ECOS

GREEN REPORT

Clean Water State Revolving Fund
A Flexible Tool for Advancing Clean Water

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Environmental Council of the States

EXECUTIVE SUMMARY

The Clean Water State Revolving Fund (CWSRF) is a federal-state-local partnership that provides funding for a wide range of water quality infrastructure projects. The CWSRF program is able to fund traditional wastewater treatment projects as well as a suite of nontraditional ones, including watershed protection, estuary management, green infrastructure, and nonpoint source projects. The twelve case studies below demonstrate the flexible nature of the CWSRF program that enables states to address their unique water infrastructure needs in communities of all sizes.

Case Studies

- Arizona: City of Bisbee's Wastewater Plant Solar Addition
- Colorado: City of Wray Wastewater Treatment Facility Improvements
- Florida: Graceville's Energy Efficiency Project
- Idaho: Fruitland's Wastewater Consolidation and Upgrade Project
- Iowa: Water Resource Restoration Sponsored Projects
- Maryland: Queen Anne's County Southern Kent Island Sewer System

- Massachusetts: Greater Lawrence Sanitary District Organics to Energy Project
- Minnesota: Regionalization of the Central Iron Range Sanitary Sewer District
- Missouri: Upper White River Basin Watershed Onsite Wastewater Treatment System Remediation Project
- Nebraska: Hasting's Aquifer Storage and Restoration Project
- Ohio: Helping Small Wastewater Treatment Plants Achieve Compliance
- Pennsylvania: Mussels for Clean Water

PROJECT DESCRIPTION

This report builds on the 2016 Environmental Council of the States (ECOS) **Innovations in the Clean Water SRF Grant Project**. It highlights additional innovative projects funded by the CWSRF, particularly ones that benefit disadvantaged communities, build recipient capacity, and address resilience challenges.

To gather case studies for this report, ECOS solicited examples of innovative uses of the CWSRF from states and through associations including: the Association of Clean Water Administrators, the Council on Infrastructure Financing Authorities, the National Association of Clean Water Agencies, and the Water Environment Federation. The 12 case studies featured in this report are also available as individual fact sheets. Three of the projects were chosen by a selection committee to receive special recognition and were featured in a national webinar. The **webinar**, held on January 30, 2018, is available for viewing.

ACKNOWLEDGMENTS

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Arizona: City of Bisbee's Wastewater Plant Solar Addition

Bisbee, Arizona is a small town with a population of 5,575 that was designated as a Disadvantaged Community by the Arizona Water Infrastructure Finance Authority (WIFA). In an effort to mitigate increasing energy costs while conserving Arizona's natural resources, the city decided to add solar panels to its San Jose Wastewater Treatment Plant.

Harnessing Renewable Energy

The 1.2 million gallons per day San Jose Wastewater Treatment Plant was by far the largest power user in Bisbee. After a thorough review of plant operations, the city repaired equipment, cleaned tanks, installed new aeration diffusers and actuators, and provided operation staff with updated training. With these changes, the plant saved approximately 15% in power usage and related costs, but they wanted to do more to offset increasing energy costs.

Realizing the environmental and economic benefits of using a renewable energy source like solar power, Bisbee officials decided to install a 400-kilowatt solar system to produce electricity to run the wastewater treatment plant. The solar array was sized at 125% of the plant's peak power demand with expected annual energy production estimated at 713,000 kilowatt hours. The fixed mounted system requires little to no maintenance, allowing plant operators to focus on the plant rather than the solar array.

Stabilizing Rates

Before this project, Bisbee increased sewer bills every year to cover the cost of operating the plant. With the solar array, the city saves nearly $110,000 per year in energy costs and no longer needs to increase rates annually. This is a welcome benefit to the community.

Environmental Benefits

A solar panel array was the clear choice in sunny Arizona, especially considering the affordable financing offered by WIFA and incentives offered by the power company. The renewable energy source has exceeded expectations, producing 87% of the electricity required to the run the plant. The solar photovoltaic panels use virtually no water to generate electricity so the system is also saving water. This water conservation is particularly meaningful in an arid state like Arizona.

Special Recognition

The project received two awards for its contributions toward clean water and energy management. It received the Arizona American Public Works Association Small Cities/Rural Communities 2016 Project of the Year – Environment Clean Water Project of the Year and the WIFA 2015 Clean Water Project of the Year.

Funding Mechanism

To fund the renewable energy upgrade, the city applied for a $1.6 million loan, and the WIFA Board of Directors approved the loan with $400,000 in principal forgiveness.

