



## Addressing Manganese in Drinking Water with the Drinking Water State Revolving Fund

Communities may use the Drinking Water State Revolving Fund (DWSRF) to address manganese contamination in drinking water systems.

### BACKGROUND

Manganese is a naturally-occurring element that can be found in air, soil, and water and is an essential nutrient for humans. Therefore, lower concentrations of manganese have health benefits<sup>1</sup>, and higher concentrations levels can be toxic. The U.S. Environmental Protection Agency (EPA) created [health advisories \(HAs\) for manganese](#), which are concentrations in drinking water at or below which health effects are not anticipated to occur over a specific duration. For manganese, drinking water concentrations above the lifetime HA are not necessarily harmful to the majority of the general population. However, elevated manganese exposure could impact those who have decreased ability to excrete manganese (e.g. those with liver disease).

EPA also established a National Secondary Drinking Water Regulation that set non-mandatory water quality standards for manganese. When manganese is present in drinking water at levels above the secondary maximum contaminant level

(SMCL) (0.05 mg/L), it may cause a black or brown appearance, black staining, or a bitter metallic taste. While not harmful to public health, these noticeable effects may cause people to stop using water from their public water system even though the water is safe to drink at the level of the SMCL.

### MANGANESE TREATMENT TECHNOLOGIES

There are several effective treatment technologies available for manganese removal in drinking water, including catalytic precipitation (typically by greensand with permanganate or chlorine backwashes); oxidation and filtration (e.g., with ozone or permanganate to form particulates and then physical removal by filtration with low-pressure membranes or lime softening); and biological treatment.

#### Additional Resources on Manganese in Drinking Water:

EPA's Drinking Water Health Advisory for Manganese:  
[https://www.epa.gov/sites/production/files/2014-09/documents/support\\_cc1\\_magnese\\_dwreport\\_0.pdf](https://www.epa.gov/sites/production/files/2014-09/documents/support_cc1_magnese_dwreport_0.pdf)

EPA's National Secondary Drinking Water Regulations:  
<https://www.epa.gov/sdwa/secondary-drinking-water-standards-guidance-nuisance-chemicals>

<sup>1</sup> Dietary Reference Intakes (2001) National Academy of Sciences, National Academy Press. Manganese pp.402-404.

## DWSRF ASSISTANCE

The DWSRF can provide financial assistance to publicly owned and privately owned community water systems, as well as non-profit non-community water systems, for drinking water infrastructure projects. Projects must either facilitate the system's compliance with national primary drinking water regulations or significantly further the health protection objectives of the Safe Drinking Water Act (SDWA).

Each of the 50 states and Puerto Rico operates its own DWSRF program. They receive annual capitalization grants from EPA, which in turn provide low-interest loans and other types of assistance to water systems. Repayments of DWSRF loans begin up to 18 months after project completion, with loan terms up to 30 years for most communities, or up to 40 years for disadvantaged communities.

Additionally, states may use a portion of their capitalization grant from the EPA as "set-asides" to help communities build the technical, managerial, and financial capacities of their water systems. With an emphasis on small systems, these funds help ensure sustainable infrastructure and public health investments.

### Treatment

DWSRF assistance can be used to upgrade treatment technologies, like building a new treatment plant or expanding an existing facility to add manganese removal capability. DWSRF set-asides can be used for laboratory or testing equipment for research or contamination evaluation.

### Outreach and Training

Although routine/compliance monitoring is not eligible for DWSRF funding, outreach and training for water system operators is an eligible set-aside activity. This can include one-time monitoring at a system to show operators how to conduct manganese monitoring themselves. States can also use DWSRF set-aside funds to present workshops, seminars, and other training events that provide operators with ongoing educational opportunities regarding manganese treatment.

## Planning and Optimization

States can use DWSRF set-asides to help water systems conduct studies and evaluations to determine the best approach for addressing manganese. For example, these evaluations can include pilot testing for treatment alternatives or a cost-benefit analysis of various approaches to address manganese. Since these evaluations are likely to result in a capital improvement project, assistance can also be provided from the loan fund. DWSRF set-asides, or loans, can also be used for the planning and design of infrastructure projects that address manganese.



