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ENVIRONMENTAL PROTECTION

State Water Resources Control Board
Division of Drinking Water

September 23, 2022 PWS# 3210011

Plumas Eureka CSD
200 Lundy Lane
Blairsden, CA 96103

Attention: John Rowden – Project Manager

Subject: Proposed Arsenic Treatment Pilot Study Reviews

On July 15, 2022, the Plumas Eureka CSD (District) submitted two proposals for arsenic treatment pilot testing to the Division of Drinking Water (Division) for review. One proposed pilot test protocol (Farr West Protocol) dated July 7, 2022, was prepared by Lucas Tipton, P.E., of Farr West Engineering. The other proposed pilot test protocol (Murraysmith Protocol) dated June 2022 was prepared by Lee Odell, P.E., of Murraysmith Engineering. Each protocol used data gathered from on-site bench scale jar testing conducted by Farr West and WesTech Engineering (WesTech) in May 2022.

An evaluation of the two pilot test protocols was conducted by Division staff engineers Michael Burgess and Nick McGann. Our comments are summarized in the enclosed memorandum dated September 22, 2022. In summary, the Farr West Protocol follows the Division's Arsenic Pilot Study Guidelines, while some items need further clarification. The Murrysmith Protocol did not contain sufficient information to fully evaluate whether it would follow the Division's guidelines.

If you have any questions, please contact Nick McGann at (530) 224-3269 or me at (530) 224-4828.

Stephen W. Watson, P.E.
Lassen District Engineer
Drinking Water Field Operations Branch

Enclosure

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State Water Resources Control Board
Division of Drinking Water

TO: Stephen W. Watson, P.E.
Lassen District Engineer
Division of Drinking Water

FROM: Michael Burgess and Nick McGann
Lassen District Staff Engineers
Division of Drinking Water

DATE: September 22, 2022

SUBJECT: Plumas Eureka CSD, System #3210011, Proposed Arsenic Treatment Pilot Testing

Introduction

On July 15, 2022, the Plumas Eureka CSD (District) submitted two proposals for arsenic treatment pilot testing to the Division of Drinking Water (Division). One proposed pilot test protocol (Farr West Protocol) was prepared by Farr West Engineering and is dated July 7, 2022, and the other proposed pilot test protocol (Murraysmith Protocol) was prepared by Lee Odell, P.E., Murraysmith Engineering and is dated June 2022. An evaluation of the two pilot test protocols with regards to their conformance to the Division's Arsenic Pilot Study Guidelines follows.

Farr West Protocol

Pilot Testing Set Up

The proposed pilot test protocol will test the effectiveness of hypochlorite as an oxidant combined with Polyaluminumchloride (PACl) as a primary coagulant versus the use of potassium permanganate (KMnO4) as an oxidant with alum as a primary coagulant. Magnafloc LT27 will be used as a filter aid in both cases. A 5 gpm side stream of water from Well 02 will be injected with hypochlorite solution followed by PACl and Magnafloc or a KMnO4 solution followed by alum and Magnafloc. The side stream is then split evenly between four, 4-inch diameter, filters containing Omni-SORB filter media. The filters will be run to completion (filtration followed by backwash) twice and the run times noted.

Stage 1, Chemical Dosage Verification

A side stream from Well 02 will be set at 1.40 gpm, which corresponds to a filter-loading rate of 4.0 gpm/ft^2. The chemical dosing pumps will be set at the dosages determined in the bench top testing, and the water will be split evenly between the four pilot filters. Two raw water samples will be collected at the beginning of each test run. After operating the filters for two to four hours or approximately half of the total run time determined during the pilot test set up, two filter effluent

samples will be collected from each filter. One sample from each of the sets will be tested in the field for iron, manganese, arsenic, and phosphate and the second sample from each set will be sent to a lab for verification of the results obtained in the field. If all results are below their respective maximum contaminant levels (MCLs), a second filter run will be performed using the same chemical dosages. If all results are not below their respective MCLs, the oxidant, coagulant, and filter aid dosages will be adjusted, and another filter run will be performed. Filter runs will continue to be performed until the results are less than their respective MCLs in two consecutive filter runs with the same chemical dosage.