Views of the 400-kilowatt Solar Array at the San Jose Wastewater Treatment Plant. Photo Credit: WIFA of Arizona

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Colorado: City of Wray Wastewater Treatment Facility Improvements

The City of Wray is a small, disadvantaged community of 2,300 in northeastern Colorado. Until the city took advantage of CWSRF funding, it struggled with the high cost of upgrading their existing wastewater treatment facility (WWTF) to meet the state's requirements and to address more stringent future effluent limitations for ammonia, total nitrogen, and phosphorus in the receiving stream. Through careful consideration of their options, the City of Wray identified a more affordable solution that meets their environmental needs.

Choosing the Sustainable Compliance Option

In late 2014, the City of Wray began a project to address requirements associated with the existing, organically overloaded WWTF. One solution identified in an alternatives analysis was a mechanical plant that met the city's needs but would have cost the community over $9.3 million. Additionally, this option would have resulted in high ongoing operations and maintenance (O&M) costs, required a secondary clarification process, and generated an additional waste stream. Instead, the city selected an alternative that utilizes enhanced lagoon aeration along with moving bed biological reactors (MBBR) to achieve the desired effluent results with a project cost of just over $6.2 million plus moderate O&M costs.

Benefiting the City & Environment

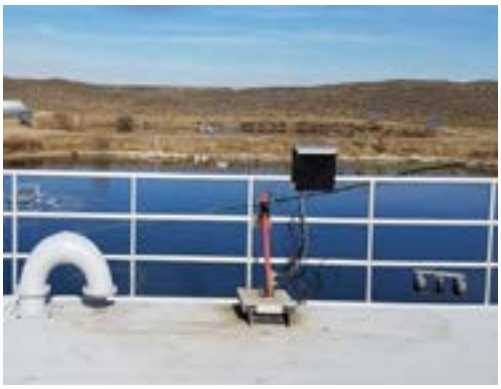
Having identified a cost-effective option and acquired a CWSRF loan and principal forgiveness, the community will be able to maintain affordable user rates while upgrading the facility to meet effluent requirements. Beyond achieving compliance, the chosen plan has automatic backwashing of the disc filters, needs no supplemental water for backwashing, and creates no additional waste stream. This alternative requires minimal operator attention and allows the system to be easily upgraded for total nitrogen and phosphorus removal. By utilizing MBBR processes, the new system will be also able to achieve cold weather ammonia removal.

Projected Results

The facility upgrades will improve effluent discharge to the North Fork of the Republican River and maintain affordable user rates for the community.

Funding Mechanism

- CWSRF loan: $1,634,200
- CWSRF principal forgiveness loans: $1,115,800
- Energy Impact Assistance Fund grants: $2,733,605
- Town reserves: $686,000
- Total project costs: $6,169,605



View of the Wastewater Treatment Lagoon from the Top of the MBBR.

Photo Credit: Colorado CDPHE

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Florida: Graceville's Energy Efficiency Project

Graceville, a small, rural community in northwest Florida with a population of 2,212 and a median household income of $29,234, is considered financially disadvantaged. Graceville's wastewater treatment plant (WWTP) is a relatively new 1.1 million gallon per day sequencing batch reactor, but the sludge process uses the aeration tank and blowers from the old plant. Because this system is not energy efficient and is in need of substantial upgrades, Florida's CWSRF Program approached the city with a project to bolster the sustainability of its WTTP.

Modifying an Inefficient System

With the help of the state, Graceville is undertaking a project to modify the WWTP's existing digester by replacing the inefficient blowers with new high-efficiency blowers, and a jockey pump to provide greater flexibility in the volume of air supplied to the digester. The aeration rate will be determined by an innovative, patent-pending process that calculates the actual need for air in the digester based on real-time data supplied by sensors. Not only will the process greatly reduce the aeration requirement, but it will also keep phosphorus bound in and removed with the sludge so that it does not return to the headworks. Due to this adjustment in the treatment process, less alum is required to remove phosphorus which will save the plant money.

Chemical & Energy Savings

Once the new process is online and calibrated, the new blowers are expected to save the city nearly $15,000 per year. High-efficiency blowers and the ability to calculate the needed aeration rate will reduce the overall amount of air used in the aerobic digestion process, thus saving Graceville money and energy. In addition to the energy savings, it is anticipated that the chemical savings will be approximately $7,000 per year due to the reduced need for alum.

Funding Mechanism

To finance this project, Graceville received a $1.1 million CWSRF loan and a $893,600 disadvantaged small community grant from the state, which will be used to pay off a portion of the loan. It is anticipated that the chemical costs and energy savings of the upgraded system will be approximately twice the annual debt service on the $1.1 million loan.

