San Francisco Bay Nutrient Management Strategy

FY2025 Program Plan

May 2024

SFEI Contribution #1326

SFEI San Francisco Estuary Institute

San Francisco Bay
Nutrient Management Strategy
FY2025 Program Plan

May 10, 2024

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1. INTRODUCTION

This document summarizes work included in the FY2025 SFB Nutrient Management Strategy (NMS) Program Plan for FY2025, reviewed and discussed at the May 10, 2024 NMS Steering Committee (SC) meeting

An overview of the FY2024 Program Plan budget is presented in Section 2, including revenue sources and estimated expenses for Core Program and Project work. FY2024 work is described in more detail in Section 3, including: high level project description; recent progress or related work activities; FY2025 work; work products; and budget justification. Each project description also includes a schematic summarizing how the work aligns with NMS science/management priorities (See Science Plan Background for details).

2. FY2025 PROGRAM PLAN BUDGET

2.1 Summary

Table 1 provides an overview of the NMS FY2025 Program Plan Budget. Estimated revenue sums to $2,700,000 (row 5) and comes from three sources: NMS FY2025 Permit Funds; RMP Status and Trends funds for ship-based monitoring (row 3); and RMP special study funds (row 4).

Work for FY2025 (Expenses) is organized into Core Program (rows 5-8) and Projects (rows 6-9) . Total projected expenses sum to $2,700,000, leaving an estimated balance of $0.

Table 1 NMS FY2025 Program Plan (May 10 2024, Proposed)

FY2024 REVENUE (Estimated)

			Revenue
1	**R.1**	Nutrient Permit: FY2025 Funds [1]	2,200,000
2	**R.2**	RMP CY2024 special study funds [2]	250,000
3	**R.3**	RMP Contribution to ship-based monitoring [3]	250,000
4		**FY2024 Total Revenue**	**2,700,000**

FY2024 EXPENSES

			Expenses
	1. PROGRAM		
	Monitoring		
5	**C1**	Ship-based channel monitoring: sampling, analysis	520,000
6	**C2**	Mooring Network: data analysis, interpretation, maintenance	530,000
	Modeling		
7	**C3**	Biogeochemical model development and application	500,000
	Program coordination		
8	**C4**	Science Program Coordination	700,000
9		***Program subtotal***	***2,250,000***
	2. PROJECTS		
10	**P1**	Shoal monitoring South Bay, partial Central	100,000
11	**P2**	Synthesis: improved estimates of shoal Kd and evaluation of in-situ phyto community measures	70,000
12	**P3**	AF planning, analysis	20,000
13	**P4**	Synthesis #1: long-term conditions: wind, T, clouds, sun, PDO, Q, SSC	120,000
14	**P5**	Synthesis #2: intensive analysis, with model of highly-variable conditions, 2021,	120,000
15	**P5**	Science Planning effort (along with above)	20,000
16		***Projects subtotal***	***450,000***
17		**FY2024 Total Expenses**	**2,700,000**
18		**FY2024 Balance**	**0**

[1] NMS Permit Funding available for FY2024

[2] RMP contribution (from RMP Special Studies) has generally been ~$250,000, and has been used to offset C2 Mooring program costs. RMP will finalize funding decisions in Jul/Aug 2024.

[3] This funding goes directly to USGS to support ship-based monitoring, and offsets costs under C1.

3. FY2025 PROGRAM PLAN: CORE PROGRAM and PROJECTS

3.1 CORE PROGRAM

C1 Monitoring: Deep channel monitoring	Total FY25 Work	Other Funds	FY25 Permit Funds
Team: USGS, UCSC, Bend Genetics, BSA, SFEI	$519,000	$250,000*	$269,000

*Other Funds: RMP Status and Trends funding for water quality cruises

Project Description

This project supports biweekly to monthly ship-based water quality cruises along San Francisco Bay's (SFB) deep channel. Work is pursued through an on-going collaboration with the USGS aboard the *R/V* Peterson, continuing the USGS' long-term SFB water quality measurements. The overall program is jointly funded by USGS, the RMP, and the NMS.

