INFORMATION ITEM

Operation Baseline Update

Summary

Delta Stewardship Council (Council) staff and U.S. Geological Survey (USGS) scientists will provide an update on "Operation Baseline," a multi-year research initiative evaluating the water quality impacts of SacSewer's $1.7 billion EchoWater wastewater treatment plant upgrade. The Council launched this effort in 2016 to better understand how changes in nutrient inputs affect the Sacramento River and Sacramento-San Joaquin Delta ecosystem. USGS California Water Science Center staff will present highlights from several Operation Baseline studies, including new tools and approaches for understanding how nutrients and phytoplankton vary across space and time.

Background

The Sacramento Area Sewer District's EchoWater Resource Recovery Facility is the second largest inland discharger of its kind in the nation and processes about 135 million gallons of wastewater daily (enough water to fill over 200 Olympic-sized swimming pools each day). Treated wastewater discharged into the Sacramento River—particularly its ammonium content—was hypothesized to disrupt the Delta food web, threatening endangered Delta Smelt and other native fish species. In response, the Central Valley Regional Water Quality Control Board issued a 2010 mandate requiring advanced treatment to: remove ammonium and nitrate; further reduce pathogens by May 2021, and add new filtration and disinfection systems by May 2023.

SacSewer met the 2021 deadline through EchoWater, a $1.7 billion upgrade, including a 16-acre Biological Nutrient Removal facility, where ammonium is converted first to nitrate and then to nitrogen gas. The project eliminated nearly all ammonium and reduced total dissolved inorganic nitrogen concentrations by over 60% in the treated wastewater discharged into the Sacramento River and Delta.

Seizing the opportunity to study a potentially major shift in nutrients, and its effects on the Delta's food web, the Council invested nearly $4.5 million in multiple studies to develop tools and collect data—beyond monitoring required by regulators—to understand conditions prior to this large scale management change and to enable meaningful comparisons of water quality and the ecological responses after the upgrade. Many others contributed funding and in-kind resources for these and related studies. Broadly, this collaborative effort sought to:

- Establish a baseline of water quality, focusing on nutrients and phytoplankton, in the Delta.
- Assess the effects of a $1.7 billion upgrade to a major wastewater treatment plant in the Delta.
- Modernize and expand water quality monitoring to better capture spatial and temporal dynamics (how conditions vary across space and time).

Why measure nutrients and phytoplankton?

Phytoplankton, fueled by nutrients like nitrate, ammonium, and phosphate, are vital to understanding the Delta food web and threatened fish species. Too few nutrients limit productivity; too many triggers harmful blooms and invasive plants. Without the right balance of nutrients, healthy phytoplankton communities decline, altering the Delta food web and ecosystem. Past monitoring was inconsistent and too coarse to reveal these dynamics.

Modernizing Water Quality Monitoring

Prior to the EchoWater upgrade, the existing monitoring system was not designed to answer questions about how nutrients and phytoplankton interact across the Delta or to record baseline conditions. Operation Baseline addressed this need by modernizing and expanding water quality monitoring across the Delta, directly advancing the objectives of the collaborative effort.

Operation Baseline built on existing monitoring efforts and developed new approaches to improve how water quality is measured. As a result, these studies broadened the monitoring toolkit—from traditional grab samples to high-resolution surveys over the entire Delta and continuous real-time sensors—providing a more complete picture of nutrient levels, phytoplankton communities, and core water quality indicators such as temperature, salinity, clarity, and

dissolved oxygen. These new approaches have advanced our ability to track changes across space and time and to better understand the ecological effects of nutrient management actions.

Status of Objectives

Operation Baseline successfully established a Delta-wide water quality baseline, documenting pre-upgrade conditions for nutrients, phytoplankton, and related water-quality indicators. This baseline now supports meaningful before-and-after comparisons tied to the EchoWater upgrade. Analyses to date confirm that the EchoWater upgrade effectively removed ammonium from treated effluent and altered nutrient availability in the Sacramento River and upper Delta. Initial findings show shifts in nutrient ratios and phytoplankton composition following the upgrade, although the full ecological effects unfold over multiple years and continue to be assessed. Existing stockpiles of nutrients in the system may still have an impact for many years. As a result, the hypotheses about ammonium limitation of beneficial phytoplankton are not yet fully resolved and require continued monitoring.

For more details, please see the Operation Baseline Information Sheet (Attachment 1).

Science Action Agenda (SAA) High-Priority Research

Operation Baseline is responsive to priority science actions identified in the Science Action Agenda (SAA) (https://bit.ly/4oNdyxe). The first priority science action is #4A from the 2017-2021 edition—conduct studies to understand ecosystem responses before, during, and after major changes in effluent quantity or type from major Delta point sources, including treatment plants. The subsequent 2022-2026 SAA also highlighted the need for this work in Science Action #1C. To find out more, please visit: https://scienceactionagenda.deltacouncil.ca.gov/

Fiscal Information

The Council approved funding for the initial suite of studies in 2017. Additional studies were funded by the Council between 2019-2022 for a total investment of nearly $4.5 million. Research teams included USGS, San Francisco State University, San Francisco Estuary Institute, Cal Maritime, and Sacramento Area Sewer District. Other collaborators and data users contributed funds and in-kind resources to

related monitoring and special studies including the State Water Contractors, Delta Regional Monitoring Program, CA State Water Resources Control Board, CA Department of Water Resources, US Bureau of Reclamation, USGS, and others.

List of Attachments

Attachment 1: Operation Baseline Information Sheet

Contact

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