Old Blowers at the Graceville WTTP.
Photo Credit: Charlie Martin with City of Graceville

Aerial View of the Graceville WWTP.
Photo Credit: Florida DEP

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Iowa: Water Resource Restoration Sponsored Projects

In 2009, the Iowa Legislature authorized the use of sewer utility revenues to finance a new category of projects called "water resource restoration sponsored projects." These projects are defined as locally-directed, watershed-based efforts to address water quality problems. Prior to 2009, utility revenues could only finance construction and improvements for the wastewater system itself. Now, wastewater utilities can also finance projects, within or outside the corporate limits, that cover best management practices for nonpoint source pollution control. Examples of water resource restoration sponsored projects include permeable paving, rain gardens, wetland restoration, and other retention and infiltration practices that address nonpoint source runoff issues.

Funding Mechanism

Iowa has implemented the sponsored projects effort through the CWSRF. On a $1 million CWSRF wastewater loan the borrower pays $1.2 million in principal plus interest and fees. With a sponsored project, utilities may apply for sponsored project funding up to 10% of their loan amount. The sponsored project amount is added to the principal, and the interest rate is reduced by up to 1%; the utility borrows $1.1 million, but still pays back $1.2 million. In the end, the utility ratepayers get two projects for the cost of one. A total of $62 million in commitments for more than 82 sponsored projects have been made since 2013.

Sponsored Project Examples

Dubuque: In 2013, the City of Dubuque pilot-tested the sponsored project funding mechanism. The city executed a $64 million CWSRF loan to upgrade its wastewater treatment plant and borrowed an additional $9.4 million for a sponsored project. Dubuque could afford the additional loan because of an interest rate reduction for the CWSRF project. The project funded the installation of permeable pavers in 74 alleys throughout the Bee Branch Creek urban watershed. The permeable alleys infiltrate storm water, providing water quality benefits to the recently daylighted Bee Branch Creek corridor.

North Liberty: When the rapidly growing community of North Liberty constructed a $20 million wastewater treatment plant upgrade, the city also applied for $1.4 million in sponsored project funding. With a portion of the funds, the city created a residential rebate program for soil quality restoration. Homeowners received up to $1,500 to aerate, apply compost, and overseed their lawns. Soil quality restoration is an inexpensive and simple method to increase water holding capacity and reduce runoff in urbanized areas.

Sioux City: Sioux City's geology creates erosion and nonpoint source pollution challenges. The city's Ravine Park and adjoining Southern Hills Mall were chosen as sites for sponsored projects to restore native prairie and oak savanna, restore streams, and install bioretention to address erosion caused by runoff. Sioux City received $14 million in wastewater loans and borrowed an additional $900,000 to fund the sponsored project. This sponsored project allowed stakeholders throughout the community to collaborate on solutions to the water quality challenges.

Clinton: The City of Clinton is under a consent order to separate its combined sewers. Clinton's sponsored project gave the city an opportunity to experiment with infiltration practices to manage stormwater with the goal of downsizing stormwater pipes. The city installed permeable paving in alleys and parking areas, along with soil quality restoration and stormwater tree planters. Clinton borrowed $6.6 million for combined sewer overflow correction and used an additional $665,000 for the sponsored project.

Creating Laboratories for Innovation

Because the goals and priorities for the projects are locally directed, Iowa communities have become laboratories for innovative approaches to improve water quality. Sponsored projects provide demonstrable water quality solutions that increase public and private sector awareness, knowledge, and popularity of sustainable practices.

Snow Melt Differences Between Old Impervious Alleys and New Green Alleys.
Photo Credit: Iowa DNR

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Idaho: Fruitland's Wastewater Consolidation and Upgrade Project

When effluent discharges did not consistently meet U.S. EPA permit limits, the small, rural City of Fruitland, Idaho sought funding from the Idaho Department of Environmental Quality (IDEQ) State Revolving Fund (SRF) to upgrade its wastewater collection and treatment system. The 2013 SRF loan enabled the city to consolidate the system by eliminating one point of discharge, installing energy-efficient alternatives, and upgrading their remaining treatment plant with an innovative and cost-effective process.

Project Description

Fruitland historically treated its wastewater in two aerated lagoon facilities that discharged to two different Clean Water Act 303(d)-listed receiving streams. The city struggled to meet EPA permit limits for biochemical oxygen demand, total suspended solids, and nutrients.

To address this problem, Fruitland designed and implemented a project replacing one aerated lagoon with a lift station, and the other lagoon with an upgraded facility sized to accept the city's total wastewater flow. The upgraded wastewater treatment facility was built to include an innovative Multi-stage Activated Biological Process (MABP) for conventional organics reduction and biological nutrient removal. The new plant includes secondary and tertiary filtration with ultraviolet (UV) light disinfection of the effluent.