Progress in FY2024

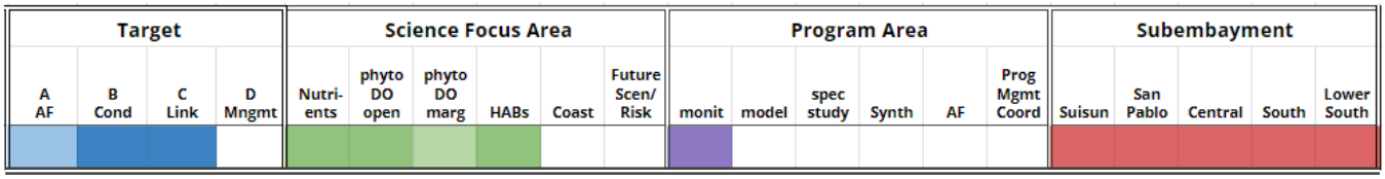
- Work is on track for there to be a total of 19 R/V Peterson cruises in FY2024, approximately half of them full-Bay cruises (south of Dumbarton Bridge to Rio Vista) and half South+Central Bay cruises (south of Dumbarton Bridge to Angel Island).
- Multiple types of measurements were performed during the cruises, including: vertical profiles using submersible water quality sensors; continuous surface water measurements using sensors plumbed to the vessels flow-through system. In addition, surface water grab samples were collected and the following measurements performed: inorganic and organic nutrients; chlorophyll-*a*; phytoplankton taxonomy by microscopy; dissolved harmful algae (HA) toxins using SPATT; and molecular techniques for quantifying phytoplankton taxa (18s, 16s sequencing; targeted used of qPCR).
- In addition to the Peterson's standard set of flow-through sensors, the USGS team also plumbed a YSI EXO2 multi-parameter instrument (same as used at NMS mooring sites) into the vessels flow through system, which will enable better cross-comparisons or cross-validation among monitoring approaches (channel cruises, moorings, mapping).
- Researchers from SFEI (NMS) and the USGS Water Science Center (USGS-WSC) met approximately to discuss upcoming work and longer-term planning.

Plans for FY2025

- The number of cruises and regions sampled during FY2025 are anticipated to be similar to FY2024 and prior years, along with similar field measurements and discrete sample analyses.
- A Fluoroprobe will be added to the flow-through system (multiple excitation-emmission wavelengths, to estimate concentrations of multiple pigments to characterize phytoplankton

community composition.). The addition of the Fluoroprobe to the Peterson will allow for both cross-comparisons between channel cruise and mapping survey data, and exploring how the Fluoroprobe compares relative to other measures of community (e.g., sequencing data, microscopy data). See Project P2 for additional information.

Alignment with NMS Priorities



Work Products

a. Datasets for nutrients, chlorophyll-a, phytoplankton community, and toxins, which will be made publicly available either through the USGS website or through the NMS.
b. Results summarized in NMS Multi-year Report.
c. Data will be used in other NMS program areas (model calibration, condition assessment, Assessment Framework development).

Budget Justification:

The $520,000 in funding includes both RMP and NMS funds. Approximately $250k from the RMP goes directly toward supporting 1-1.5 FTE USGS technicians who carry out the field work, analyze a subset of samples (chl-a, SPM, etc.), and manage datasets. NMS funds ($270k) will support the following: nutrient measurements (ammonium, nitrate + nitrite, reactive phosphorus, dissolved silicate; total N and total P measured in approximately half of the samples; CBL, $25k); phytoplankton taxonomy by microscopy (BSA, $58k); dissolved toxin measurements (UCSC, $36k); molecular techniques for detecting and quantifying HA abundance and characterizing phytoplankton assemblage (18s,16s amplicon sequencing; qPCR; Bend Genetics, $25k); support for SFEI labor for inter-program coordination and data management ($20k); and cover the cost increases for cruise work that came on-line in FY24 $120k.

USGS in-kind programmatic funds cover the following: ship captain and direct costs (fuel, ship maintenance, transportation); program management support; and remaining technician costs (field, lab, data-management).

