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Flexible Nitrogen Reductions for a Healthier San Francisco Bay

October 26, 2026

Water quality trading offers Bay Area communities a flexible and effective way to meet new nutrient limits—and protect one of California's most iconic estuaries.

In 2022, a massive harmful algal bloom in the San Francisco Bay depleted oxygen in the water and killed a significant number of fish. To prevent such algal blooms from happening again, the state regulatory body, the Regional Water Quality Control Board, issued a Nutrient Watershed Permit in 2024, which controls summer nitrogen discharges from wastewater treatment plants (WWTPs) in the San Francisco Bay.

The cost to comply might be steep: projected at approximately $11 billion in WWTP upgrades across the Bay—a cost that may hit household bills.

The Bay Area Clean Water Agencies (BACWA), a group of 40 WWTPs that provide sewer services to more than 7 million people, has partnered with The Freshwater Trust (TFT), an environmental nonprofit, to explore cost-effective options for reducing nitrogen.

Nutrients such as nitrogen and phosphorus are by-products of human waste, food waste, detergents, and other sources that flow through pipes to WWTPs for treatment. Uniquely to San Francisco Bay, approximately 80% of nitrogen entering the Bay comes from WWTPs, making wastewater plants a primary focus for nutrient management. San Francisco Bay WWTPs historically have not been required to remove nutrients from treated wastewater released into the Bay, and the Bay has been resilient to high nutrient conditions. However, as the region's population has grown and environmental conditions have evolved, nutrient-driven ecological problems in the Bay have become more frequent, including deadly algal blooms.

"Public wastewater agencies that discharge to the San Francisco Bay are deeply committed to protecting the water resource," said Lorien Fono, Executive Director of BACWA. **"We are exploring solutions that maximize benefits to people and the environment while minimizing impacts to sewer rates."**

WWTPs need to continuously adapt to changes in water quality based on what people put down their pipes—choices that are outside WWTP control, but inside their responsibility to mitigate. The Nutrient Watershed Permit stipulates that WWTPs must reduce nitrogen discharges by 40% compared to 2022 levels. These changes need to be in place by 2034 and involve significant facility planning and construction—all while maintaining current water treatment operations. With all WWTPs facing the same deadline, demand for labor and materials may create competition for supplies and human capital, raising costs and timelines for complicated engineered solutions.

This adds up to a tall order for WWTPs to deliver big and lasting reductions in nitrogen on a relatively short timeline.

"We have seen complicated situations like this before, and we have successfully implemented innovative solutions," said Chris Thomas, Policy Specialist at The Freshwater Trust. Thomas is part of an expert team supporting BACWA in evaluating water quality trading as a flexible compliance option.

What Is Water Quality Trading?

Water quality trading (WQT) is a voluntary, federally approved alternative for compliance that can achieve greater nutrient reductions across a watershed at a lower cost. Instead of every WWTP making costly upgrades at their treatment plant, the WWTPs can coordinate across a watershed to invest in actions that deliver the greatest water quality benefit per dollar—wherever those actions are located. Thus, WQT enables WWTPs to look beyond their individual facility to achieve the required nitrogen reductions collaboratively, realizing greater benefits for the watershed at lower costs.

BACWA has tasked The Freshwater Trust with pursuing an evaluation of a nitrogen trading program. Analysis has included discussions with BACWA members, economic analysis, and collaborations with the San Francisco Estuary Institute (SFEI) on watershed modeling of WQT scenarios.

A watershed-wide program to reduce nutrients in the San Francisco Bay could include voluntary trades between wastewater treatment plants. One treatment plant facing high costs to comply with the nutrient regulations can purchase credits from another discharger that can achieve nutrient reductions more cost effectively.

"As an ecologist living in the Bay, I want the water protected *and* I want reliable and affordable sewer services. It just makes sense to consider successful and creative options, like water quality trading, to get more done at once," said Jessica Fox, Director of Integrated Compliance Solutions at The Freshwater Trust.

The Potential of Water Quality Trading

- **Collaboration:** Trading enables coordination across the Bay, turning individual compliance challenges into shared solutions.
- **Cost Savings:** Trading allows WWTPs to consolidate capital investments where they make the biggest difference, saving money for ratepayers in some cases.
- **Environmental:** Well-designed trading programs include safeguards and verifications so that trading delivers water quality outcomes.

Over the coming months, The Freshwater Trust will continue evaluating options for a trading program design that are responsive to the diverse realities of San Francisco Bay's WWTPs and the communities they serve.

Learn more

- **Program Overview:** Water Quality Trading: San Francisco Bay, BACWA
- **Report:** The Pulse of the Bay: Nutrients in the Bay, San Francisco Estuary Institute
- **Blog:** Water Quality Trading: A Smarter Way for Utilities to Meet Water Quality Goals, The Freshwater Trust