Innovative Watershed Management

The Snake River at Fruitland is a 303(d)-listed waterbody and a salmonid spawning and rearing location. Through this project, the city eliminated discharges to the Snake River by pumping wastewater to a single upgraded treatment plant. This resulted in a single surface water discharge to a different receiving stream that meets water quality standards at lower costs.

Cost-Saving Treatment Technologies

The MABP, an innovative biological nutrient removal system, achieves the required nutrient reduction without chemical precipitation, thereby minimizing sludge production and eliminating chemical residuals. Compared with chemical nutrient removal, this system saved the city over $330,000 per year in costs. Also, by using a new gravity transfer sewer to split off the gravity-fed portion of the flow to the pump station, the city is saving over 43% in pumping costs every year.

Increasing Energy Efficiency

Fruitland will also realize long-term cost savings from reduced energy requirements because it chose to install the following energy efficient components:

- Premium energy-efficient motors;
- Variable frequency drives;
- A low pressure, high intensity UV light disinfection system;
- Advanced SCADA control and monitoring; and
- Diversion interceptor sewer to reduce pumping requirements.

Funding Mechanism

The IDEQ SRF did not have the funds available to finance the entire $20 million Fruitland project so the SRF worked with U.S. Department of Agriculture's Rural Development to jointly fund the project. IDEQ provided Fruitland $10 million in interim funding with a low interest rate. Once Fruitland spent the first $10 million, Rural Development paid back the city, which the city then used to repay IDEQ for the interim financing. IDEQ used the repayment to provide the city with $10 million in long-term financing. The IDEQ SRF saved this small community money by applying a low interest rate of 1.25% on interim financing. Additionally, the city was eligible for $542,322 of loan principal forgiveness.

Effluent Weirs. Photo Credit: Idaho DEQ

MABP Extended Aeration Tanks.
Photo Credit: Idaho DEQ

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Maryland: Queen Anne's County Southern Kent Island Sewer System

Queen Anne's County in Maryland is using CWSRF funding to finance a multi-phase project that will provide public sewer service to 1,526 existing properties with failing septic systems. These properties, located on Southern Kent Island and within the Chesapeake Bay Critical Area, will be connected to the County's Enhanced Nutrient Removal Wastewater Treatment Plant. The Chesapeake Bay Critical Area was defined in 1984 to foster sustainable development and minimize damage to water quality and wildlife habitats. The area includes all land within 1,000 feet of Maryland's tidal waters and tidal wetlands, the Chesapeake Bay, the Atlantic Coastal Bays, their tidal tributaries, and the lands underneath these tidal areas.

Project Overview

To add 1,526 existing properties to the sewer system, the county will install sewer collection systems, comprised of over 70,000 feet of 2 to 16-inch diameter pipes and individual home septic tank effluent pumps. The county significantly reduced estimated project costs through the use of a septic tank effluent pumping system that limits transmission of effluent to greywater. This technology eliminated the need for intermediate pumping stations and minimized sources for inflow and infiltration. The four phases of the project are expected to be completed by 2025.

- Phase 1 – Kent Island Estates & Romancoke Communities (780 improved properties)
- Phase 2 – Tower Garden Subdivision (199 improved properties)
- Phase 3 – Queen Anne Colony & Kentmorr Subdivisions (336 improved properties)
- Phase 4 – Chesapeake Estates, Sunny Isle of Kent, Batts Neck & Matapeake Estates Subdivisions (211 improved properties)

Funding Mechanism

Phase one of the $55 million project is being financed with a $34 million Maryland Water Quality State Revolving Fund loan. As a disadvantaged community, Queen Anne's County received $1.2 million in loan forgiveness, at an interest rate of 0.8% per year and a term of 30 years. Phases two through four will need an additional $21 million in debt financing.

The revenue for the payment of debt service on this project will come from three sources.

- Assessment of $1,000 per year per existing property for 20 years ($30 million revenue)
- Benefit premium of $27,920 on 560 buildable vacant lots over 30 years ($15.6 million revenue)
- Bay Restoration Fund grant of $10,000 per existing property over 40 years ($15.3 million revenue)

Protecting Public Health & the Environment

Ninety percent of the existing septic systems, which are located on small lots with marginal soil and high groundwater, discharge wastewater directly into the groundwater. The contaminated groundwater can leach into wells and has surfaced on some properties, posing a public health risk for the community. Connecting these failing systems to the Enhanced Nutrient Removal Wastewater Treatment Plant will prevent the transmittal of pathogens and protect the health of the community. Additionally, this project is expected to help with Chesapeake Bay restoration efforts by preventing 7,000 pounds of nitrogen per year from entering the bay.