C2 Moored Sensor Network	Total FY25 Work	Other Funds	FY25 Permit Funds
Team: SFEI, USGS-BGC, USGS-MarFac	$550,000	$250,000*	$300,000

*Other Funds: RMP Special Study funds (estimated)

Project Description

This project will support the collection of high-frequency water quality data (15-min) at the SFEI-NMS network of 12 mooring sites distributed throughout South, Lower South, and Central Bays. Work includes:

- Monthly maintenance trips to each site (~3 boat days/month).
- Instrument maintenance and calibration.
- Data QA/QC and data management, along with refinements to data management tools.

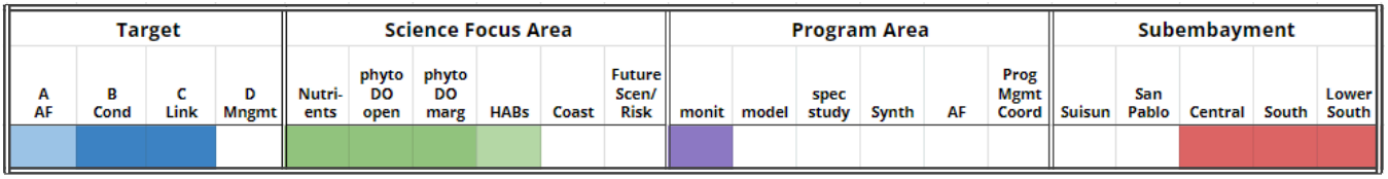
Work in FY2024

- Collected high-frequency sensor measurements at 12 existing stations (9 full stations with multi-parameter instruments, 2 oxygen-focused sites, 1 sediment site), along with periodic discrete sample collection for sensor validation.
- Conducted monthly calibration and servicing of water quality instruments.
- In collaboration with USGS, added DO sensors at two additional depths at the Dumbarton Bridge (DMB) and San Mateo Bridge in the channel;
- Added chlorophyll and DO to an existing station on Alcatraz, also in collaboration with USGS.
- Continued nitrate measurements at DMB and a shoal mooring site, and added a nitrate sensor in Alviso slough in fall 2024.
- Continued updates/improvements of data management codebase, including automated and semi-automated QA/QC processes.

Plans for FY2025

- Continue water quality measurements at 12 existing stations in South, Lower South, and Central Bays, including maintenance trips at 3-4 week intervals.
- Data QA/QC and data management.
- *Note*: Additional moored sensor work (network expansion, maintenance, adding telemetry) will be supported by the NOAA MERHAB and EPA WQIF grants (two new Central Bay stations to be installed in FY2025).

Alignment with NMS Priorities



Work Products

a. Curated 15-minute dataset of water quality parameters from nine stations (T, S, DO, chl, turbidity, fDOM).

b. Curated 15-minute dataset of nitrate data from three stations.

c. Updated QAQC scripts and documentation, maintained and versioned on GitHub.

d. Mooring program update memos (twice-yearly or quarterly) summarizing status of stations, data QAQC and data visualizations.

Budget Justification

The mooring program cost for FY25 include:

- Field support: boat support and field/deployment logistics from both USGS-Pacific Marine Facility (MARFAC) and USGS-CA Water Science Center (WSC), and with USGS-CA-WSC also contributing to instrument troubleshooting and discrete sample collection and processing ($190k)
- Analysis of discrete samples ($10k)
- SFEI labor for field and laboratory work, fieldwork planning and logistics, documentation, and overall project management ($200k)
- Data processing and QA/QC, review, and report outs ($100k)
- Direct expenses, including: instrument and sensor repair/factory-calibration/replacement, reagents, equipment, and other direct expenses ($50k)

C3 Core Modeling	Total FY25 Work	Other Funds	FY25 Permit Funds
Team: SFEI, Four Peaks, RMA	$500,000	$0	$500,000

Project Description

NMS Core Modeling work focuses on the development and application of three-dimensional hydrodynamic-biogeochemical models to predict or forecast water quality in San Francisco Bay. The SciencePlan2.0's 5-year modeling workplan presents the overall science and management questions, and provides a high-level overview of modeling activities (2019-2025), with work organized into three broad categories: model development (hydrodynamics, biogeochemistry); model studies or applications to address management/science questions; and model maintenance/documentation and tools.

