COUNTY OF SONOMA

575 ADMINISTRATION
DRIVE, ROOM 102A
SANTA ROSA, CA 95403

SUMMARY REPORT

Agenda Date: 12/13/2022

To: Board of Directors, Sonoma County Water Agency
Department or Agency Name(s): Sonoma County Water Agency
Staff Name and Phone Number: Todd Schram 707-524-1173
Vote Requirement: Majority
Supervisorial District(s): Countywide

Title:
Water Resources Investigations to Evaluate Streambed Clogging Impacts on Riverbank Filtration

Recommended Action:

A) Authorize Sonoma County Water Agency's General Manager to execute an agreement with United States Geological Survey, United States Department of the Interior, in a form approved by County Counsel, for water resources investigations for microbial controls on water availability during riverbank filtration through December 31, 2024, in the not-to-exceed amount of $375,000, and, consistent with other agreements, authorize Sonoma County Water Agency's General Manager to amend or terminate this agreement with approval of County Counsel.

B) Authorize Sonoma County Water Agency's General Manager to execute an agreement with Lawrence Berkeley National Laboratory, in a form approved by County Counsel, for water resources investigations for biogeophysics to monitor bathymetry, hydraulic conductivity, and bioclogging at Sonoma Water diversion facilities through December 31, 2024, in the not-to-exceed amount of $390,000, and, consistent with other agreements, authorize Sonoma County Water Agency's General Manager to amend or terminate this agreement with approval of County Counsel.

Executive Summary:
Sonoma County Water Agency (Sonoma Water) uses riverbank filtration (RBF) as a low cost and sustainable alternative to traditional drinking-water treatment. RBF relies on maintaining the natural hydraulic connection between surface water and groundwater across the streambed of the Russian River. The seasonal erection of Sonoma Water's inflatable dam near Wohler Bridge fosters accumulation of fine sediments and growth of biofilms in the streambed, which can lead to streambed clogging and an associated reduction in the water-withdrawal efficiency of Sonoma Water's RBF system. During the recent drought, reductions in water-withdrawal efficiencies at Wohler were significantly greater than have been observed in the past. Sonoma Water, the United States Geological Survey (USGS), and Lawrence Berkeley National Laboratory (LBNL) have a continued interest in collaborating on studies that provide data to better understand how recent drought conditions impact the magnitude and persistence of streambed clogging and associated reductions in water withdrawal efficiency of Sonoma Water's RBF facilities. This item requests authorization for Sonoma Water's General Manager to execute joint funding agreements with USGS and LBNL to collaboratively conduct these studies.

Discussion:
HISTORY OF ITEM/BACKGROUND

Sonoma Water serves over 620,000 residents in portions of Sonoma and Marin counties in California, using riverbank filtration (RBF) as a low cost and sustainable alternative to traditional drinking water treatment. Sonoma Water draws water from the Russian River through underlying bed sediments consisting of highly transmissive, poorly sorted alluvial sand and gravel. This downward flow is sustained by pumping from six collector wells with horizontal lateral screens located adjacent to the river's bank. Each collector well includes a 13 to 18 foot diameter vertical caisson extending roughly 80 feet below the streambed, with 6 to 12 intake laterals extending radially from the bottom of the caisson into the aquifer. When Russian River water levels are significantly reduced during the start of the dry season, beginning in late spring to early summer, a rubber dam is inflated to augment water yields for the three upstream collector wells (numbers 1, 2, and 6) by increasing the river stage and extent of the infiltration area behind the dam, thereby increasing groundwater levels and production capacity.

A downside of RBF operations is that they are affected more directly by changes in environmental conditions (e.g., droughts, floods, nutrients) than conventional systems. Thus, careful and ongoing study is needed to address any uncertainties that may exist from potential changes in surface-water quality and quantity in order to carefully plan for and mitigate operational risks and costs (e.g., pumping strategies). Even sensibly designed and operated RBF sites with relatively recent construction, such as Sonoma Water's Collector 6, completed in 2006, could be impacted by changes in the local environment and lead to reduced water withdrawal efficiency. The hydraulic connection between the river and groundwater must be sustained for RBF to function properly and modifications within the hyporheic zone of the riverbed could result in reduced permeability and consequent impacts on water production. Riverbed clogging (decreased riverbed permeability) has been attributed to changes in physical (precipitation, infiltration of suspended particles), mechanical (gas entrapment), biological (bacterial growth and reproduction), and chemical (precipitation, complexation reactions) processes. A better understanding of the controls on these types of disruptions to RBF performance would help to inform sustainable mitigation strategies.