Image Credit: Queen Anne's County Sanitary District

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Massachusetts: Greater Lawrence Sanitary District Organics to Energy Project

In 2014, Massachusetts established a ban on landfills accepting organic materials to preserve landfill space and support composting operations. The state needed alternate destinations for organic materials, and state-supported feasibility studies determined that anaerobic digester facilities could accept food waste. The Greater Lawrence Sanitary District (GLSD), which had excess digester capacity, acted on this opportunity and started the Organics to Energy Project.

Meeting a Zero-Net Energy Goal

The Organics to Energy Project moved GLSD toward its goal to become a zero-net energy facility by 2018. The project involved the design and installation of an innovative organic waste receiving and feed system, construction of an additional anaerobic digester, and installation of two 3.1 megawatt (MW) combined heat and power generators. Prior to this project, GLSD implemented a number of energy efficiency and renewable generation projects to drive electrical purchases down by 30% and reduce energy costs by more than $1 million per year.

Using Food Waste to Decrease Emissions

The Organics to Energy Project is an innovative way to address declining landfill capacity and achieve a zero net energy goal. When the GLSD digesters and treatment works improvement project is complete, the facility will be able to accept 92,000 gallons per day of source separated organics. Since food waste produces a high-quality biogas in higher volumes than sewage, the project will generate 3 MW of electricity on site, reduce its carbon footprint by 3,919 tons per year, and reduce annual electrical costs by $2.5 million and natural gas costs by $250,000. Additionally, the new facility could meet 40% of Massachusetts' goal of organics diversion while improving resiliency by allowing the facility to operate off-grid in the event of a natural disaster.

Funding Mechanism

The GLSD, which serves five communities in the Merrimack River Valley, was awarded three grants totaling nearly $6 million in state funding from the MA Department of Energy Resources, the MA Clean Energy Center, and the MA Department of Environmental Protection. The balance of the cost of the Organics to Energy Project, $24.8 million, is being financed through the CWSRF.

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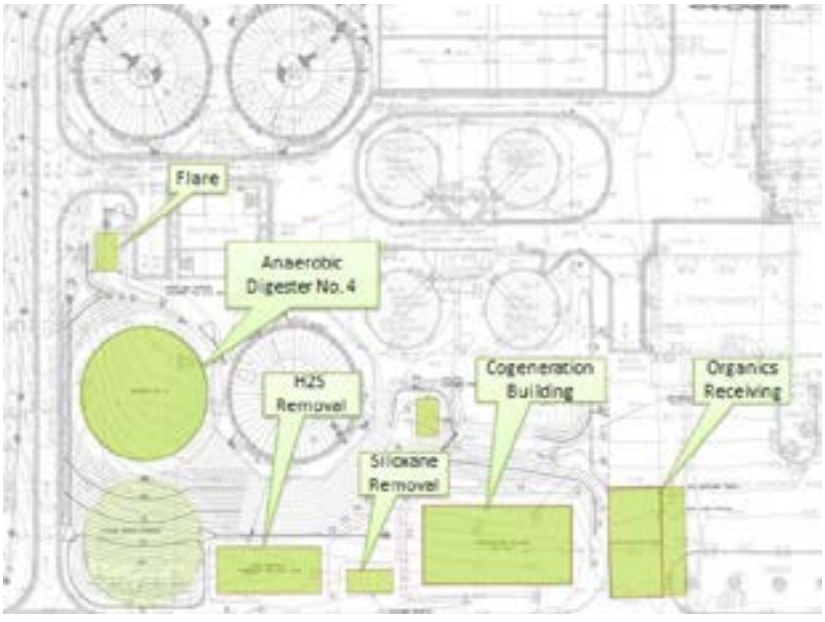

GLSD Co-Digestion & Energy Recovery Facilities. Photo Credit: GLSD

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Minnesota: Regionalization Creates the Central Iron Range Sanitary Sewer District

In the early 2000's, three small communities on Minnesota's Iron Range were facing expensive upgrades to their outdated wastewater treatment plants, coupled with increasingly stringent permit limits for phosphorus and mercury to meet water quality standards for Lake Superior. Initially, the cities of Chisholm, Buhl, and Kinney planned to keep and upgrade their separate treatment facilities. However, community leaders decided to consider a regional alternative. When cost estimates for creating a single regional facility came in at half the cost of separate upgrade projects, the Central Iron Range Sanitary Sewer District was born.

