. Ultimately the project restored the natural flow of the river and provided the City of Munroe Falls with the desired significant water feature.

By choosing to implement the TMDL through the voluntary dam modification and removal projects, local stakeholders were eligible for grant funding that would not have been available to finance wastewater treatment plant upgrades under the second alternative. The project, completed in spring 2005, cost an estimated $5 million. Funding sources included Ohio EPA section 319 grant, Ohio EPA's Clean Water Act State Revolving Loan Fund's Water Resource Restoration Sponsor Program, the Clean Ohio Fund, and supplemental environmental project (SEP) enforcement monies.

What is the current status of the Middle Cuyahoga River watershed as a result of the TMDL process?

The Middle Cuyahoga River watershed is not yet in full attainment of water quality standards; however, the voluntary dam modification and removal projects have resulted in the anticipated chemical and physical water quality improvements, as indicated by water samples and computer modeling. DO levels in the river are now consistent with the state's water quality standards for this parameter. Also, the condition of the warmwater aquatic live community in the stream also significantly improved. Prior to the project, Ohio EPA assessed the diversity of the macroinvertebrate community (ICI), the fish community using the Index of Biological Integrity (IBI) and Modified Index of Well Being (MIwb), and the physical habitat conditions using the Qualitative Habitat Evaluation Index (QHEI). Scores from the initial assessment using the ICI, IBI, MIwb, and the QHEI indicated that the majority of the Middle Cuyahoga River did not meet the warmwater habitat designated use prior to implementing the TMDL. The Ohio EPA assessed the Middle Cuyahoga River from 2005 to 2007. Information from this assessment indicated a 56 percent increase in IBI scores and a 57 percent increase in QHEI scores in Kent. The river in the former Munroe Falls dam pool meets the QHEI and ICI criteria, but still has a non attainment status for the fish indices. However, all the elements required for a full recovery of aquatic communities to warmwater habitat standard were present, and the river is expected to reach full attainment within the next few years. A full report of the demonstrated improvement of the aquatic community is available at: www.epa.ohio.gov/dsw/tmdl/CuyahogaRiverMiddleTMDL.aspx

How did local stakeholders benefit from the TMDL process?

The Middle Cuyahoga River Restoration Project produced the anticipated water quality improvements, has restored portions of the river to full attainment, and is on its way to meeting its warmwater habitat designated use in all segments. In addition to water quality benefits, this successful TMDL implementation project has provided the cities of Kent and

Munroe Falls, as well as other local stakeholders, with a wide range of additional benefits, including:

- **Leveraged financial resources.** Local stakeholders, specifically communities with wastewater treatment plants that would have required costly upgrades, were able to avoid significant investments that were not guaranteed to result in attainment of water quality standards. For example, the City of Kent alone avoided spending nearly $5 million in wastewater treatment plant upgrades. Communities were able to work together, along with state and federal agencies, to obtain funding for dam modification and removal projects. The Kent Dam Water Quality Improvement Project received more than $5 million in funding from state and local partners. Ohio EPA's Clean Water Act State Revolving Loan Fund's Water Resource Restoration Sponsor Program (WRRSP) provided $3.94 million. The Clean Ohio Fund contributed $636,000. Ohio EPA provided $500,000 through a Clean Water Act (CWA) section 319 grant and ODNR provided $6,400 in additional grant funds. For the Munroe Falls dam project, Summit County obtained more than $1.4 million from Ohio EPA's Clean Water State Revolving Loan Fund's WRRSP. In addition, this project obtained approximately $1 million in a CWA section 319 nonpoint source grant and $500,000 from supplemental enforcement environmental project monies.
- **Historical preservation.** The project preserved and restored the arched dam structure dating back to the 1830s, but provided for a free-flowing river channel through removal of an old canal lock east of the dam.
- **Increased aesthetics and educational opportunities.** Developing Heritage Park in the drained dam pool to satisfy National Historic Preservation Act requirements alsoaddressed concerns related to aesthetics. Interpretative signage in Heritage Park educates visitors about the history of the area and associated environmental benefits of the project.
- **Effective local partnerships.** The Middle Cuyahoga River Watershed Stakeholder Forum and the Kent Dam Advisory Council set the stage for successful partnerships necessary to address other water quality problems throughout the Cuyahoga River watershed. Some of the participants in the Middle Cuyahoga River TMDL process also participated in the TMDL processes for the Upper and Lower Cuyahoga River.

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For more information on the Ohio TMDL Program, visit www.epa.ohio.gov/dsw/tmdl/index.aspx