Milwaukee Metropolitan Sewerage District

Weathering the storm where rain falls

Project at a Glance

Utility Overview

- Utility: Milwaukee Metropolitan Sewerage District (MMSD)
- Location: Milwaukee metro area, Wisconsin
- Population served: 1.1 million
- Service area: 411 square miles

Challenges

- Combined sewer overflows
- Basement backups
- Stormwater runoff from municipal separate storm sewer system

Solution

- Comprehensive localized infrastructure strategies across public and private properties

Costs and Funding Sources

- Total project budget for 2019: $11 million
- Green purchasing programs: $6.5 million
- Public property projects: $1.2 million
- Private property projects: $1.9 million
- Funding source: Capital Improvement Budget

Benefits

Expected to save MMSD in traditional infrastructure upgrades

Reduces sewer overflow incidences by 96%, from 50 to 60 per year to only 2.3 per year

Creates 500 green maintenance jobs at full implementation

Produces 160 construction jobs on average per year

Increases property values by an estimated $667 million

Educates the public about water resources and sustainable solutions

Improves environmental health by reducing carbon emissions, conserving energy, and improving air and water quality

Improves quality of life and aesthetics by providing additional green spaces and recreational opportunities

BACKGROUND

Milwaukee, Wisconsin sits on the shores of Lake Michigan at the confluence of three rivers: the Menomonee, the Kinnickinnic, and the Milwaukee. Its location in the Great Lakes Region means Milwaukee has a humid climate and is subject to rapidly changing weather, dramatic shifts in temperature, and severe winter storms, often producing several inches of snow.

In Milwaukee, **one inch of** rainfall amounts to **7.1 billion gallons of water**

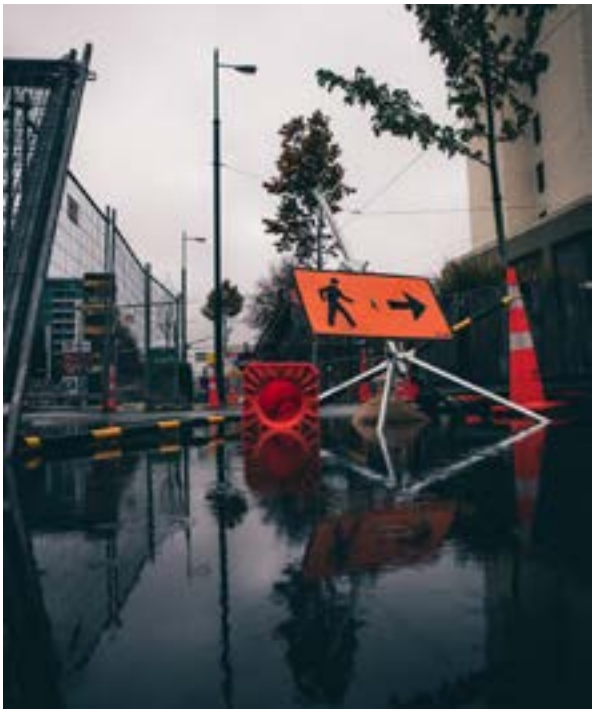
CHALLENGE

In Milwaukee, one inch of rainfall amounts to 7.1 billion gallons of water. To control this influx of stormwater, the local utility, Milwaukee Metropolitan Sewerage District (MMSD), receives flows from two sewer systems – a combined system constructed over 130 years ago and a separate system built following World War II. Faced with sewer overflows and basement backups, MMSD made significant updates to these systems in 1993 by installing a network of over 19 miles of tunnels 300 feet below ground. Through the mid-1990s, MMSD invested $3 billion in gray infrastructure and in 2010, another $1 billion in an overflow reduction plan that expanded the deep tunnel system to 28.5 miles and allowed it to store up to 521 million gallons of stormwater. Despite these massive investments and time-intensive infrastructure upgrades, the Milwaukee community continued to voice concerns about sewer overflows.