Benefits of Regionalization

By working together, these three small Minnesota communities developed an innovative, sustainable, and cost-effective treatment facility that will serve the area's needs for decades. It will also protect Lake Superior by meeting stringent phosphorus and mercury limits established in the Great Lakes Water Quality Agreement. District communities have realized an estimated savings in excess of $1 million in annual operation, maintenance, management, and debt service costs when compared to the multiple facility alternative. This is in addition to an estimated $8 million savings in initial capital cost. Also, the project reduced the number of National Pollution Discharge Elimination System permits and permitted discharge points from three to one, reducing monitoring requirements.

Paving the Way for Growth

Prior to the creation of the Central Iron Range Sanitary Sewer District, communities were under development moratoriums because their wastewater treatment plants were at capacity. The project paves the way for growth by providing the opportunity for industrial and commercial development in member communities. Most significantly, the facilities provide expandable state-of-the-art secondary and advanced treatment technologies that achieve current and future protective discharge limits to the Great Lakes basin in a cost-efficient manner.

Sequencing Batch Reactors. Photo Credit: Central Iron Range Sanitary Sewer District

Meeting the Requirements of the Great Lakes Agreement

The new regional treatment facility allows the communities to meet the requirements of the Great Lakes Water Quality Agreement. Their existing facilities that were operating at capacity and beyond their useful life were not meeting the requirements. The new facility helps protect Lake Superior by using a tertiary treatment system to reduce the average monthly mercury discharge to 1.8 nanograms per liter.

Funding Mechanism

The Iron Range Resources and Rehabilitation Board provided $5.5 million in grants for planning and preliminary design of the district. To finance the $22.2 million for phase one of the project, the district obtained $8.5 million in CWSRF loans and $13.7 million in state grants. The phase two project cost is $5 million, financed with an additional $2.7 million CWSRF loan and $2.3 million state

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Missouri: Upper White River Basin Watershed Onsite Wastewater Treatment System Remediation Project

The Missouri Department of Natural Resources (DNR) and the Upper White River Basin Foundation are working together to help homeowners repair or replace failing septic systems within the Upper White River Basin Watershed. This southwest Missouri watershed is known for its high quality water resources which support the tourism and recreation industries associated with Table Rock Lake and Lake Taneycomo. According to the U.S. Army Corps of Engineers, Table Rock Lake's recreation industry alone generates $2 to $3 billion per year. Despite the area's large tourism industry, significant portions of the counties in the watershed have median household incomes lower than the state average, making it difficult for these homeowners to secure traditional loans for septic system repairs.

Replacing Failing Septic Systems

The Upper White River Basin Foundation developed an innovative onsite septic remediation program that helps homeowners within the watershed repair or replace failing septic systems. The foundation uses CWSRF grant funding to make grants and no-interest loans available to eligible homeowners in Missouri's portion of the watershed. Once individuals apply, the foundation uses the income level of the homeowner to determine the amount of grant funds and zero-interest loans they are eligible to receive.

Empowering Residents through Remediation Financing

By financing septic remediation projects in the Upper White River Basin, the foundation is helping homeowners protect themselves and their watershed. Improperly constructed and poorly maintained septic systems can pose human health risks and can cause substantial pollution to groundwater and surface water. Through this program, homeowners have prevented 6.7 million gallons of untreated sewage from entering the area's water annually. Untreated sewage that reaches Table Rock Lake and Lake Taneycomo contributes to nutrient loading that can lead to algal blooms. This program empowers residents in areas without municipal sewer service to help keep the region's economically vital water resources clean.

Funding Mechanism

DNR initially awarded the Upper White River Basin Foundation a $1 million CWSRF grant in 2011 for a pilot program to address failing septic systems, and the foundation secured a $135,000 grant from the Missouri Department of Conservation to pay for administration costs of the program. Due to the measurable success of the program, which initially funded the repair or replacement of 138 systems, DNR awarded an additional $1 million CWSRF grant to the foundation in 2016 to continue the work. The foundation has since funded an additional 100 septic systems using about half of the second grant combined with loan repayments from the original projects.

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An Old, Collapsed Septic Tank.
Photo Credit: Missouri DNR

Setting a New Treatment Tank.
Photo Credit: Missouri DNR

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Nebraska: Hasting's Aquifer Storage and Restoration Project

The City of Hastings collects raw well water from municipal wells throughout the community, which then flows directly into the city's water distribution system without treatment or storage. Increasing levels of nitrate and uranium contaminants have been detected in large areas of source water for Hastings, posing a significant threat to the community's drinking water. The city developed the aquifer storage and restoration (ASR) project to address the contaminant issue by directly treating the source water.