### Source

For some water systems, finding a new source of drinking water could be a cost-effective solution for manganese contamination if their current drinking water source is contaminated. DWSRF assistance can be used to locate and create a new drinking water source, such as drilling a new well. Set-asides can be used for special testing of the new drinking water source or legal fees associated with finding a new source. With EPA's 2019 [class deviation](#) for water rights, the DWSRF can be used to obtain rights to the new source of water.

## LEARN MORE ABOUT FUNDING

DWSRF assistance is distributed directly from state agencies. Each state has its own procedure. Contact information for each state is available at <https://www.epa.gov/drinkingwatersrf/state-dwsrf-website-and-contacts>.



For more information, visit: [epa.gov/dwsrf](https://www.epa.gov/dwsrf)



## DWSRF Case Studies: Manganese in Drinking Water

How communities are using the Drinking Water State Revolving Fund (DWSRF) to address manganese contamination in drinking water systems.

### WOODLAND SUMMIT, CT

The Woodland Summit Community Water Association (WSCWA) utilized \$280,000 in DWSRF funding, including \$70,000 in principal forgiveness, for various water system improvements. This project included replacement of the old water storage tank and iron/manganese filtration systems, removal of older pressure storage tanks, and installation of a new radon treatment system and treatment residuals disposal system.

The WSCWA water system was built in 1965, prior to the Safe Drinking Water Act, and was in poor condition due to lack of maintenance and capital investment. Groundwater wells had high levels of iron, manganese, and radon, and the filtration system had exceeded useful life and was poorly functioning. Additionally, WSCWA's 55-year-old storage tank had never been inspected and was out of compliance with the state's 10-year inspection requirement.

As part of this project, WSCWA worked with Resources for Communities and People to utilize Check-Up Program for Small Systems software and implement a comprehensive and sustainable asset management plan.

Through the asset management plan, WSCWA was able to prepare a series of water rates adjustments to support DWSRF loan repayment and provide funding for future capital investments. Of note, WSCWA is run by volunteer leadership who worked together to adjust water rates and invest in public health protection for the community.



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EPA's National Secondary Drinking Water Regulations:  
<https://www.epa.gov/sdwa/secondary-drinking-water-standards-guidance-nuisance-chemicals>



## WILLIAMS, CA

The City of Williams was in violation of California's manganese secondary MCL and utilized DWSRF funding to address this issue. In 2019, the city received \$405,000 in DWSRF assistance for the development of design drawings and environmental documents for the upcoming construction of a new well with manganese filtration. This new well supplements the existing wells with reduced capacity due to sanding and water quality issues. The city is constructing the new well with manganese treatment to address their State drinking water violation and provide safe drinking water to 5,250 residents.

## MARLBORO, NJ

In 2016, the Township of Marlboro received approximately \$12 million in DWSRF assistance for construction of the Harbor Road Water Treatment Plant. This new facility was necessary to replace an old and outdated water treatment plant and reduce levels of iron, manganese, and total dissolved solids from the drinking water. Project components included a filtration building with 10 vertical filter pressure filters, chemical feed systems, backwash recycling system, pumping equipment, and ancillary facilities. The building also contains laboratory, control rooms, and electrical equipment. This DWSRF project provided the township's 31,500 residents with reliable, safe drinking water.



## SHREWSBURY, MA

This project involved construction of manganese treatment at the Town of Shrewsbury's existing water treatment facility. Manganese concentrations in the town's drinking water were increasing, and this project was a proactive measure to reduce manganese levels before they became too high to control through blending. To achieve this, the town incorporated manganese filters into the treatment process. Three filter technologies were utilized: the first two were common media options for manganese treatment. The third was Mangazur filter media, a new technology, that is uncommon in the northeastern region of the country. The town's water treatment facility is considered a "pioneer" in Mangazur filter media. This project, which was co-funded with \$12 million in DWSRF funding and a state grant, was completed in June 2019 and increased drinking water quality for the town.



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