Work/Progress during FY2024

- Modeling work in FY2024 focused primarily (75%) on simulating a range of nutrient load reduction scenarios. That work was carried out working closely with Water Board staff and stakeholders and aimed to address information needs relevant to planning the third 5-year Bay-wide nutrient permit that is anticipated to begin on July 1 2024.
- Work also moved forward with NMS funding on a few other fronts, including: extending hydrodynamic runs to a continuous decade by simulating/validating hydrodynamics for WY2019, 2020, 2021, and 2022 (for use in upcoming 10-year biogeochemical simulations); testing modules/approaches to better represent denitrification rates and oxygen demand at the sediment:water interface; another round of improvements to the empirical light attenuation estimates/model-inputs; and shifting to an improved advection scheme (needed when the hydrodynamics and biogeochemical simulations are run separately).
- Additional NMS-related work, supported by other funds, has also been moving ahead e.g.,: early work on sediment transport modeling (with the aim of ultimately predicting light attenuation coefficient; funded by EPA-WQIF); stepwise testing and model development for hindcasting the 2022 HAB event.
- For relatively recent materials, see the April 2023 MAG report, and the 2023 NMS Modeling Update Report

Work Plans for FY2025

For FY2025, work will return to pursuing a subset of the activities identified as priorities for FY2024, including:

- Based on MAG feedback and recommendations, pursuing the following:
  - refinement/testing of several priority processes (e.g., water column respiration vs. sediment respiration, refining production module(s))
  - continued model validation and analysis/interpretation of key processes (e.g., mass balances, nutrient cycling, production), including writing this up jointly in the form of a manuscript(s) for

submission to a peer review journal.

- applying the model to explore management and environmental change scenarios

The following Model Development and Model Application projects are provided as examples, with the primary focus areas for FY2025 to be finalized during May-July 2025.

Model Development

- Extension of hydrodynamic and biogeochemical simulations to WYs 2019-WY2022. This will allow additional biological and high frequency water quality data from these water years to be used for the next round of model calibration and validation. Extending the model to these new water years requires developing and/or assembling model inputs including freshwater inflows (hydrological model simulations), POTW nutrient loads, wind, light field attenuation coefficients, and other boundary conditions. [Note: Hydrodynamic simulations have been completed, and early runs setup and simulated for WY2021).
- Continued improvements to light extinction coefficient estimates incorporating input from a sediment expert panel received in FY22, with the upcoming steps bringing in additional remote sensed data, in particular to provide information for the shoals.
- Targeted investment into O_2 related processes and improvements to model performance in predicting DO.
- Begin collaboration with SCCWRP to assess and improve ocean forcings for the NMS model based on SCCWRPs coastal model predictions.
- Model refinements and model validation updates based on: (1) MAG feedback from workshops 1 (completed), workshop 2 (completed in February 2023) and workshop 3 (planned in Winter/Spring 2025); (2) model performance in WY2019-WY2022. The refinements will continue to advance a “global” calibration that works across multiple water years covering a range of hydrological and meteorological conditions.

Model Application

- Continue with in-depth mechanistic/quantitative interpretations of multi-year biogeochemistry simulations using both the aggregated and full resolution models. The model interpretations will be integrated into the MAG process (potential MAG workshop 3 in October/November 2025), and will be further refined for submission to peer-reviewed journals.
- Pursuing priority modeling application studies, both as part of continued/iterative model development/improvement and to address NMS science/management questions. Specific applications may be related to:source apportionment, returning to the recommendations in the 2021 report, develop/refine approach, evaluate output (e.g, subembayment source apportionment, or Management Unit delineation); quantitatively exploring/testing hypotheses for explaining observed changes in ecosystem response (e.g., changes in suspended sediment concentration i.e., K_D; changes in benthic grazer abundance); simulating extreme events or potential future scenarios; evaluating the importance of, or sensitivity to,

ocean boundary conditions (e.g., upwelling and its influence on DO and DIN concentrations/net-flux); generate multi-year time-series of freshwater and nutrient export flux through the Golden Gate -- explore key drivers of interannual/seasonal variability, and pass output to coastal modeling effort for simulation of coastal response (collaborators: SCCWRP, UCSC, UCLA); developing a framework for model uncertainty assessments in answering science and management questions from the context of key decision variables for nutrient management in SFB.