Monthly average water levels in Collectors 1, 2, and 6 have shown gradual declines and associated reductions in water-withdrawal efficiencies over the last decade. Water-level declines have accelerated during recent historical drought conditions, especially for Collector 6 during summer 2021. These trends coincide with an absence of rainy-season high-flow events, lower-than-average summer river flows, and increased summer water temperatures. Research suggests that low summer flows and associated higher water temperatures accelerate biomass growth, while the absence of rainy-season high-flow events, which typically scour and redistribute riverbed sediments, likely increases the duration and magnitude of streambed clogging. However, more research is needed to understand the roles of reduced river velocities, temperatures, water quality, microbial activity, and riverbed scouring have on the extent of streambed clogging, observed water-level declines, and associated reductions in water-withdrawal efficiencies.

AGREEMENTS

Agreement with USGS:
Sonoma Water will coordinate with USGS to identify environmental drivers (winter storms, temperature, water quality) related to variability in abundance, structure, and persistence of microbial biomass within the hyporheic zone at Sonoma Water's RBF sites. Additionally, this work will identify temporal variations in the source (i.e., surface-water infiltrate versus ambient groundwater) of water recovered by RBF facilities using isotope analyses. The work will relate changes to microbial processes within the hyporheic zone and the

subsurface to reduced hydraulic streambed conductivities, the formation of an unsaturated zone, and ultimately reduced water production efficiency. Findings from this work will foster the development of prediction strategies to anticipate the magnitude, timing, and persistence of future clogging events.

USGS will collect and analyze groundwater, surface water, and streambed sediment samples to identify various factors related to water quality and biological responses in the Russian River streambed (e.g. streambed clogging) to changing climate, surface, and groundwater conditions, and predict possible future outcomes for riverbed filtration efficiency.

The cost of services for the agreement with USGS will not exceed $375,000. This agreement covers services rendered from October 1, 2022 to December 31, 2024.

Agreement with LBNL:
Sonoma Water will coordinate with LBNL to use geophysical and bathymetric methods to study changes in riverbed geomorphology, hydraulic conductivity, and unsaturated conditions at Collectors 1, 2, and 6. Past work applying geophysics and bathymetric methods to these collector wells have revealed variable conditions of riverbed hydraulic conductivity associated with changes in sediments and bioclogging, especially in the zone around the thalweg, which is a critical location for recharge to Collectors 1 and 2. The goal is to monitor the changes at these collector wells for changes in bathymetry and riverbed hydraulic conductivity before and after storm events, and during the low-flow summer dry season using geophysical methods. Time-lapse geophysical methods, as well as other in-situ information (temperature sensors, guelph permeameter) will be used to capture the streambed dynamics over space and time. This work is anticipated to help implement a long-term monitoring program to optimize pumping operations at these collector wells.

LBNL will install streambed sensors to monitor and assess changes in riverbed morphology in response to stream flow variability, and predict possible future outcomes for riverbed filtration efficiency.

The cost of services for the agreement with LBNL will not exceed $390,000; the term end date is December 31, 2024.

REQUEST FOR SONOMA WATER GENERAL MANAGER AMENDMENT AND TERMINATION AUTHORITY
Staff recommend that the Board authorize Sonoma Water's General Manager to amend or terminate the agreement with approval of County Counsel, including two options to extend the term for a period of one year each by providing written notice to the other party thirty days in advance of the expiration date of the agreement and of the first extension option. The extension will be formalized in an amended agreement or amendment signed by Sonoma Water and the other party.

County's Strategic Plan: N/A

Sonoma Water Strategic Plan Alignment
Water Supply and Transmission System, Goal 1: Protect drinking water supply and promote water-use efficiency.
Water Supply and Transmission System, Goal 2: Maintain and improve the reliability of the Water Transmission System.
Climate Change, Goal 1: Continuing improving our ability to respond and adapt to climate change.

This work will help Sonoma Water understand how environmental drivers, like drought and climate change, impact Sonoma Water's RBF system. Results will guide strategies to ensure future RBF system reliability and resilience to protect the region's drinking water supply.

Prior Board Actions:
N/A

FISCAL SUMMARY

Expenditures	**FY 22-23 Adopted**	**FY23-24 Projected**	**FY 24-25 Projected**
Budgeted Expenses	$725,000	$40,000	
Additional Appropriation Requested			
Total Expenditures	**$725,000**	**$40,000**	
Funding Sources			
General Fund/WA GF			
State/Federal			
Fees/Other	$725,000	$40,000	
Use of Fund Balance			
Contingencies			
Total Sources	**$725,000**	**$40,000**	

Narrative Explanation of Fiscal Impacts:
USGS Agreement: Budgeted amount of $375,000 is available from FY 2022/2023 appropriations for the Water Transmission Fund. No additional appropriation is required.

LBNL Agreement: Budgeted amount of $350,000 is available from FY 2022/2023 appropriations for the Water Transmission Fund. FY 2023/2024 appropriations will be budgeted in that fiscal year.

Staffing Impacts:			
Position Title (Payroll Classification)	**Monthly Salary Range (A-I Step)**	**Additions (Number)**	**Deletions (Number)**

Narrative Explanation of Staffing Impacts (If Required):
N/A

Attachments:
None

Agenda Date: 12/13/2022

Related Items “On File” with the Clerk of the Board:
None