Stage 2, Maximum Filter-Loading Rate Determination

Using the verified chemical dosages from Stage 1 operate one of the four filters at each of the following filter-loading rates: 4.5 gpm/ft^2, 5.0 gpm/ft^2, 5.5 gpm/ft^2, and 6.0 gpm/ft^2. Run the filters to backwash and record the total run time for each filter (note: each filter must be monitored separately as higher filter-loading rates may result in shorter run times before the pressure differential reaches the maximum allowable). Collect dual sample sets for arsenic, iron, manganese, and phosphate from the raw water and from each filter effluent at the end of the run and halfway through the recorded total filter run time for the different loading rates. One sample from each set will be tested in the field and the second sample from each set will be sent to a lab for analysis.

If the filters do not achieve the MCL/target concentration for each constituent, increase the chemical contact time prior to the filters and do a complete filter run to backwash again, following the same sampling procedure. Once the effluent from each filter achieves the MCL/target concentration for each constituent in three consecutive filter runs, then follow the same procedure at the following increased filter-loading rates: 6.5 gpm/ft^2, 7.0 gpm/ft^2, 7.5 gpm/ft^2, and 8.0 gpm/ft^2 until the effluent achieves the MCL/target concentration for each constituent in three consecutive runs.

Stage 3, Continuous Operations To Verify Operational Practices

Using the maximum filter-loading rate with favorable constituent concentrations, operate the filters for a total of four run cycles over two days. Collect dual sample sets for arsenic, iron, manganese, and phosphate from the raw water and from each filter effluent at the end of each run and half way through the filter run time determined in Stage 2. Measure and record the quantities of chemicals used, water treated, volume of water used to backwash the filters, and volume of sludge created for each filter run.

Murraysmith Protocol

The pilot test proposal provided by Murraysmith does not contain sufficient information to evaluate whether or not it will follow the Division's Arsenic Pilot Study Guidelines.

Conclusions and Recommendations

The pilot test protocol proposed by Farr West Engineering meets the Division's Arsenic Pilot Study Guidelines for oxidation/filtration treatment. The protocol will evaluate the two oxidation/filtration treatments identified in bench scale testing for both effectiveness and factors effecting affordability (i.e. chemical usage, water used for backwashing, and solids production). The pilot testing will:

1) verify or further optimize the chemical dosages determined in the bench scale testing previously performed, 2) determine the maximum filter-loading rate for each proposed oxidation filtration technology using water produced by the District's Well 02, and 3) determine the chemical usage, water usage, and solids formation while operating at the maximum filter-loading rate and optimized chemical dosages determined in Stages 1 and 2 of the protocol.

However, there will be a need for ongoing chemical dosage optimization, especially since the pilot test does not take into account potential seasonal variations in water quality and temperature that might affect the formation of floc, and it does not account for seasonal variability in the concentrations of arsenic, iron, manganese, and phosphate in the raw water. Additionally, the following items were noted during the review of the pilot test protocol:

1. In the descriptions of Stage 2 of the pilot test protocol, it is stated that two samples will be collected from each filter "column halfway through the recorded total filter runtime for each loading rate." As was also pointed out in the Stage 2 test protocol the differing filter-loading rates may result in variable cycle lengths. The Protocol needs to state how the halfway point in the filter run will be determined.

2. The Stage 2 test protocol proposes to evaluate filter-loading rates up to 8.0 gpm/ft^2 and if necessary, increasing the contact time before the filters until the effluent achieves the MCL/target concentration for each constituent in three consecutive runs. If these goals are not met, the protocol needs to state how many runs will be performed before it is decided that the MCL/target concentrations are not achievable at a given filter-loading rate.

3. The protocol states that in Stage 3 the filters will be operated at the maximum filter-loading rate "with favorable constituent concentrations." However, the protocol does not define what constitutes "favorable constituent concentrations."