Nonpoint Source Pollution

After well tests conducted in the wellhead protection area indicated high levels of nitrate and uranium pollutants in the groundwater, Hastings looked for the source of the pollution and for a solution. The city found that land-applied fertilizer, coupled with excessive irrigation and untimely, heavy rains, carried nitrates past the root zone and into the groundwater. The excess nitrates and conditions in the aquifer contribute to the mobilization of uranium into the groundwater. This creates large plumes of polluted groundwater around Hastings that move toward the city and contaminate the city's water supply.

Treating the Water

Conventional nitrate treatment available to Hastings through construction of a full-scale water treatment facility was estimated to cost the city more than $100 million over 20 years. This was not a sustainable option for the community and Hastings sought alternative ways to treat the growing nitrate issue. The city discovered that an innovative approach could provide a solution while substantially reducing capital investments and infrastructure and operating costs.

The Hastings ASR project is designed to reduce the amount of water treatment required to ensure the city has potable water. Studies found that water at the top of the aquifer has the highest nitrate levels whereas the water at the bottom is cleaner. Using multi-level pumping, individual wells in the ASR pull low- and high-quality water without mixing. Some of the low-quality water is stored and may be land applied for crop cultivation or for the city's green sites. The high level of nitrates in this water may reduce the need to add more nitrate-based fertilizer. Cleaner water from deeper in the aquifer and some of the low-quality water is treated using reverse osmosis to remove nitrate and uranium and then injected back into the aquifer. This cleaner water combines with other water in the aquifer to supply water that meets drinking standards to municipal wells down gradient. Additionally, because the aquifer has nearly unlimited capacity and can be used as a storage tank, Hastings does not need to upsize its drinking water systems for peak demand periods.

Funding Mechanism

The total estimated cost of the Hastings ASR Project is approximately $11.2 million. The CWSRF is providing funding for $7 million through low-interest loan financing, and the Department of Natural Resources is providing a $4.2 million grant.

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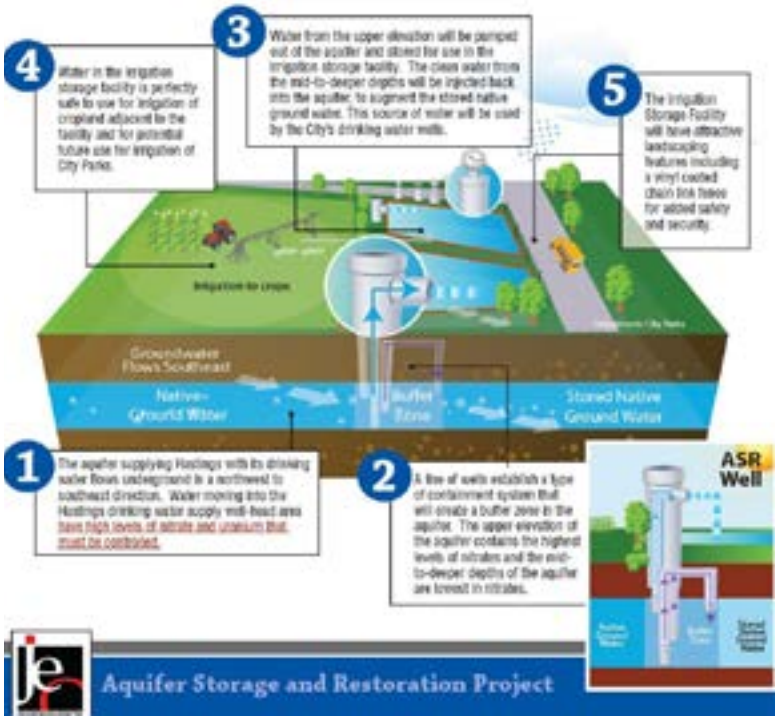

Image Credit: Nebraska DEQ

This factsheet was developed by the Environmental Council of the States. It is one of twelve factsheets on how states have used flexibility in the Clean Water State Revolving Loan Funds to pursue innovative projects. To view the other factsheets and information on other state projects visit www.ecos.org.

CLEAN WATER STATE REVOLVING FUND:

A *Flexible Tool* for Advancing Clean Water

Ohio: Helping Small Wastewater Treatment Plants Achieve Compliance

Small wastewater treatment plants (WWTP) throughout Ohio experience challenges with retaining knowledgeable and trained operators, and staying in compliance with wastewater discharge permits due to aging equipment or facilities. To help these systems achieve and maintain compliance, the Ohio Environmental Protection Agency (Ohio EPA) initiated a training and outreach program for small WWTP operators in the state.