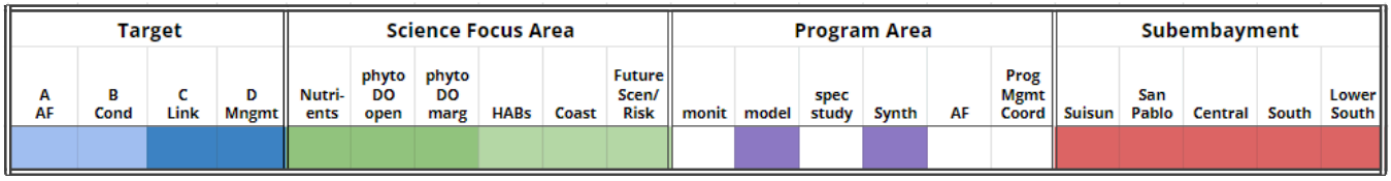
Modeling Planning, Documentation, and Infrastructure

- Model Advisory Group process: MAG funding from FY2024 will be used to convene 1-2 meetings, with October/November 2025 a reasonable target.
- Updating Modeling versions for running coupled hydrodynamics-biogeochemistry, including potential for achieving faster run-times through using other computing approaches.

NMS-related Modeling Work, using other sources

- Further development/testing of HAB model (based on Aug 2022 bloom), and write-up; and/or simulating other 'future scenarios' [EPA-WQIF] (50-75k in FY2025)
- Substantial investment with sediment transport model development, e.g., generate 1-2 full years (priority years), compare with semi-empirical K_D, test in biogeochemical simulations [EPA-WQIF] (50-100k in FY2025)
- Continued investment in model documentation, and systematic/semi-automated approaches for model setup and post-processing, consistent with ultimately making models, model-utilities, and data publicly available. [EPA-WQIF] (25k in FY2025)
- Delta-Suisun model calibration for WY2022 (hydrodynamics, biogeochemistry), simulate pre-post-upgrade loads for Regional San, evaluate influence on Delta loads to Suisun Bay [Delta RMP]. (total funding ~350k, distributed over 2-2.5 years).

Alignment with NMS Priorities



Work Products

- Technical report(s) and/or manuscripts on model applications that will focus on a subset of the following: nutrient cycling and mass balances; phytoplankton production, source/sink regions, factors regulating production/blooms, full-bay model; phytoplankton production, source/sink regions, factors regulating production/blooms, Suisun-Delta model; evaluating mixed-layer-depth prediction.
- Report-out from MAG.
- Model documentation, code for pre-/post-processing (ongoing)

Budget Justification

Funds will be used to support core modeling team labor (~2.3 FTE), along with $15k in direct costs (e.g, upgrading hpcs/servers, cloud computing).

C4 Science Coordination and Program Management	Total FY25 Work	Other Funds	FY25 Permit Funds
Team: SFEI	$700,000	$0*	$700,000

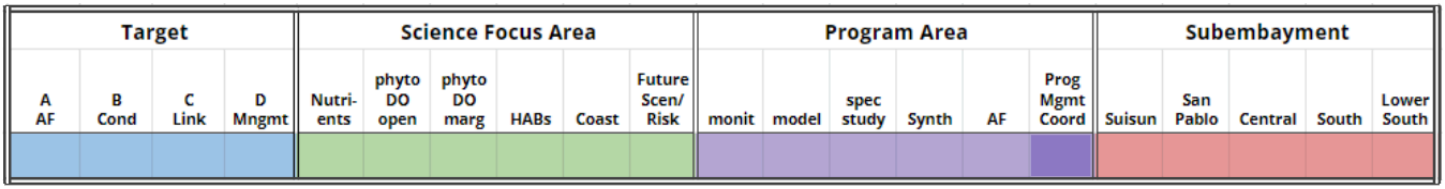
***Other funds: carryover funding from FY23**