SOLUTION

Responding to the community's flooding concerns, MMSD decided to prioritize ratepayer involvement in a solution. MMSD recognized that because localized infrastructure can be installed right on a home or business owner's property, it is more likely to gain public support since it is easily visible and accessible to the community. In 2002, MMSD began deploying localized strategies including bioswales, permeable pavement, stormwater trees, rain gardens, and more to help capture stormwater where it falls, reduce the strain on centralized infrastructure, minimize pollution caused by overflows, and improve water quality.

In 2013, the MMSD Commission decided to scale existing localized infrastructure and approved a regionwide strategic plan to implement this goal. The goal of this new plan was to "achieve zero sewer overflows, zero basement backups,

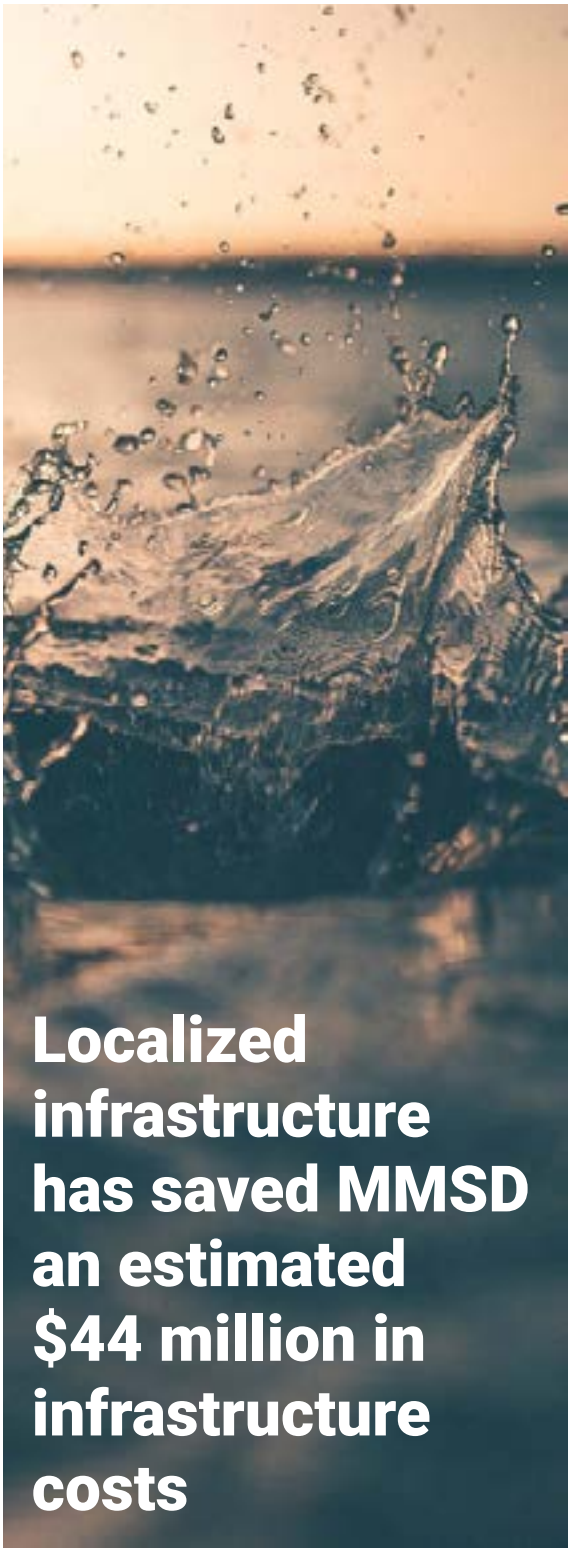


and improved water quality by the year 2035" by capturing the first 0.5 inch of rainfall from impervious surfaces with localized infrastructure. A key element included ongoing public education and outreach to the 28 communities in MMSD's service area through its "Green Solutions" program.

The Green Solutions program promoted 10 localized strategies across both public and private properties: rain barrels, rain gardens, green roofs, bioswales, porous pavement, soil amendments, native landscaping and stormwater-capturing trees, wetlands, green alleys, streets, and parking lots. For public installations, MMSD coordinated localized infrastructure installations with other municipal projects, like street improvements. With strategies implemented on private property, MMSD prioritized widespread access and feasibility, using interactive promotions like technology giveaways to reach more local households and communicate benefits. For example, the utility provided an average 75 to 100 free rain barrels each year.