Workshops for Achieving Compliance

Under Ohio EPA's Package Plant Initiative, WWTP operators were trained on better process controls including the use of low-cost tools and equipment to achieve and maintain compliance. Beginning in 2015, six workshops were offered across the state by Ohio EPA's Division of Environmental and Finance Assistance (DEFA) and Division of Surface Water in partnership with the Ohio Water Development Authority (OWDA). In addition to classroom and on-site training, each participating WWTP also received basic testing supplies and a comprehensive process control manual at no cost.

The program established Process Tools Libraries at each of the five Ohio EPA district offices. Participating WWTP operators can use these libraries to borrow equipment such as a dissolved oxygen meter or a centrifuge for use in their process control efforts. Operators were also given the opportunity to join an online forum to share lessons learned, assist each other, and ask questions of process control experts at Ohio EPA. A total of 288 attendees, representing more than 200 small WWTPs, participated in the statewide workshops.

Compliance Assistance Results

This statewide initiative to assist small WWTP operators is an example of how a state agency can help small community systems achieve compliance and operate more efficiently. In addition to these and other workshops, DEFA's Compliance Assistance Unit conducts on-site assessments to help WWTP operators maintain compliance. As a result of these efforts, the agency is seeing improved operations and compliance at many participating plants.

Community Outreach Creates Environmental and Economic Impact

Operating more WWTPs in compliance with permits keeps pollutants out of Ohio's streams and water bodies and protects human health and the environment. Additionally, the free training and resources help communities reduce their operations and maintenance costs while avoiding costs associated with non-compliance such as penalties and legal fees.

Funding Mechanism

Ohio EPA's DEFA staff are funded by CWSRF administrative fees and provide training and follow-up for this WWTP training program. OWDA contributed $250,000 for the purchase of low-cost diagnostic equipment for training workshops. All workshops and tools were provided to participants at no cost.

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One of the Statewide Workshops. Photo Credit: Ohio EPA

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CLEAN WATER STATE REVOLVING FUND:

A *Flexible Tool* for Advancing Clean Water

Pennsylvania: Mussels for Clean Water

Pennsylvania's Susquehanna River supplies over 50% of the flow to the Chesapeake Bay, which is under a U.S. EPA-established Total Maximum Daily Load requiring nutrient and sediment reductions. The Delaware Estuary is one of Pennsylvania's coastal zones supplied by the Delaware River and is impacted by nutrients and sediment originating from highly urbanized areas. To address nutrient pollution in the Chesapeake Bay and Delaware Estuary, the Partnership for the Delaware Estuary will construct a mussel hatchery and associated rearing facilities to supply mussel stock. Mussels placed in the main stem and lower tributaries of the Delaware and Susquehanna Rivers will act as filters and help purify the water.

Building Mussel Hatcheries

The Pennsylvania Infrastructure Investment Authority (PENNVEST) has provided the Partnership for the Delaware Estuary funding to construct a full-service hatchery for native species of freshwater mussels. The hatchery will produce hundreds of thousands of mussels annually. As a single adult mussel can filter up to 20 gallons of water a day, the potential water quality impacts are significant. The hatchery is part of a larger water quality improvement project that will include mussel ponds and farms. The ponds will be used to grow the mussel seed for a year. Pond rearing supports fast growth and prepares the animals for conditions in the wild. The farms, concentrated populations of adult mussels in stationary frames, will be located where the water-filtering capability of mussels is most needed in both the Susquehanna and Delaware River watersheds. This project will, for the first time, create a reliable and healthy supply of native freshwater mussels for use in stream and river restoration and in pollution reduction projects.

Surplus mussels will be reintroduced into Pennsylvania streams that are impaired for nutrients. Additionally, approximately 25% of the mussel seed and pond-reared mussels will be sold for restoration projects. This mussel farming cycle will occur annually, increasing the cumulative benefit over time.

Return on Investment

It is estimated that after 30 years this project will have removed more than 100 million pounds of nitrogen from the two watersheds. When calculated against PENNVEST's investment, this translates into a cost of approximately eight cents per pound of nitrogen removed. If anticipated operating and maintenance costs, which will not be a PENNVEST expense, are factored in, this translates into a cost of 18 cents per pound of nitrogen removed. In addition to the cost-effective nitrogen removal, this project may also net revenues to PENNVEST from the sale of mussel seed and pond-reared young and adults.

Funding Mechanism

PENNVEST invested $7,934,000 to fund the construction of the hatchery. Other partners will fund the construction of the other facilities as well as operation and maintenance costs.

Juvenile mussels in a dish.
Photo Credit: PENNVEST

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