

MEMORANDUM

Date: November 23, 2021
To: Water Utility Board
From: Joe Grande & Kelly Miess, Co-Project Managers
Subject: Advertise for Engineering Design Proposals for Unit Well 19 Treatment Project

RECOMMENDATION

Authorize Madison Water Utility (MWU) staff to advertise for engineering consulting services for the design and construction of a filtration system, and other improvements, at Unit Well 19.

BACKGROUND

This project proposes to mitigate water quality deficiencies at a critical water supply facility in alignment with Water Utility Board policies. Removing these deficiencies will support MWU's core mission to provide high-quality water for consumption and fire protection. It will also help MWU achieve its goals for adequate water quality and quantity, operational optimization, and overall system reliability.

Unit Well 19 is located on an easement on University of Wisconsin-Madison property off Lake Mendota Drive, immediately east of the University's Eagle Heights student housing complex. Unit Well 19 is in Pressure Zone 6–West, a large pressure zone that extends west from the Yahara River to the southwest shores of Lake Mendota, and south to the City of Fitchburg border. The well is a critical supply point for the University, MWU's largest customer, and contributes significantly to Zone 6–West water supply.

Constructed in 1974, Unit Well 19 consists of a deep well pump, three booster pumps and a 3-million gallon ground-level reservoir. MGE owns and maintains a stand-by generator on the site. The well runs year-round and pumps 300 to 500 million gallons annually; in 2020, the well delivered 293 million gallons, representing 24% of its potential pumping capacity

Water Quality

The 2005 Infrastructure Management Plan assessment found the facility in good working condition but noted an issue with poor water quality, specifically iron and manganese. Elevated iron and manganese causes brown/black discoloration of drinking water, affecting customer satisfaction and resulting in negative perceptions of water safety, and potential staining of laundry and plumbing fixtures. In 2019, the Water Utility Board revised the utility's Treatment Policies to require implementation of source water

treatment where average annual concentrations of iron or manganese exceed 0.1 mg/L or 0.02 mg/L, respectively. Since 2018, the average monthly measurements at Unit Well 19 have been 0.21 mg/L iron and 0.045 mg/L manganese; five samples exceeded the Secondary Maximum Contaminant Level (SMCL) for manganese, 0.05 mg/L. While the SMCL is a recommended guideline for utilities, the latest scientific evidence supports a lower aesthetic target for manganese, 0.02 mg/L¹, a level that is consistent with adopted WUB policy.

¹ Brandhuber, P., S. Clark, W. Knocke, and J. Tobiason. 2013. *Guidance for the Treatment of Manganese*. Water Research Foundation. Denver, CO.

Rising combined radium levels have been a growing concern at Unit Well 19. Since 2018, two samples surpassed the regulatory limit of 5 pCi/L, with seven more exceeding the 80% threshold established by WUB policy that triggers source reductions. A 2018 MWU pilot study demonstrated that pyrolusite filtration alone, the recommended treatment for iron and manganese removal, could lower radium by 30 to 50%, while hydrous manganese oxide (HMO) addition would further reduce radium levels and the associated cancer risk.

The table below compares current water quality at Unit Well 19 to the national primary and secondary drinking water standards, and the established Water Utility Board policies.

Contaminant	Primary MCL (Enforceable)	Secondary MCL (Non-Enforceable)	Water Utility Board Policy	August 2021 Results	Condition Notes
Radium	5 pCi/L	--	4 pCi/L	4.1 pCi/L*	2 MCL Exceedances in Preceding 2 Years
Manganese	--	0.05 mg/L	0.02 mg/L	0.046 mg/L	Above WUB Policy
Iron	--	0.3 mg/L	0.1 mg/L	0.23 mg/L	Above WUB Policy

* Running annual average of quarterly samples

Project History

The Well 19 treatment project originally was planned for 2018 design and 2019 construction. A Request for Proposals (RFP) for design services for iron, manganese and radium treatment was authorized by the Board and issued in late July 2017. In September 2017, an internal utility evaluation team reviewed and ranked three proposals, and unanimously recommended hiring Strand Associates for pilot testing and conceptual design.

Pilot testing began in spring 2018 after securing DNR approval for the testing protocol. Around the same time, the decision was made to delay the construction of the project indefinitely due to lack of funding. Strand submitted the pilot testing and conceptual design reports to MWU in early 2019.

The conceptual design report identified the mitigation alternatives considered including developing an alternate source, blending, pyrolusite filtration, and three other Best Available Technologies (BAT)

including reverse osmosis, ion exchange and lime softening. The recommended treatment was pyrolusite filtration, with the alternatives eliminated due to high capital and operation and maintenance costs, challenging water chemistry and/or troublesome waste streams.

Madison Water Utility has had excellent success with iron and manganese filtration with levels reduced by over 90% to well below the respective secondary MCLs. MWU commissioned its first iron and manganese filter at Well 29 in early 2009. A second filter was installed at Well 7 in 2015. The Utility's third filtration system was installed with construction of Well 31 in 2017. In 2020 these wells combined to produce 1.36 billion gallons of high-quality water, representing about 16% of the total water delivered by MWU.

To date, the Utility has no experience with radium treatment beyond pilot testing. Pilot testing results indicate that radium could be reduced 30 to 50 percent with just the standard pyrolusite filtration used for iron and manganese treatment. Strand recommended this treatment option along with dedicated space for the addition of Hydrous Manganese Oxide (HMO) treatment specifically to reduce radium, if needed in the future. With the planned construction, MWU will be required to bring the 50-year old facility up to current DNR standards, and additionally intends to replace the original end-of-life pumps and system controls.

Estimated Cost

The total design and construction project budget for the project is estimated at approximately **\$7.6 million**, distributed as follows:

- Engineering Services: \$900,000 (2022 Budget)
- Facility Construction: \$6,700,000 (2023 Budget)

Total Estimated Project Cost: \$7,600,000

Staff Availability

MWU Engineering staff does not have the expertise in filtration system and building retrofit design required to complete this project. However, MWU will work closely with the selected consultant to ensure project objectives are met.

Recommendation & Request for Approval

Given the critical importance of Well 19 to the Utility's supply and distribution system, and MWU's commitment to providing high-quality water, staff recommends a pyrolusite filtration system for Well 19, and other ancillary upgrades. Staff therefore requests authorization to advertise for engineering consulting services for engineering design, bidding services and construction administration for Well 19 Treatment Project.