Localized Infrastructure Strategy Used In the Green Solutions Program

Strategy	Applicability
Green roofs	Green roofs, also known as vegetated roofs, living roofs, and eco-roofs are applicable to relatively flat roof areas.
Rain gardens	Rain gardens treat relatively small areas of imperviousness for residential lots.
Stormwater trees	Stormwater trees are used to treat street impervious area by infiltrating stormwater, taking it up in roots, and evapotransporting it.
Bioretention/ Bioswales / Greenways	Bioretention is a larger, more engineered version of a rain garden and is primarily applicable to the street rights-of-way (ROW), parking lots, and to soak up stormwater runoff from non-residential sloped roofs.
Native landscaping	Native landscaping is applied to larger pervious areas, such as large turf grass areas, to reduce stormwater and pollution from pervious areas. This is separate from the native landscaping that is typically included in rain gardens and bioretention.
Porous pavement	Porous pavement is associated with treating imperviousness from parking lots and the street ROW.
Rainwater catchment (rain barrels and cisterns)	Rainwater harvesting with rain barrels and cisterns is used to collect roof stormwater. Stormwater may be reused to water landscaping and urban agriculture.
Soil amendments	Soil amendments/ improvements such as compost addition and soil aeration are included for residential yards.
Green alleys, streets, and parking lots	These strategies are included in the plan through the use of other strategies such as porous pavement, stormwater trees, and bioretention/ bioswales.
Wetlands	Wetlands are recommend in this plan, but not quantified. Restoring wetlands is supported through the Greenseams program. Constructed wetlands are encouraged and can be implemented in exchange for other localized infrastructure strategies where site-specific conditions support constructed wetlands.



Localized infrastructure has saved MMSD an estimated $44 million in infrastructure costs

Sources

MMSD: About Us
MMSD: History
MMSD: What We Do
MMSD: Green Infrastructure
MMSD: Regional Green Infrastructure Plan
MMSD: Fresh Coast Green Solutions
MMSD: Green Infrastructure Benefits and Costs
MMSD: 2017 Comprehensive Annual Financial Report
MMSD: Rain Check
WaterNow Alliance November 28, 2018, interview with MMSD

In addition to infrastructure projects, MMSD designed supplementary programs such as the Water Drop Alert, which warns participants of an upcoming storm and encourages them to minimize wastewater from their homes. Another program, named Rain Check, shows homeowners how to conduct their own home audits to mitigate any potential property damage from stormwater.

RESULTS

Economic Benefits

MMSD's investment in green infrastructure could reduce the utility's future infrastructure costs. In particular, an investment of $178 million for green infrastructure in the agency's combined sewer service area would result in stormwater capture equivalent to $222 million investment in gray infrastructure. It creates 500 green maintenance jobs at full implementation and, on average, 160 construction jobs per year. The localized infrastructure programs are also estimated to have increased property values by $667 million throughout the MMSD service area.

Social Benefits

MMSD's investment in localized infrastructure is expected to improve quality of life through new green spaces and recreational opportunities, and enhanced overall community aesthetics. Additionally, visible infrastructure projects and supplementary educational resources educate the public about water resource management and promote a shared awareness about responsible water use.

Environmental Benefits

Since 2002, MMSD has installed green infrastructure projects that capture 39-40 million gallons of water during each storm and team with the gray infrastructure to reduce combined sewer overflows to an average of 2.3 overflows per year, down from 50 to 60 per year. By capturing stormwater and adding green space and shading, localized projects provide multiple environmental co-benefits to the MMSD service area, including groundwater recharge, reduced carbon emissions, energy conservation, improved air quality, and water quality improvement.

Currently, MMSD measures the performance of its green infrastructure program using a gallons captured approach. Additional metrics, such as job creation, greenhouse gas reductions, and pollutant runoff reduction, may be added in the future.