Project Description

This funding covers the costs associated with overall science program coordination and NMS program management. Work will include:

- Science oversight for NMS, including work on multi-year science planning, study design, scientific contributions to projects, review of work products, and identifying on-going NMS science priorities.
- Program management (external), including working with the NMS Steering Committee (and subcommittee) and additional stakeholder engagement.
- Increased investment in FY2025 in 'internal' program management (managing workflow and resource allocation for NMS technical projects, deliverable tracking, budget reporting).
- Program budget tracking, managing external contracts, accounting/invoicing, etc.
- Fundraising to support NMS work

Project Alignment with NMS Priorities



Budget Justification:

Funding for C4 supports the following: lead scientist's effort across the range of NMS scientific activities (contributing to or leading projects, science oversight, planning), stakeholder engagement, and overall NMS management (roughly 50% science, 50% program management); contributions from several SFEI/NMS staff addressing a range of program management activities, e.g., management field/monitoring program, stakeholder engagement, project management, proposal writing, contract/financial management. Support for full-time project/program manager.

3.2 PROJECTS

P1 Shoal mapping, South Bay & Central Bay	Total FY25 Work	Other Funds	Permit FY25 Funds
Team: SFEI, USGS-BGC	$100,000	0	$100,000

This project will continue shoal water quality monitoring through conducting high-resolution biogeochemical mapping surveys in South Bay and Central Bays. The overall plan is to support six mapping surveys in 2024, collecting a combination of flow-through optical sensor data (e.g., chl, nitrate, turbidity, temperature, salinity) along with discrete samples (e.g., nutrients, phytoplankton community including HABs). To the extent possible, mapping surveys will be timed to coincide with USGS R/V Peterson cruises (C1 Deep channel monitoring) or satellite flyovers to expand the NMS' capacity to calibrate/validate remote-sensed data for some relevant parameters (e.g., turbidity/SSC, chl-a).

The six mapping surveys will be supported by combining P1 funds with funding from the new NOAA MERHAB grant, each supporting three surveys.

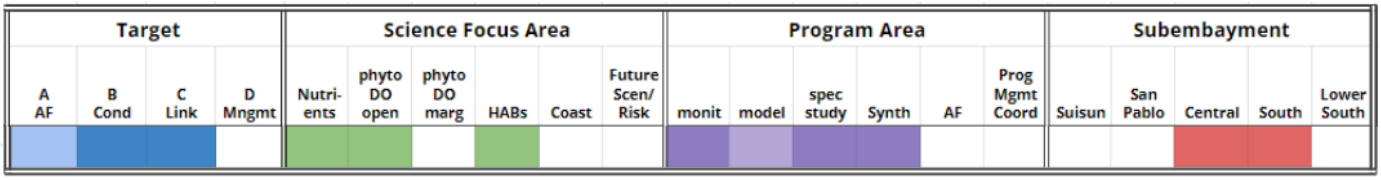
Progress in FY2024

- Six spring/summer water quality mapping trips were successfully completed, capturing interesting/important spatial gradients in nutrient concentrations, estimated GPP, and other parameters.
- Continued refinements & standardization of mapping approach (program design; joint SFEI & USGS-BGC).
- On-going synthesis/interpretation of mapping data alongside other datasets, forthcoming technical report (summer 2024).
- Data will be valuable for upcoming model calibration/validation work, which will include three years with mapping and shoal mooring data (wy2021, 2022, 2023).

Plans for FY2025

- six water quality mapping and sampling trips in South Bay.
- Characterize spatial patterns in South Bay water quality not captured by standard channel cruises, including mechanisms behind spatial variability in GPP, DIN, DO, pH.
- Match mapped and moored high-frequency data to allow cross-validation of the datasets.

Alignment with NMS Priorities



Work Products

a. Data from six mapping cruises, yielding one or more two-dimensional water quality maps per trip.

b. Corresponding discrete sample data from 15-20 locations per cruise: nutrient, chlorophyll-a and suspended sediment samples; phytoplankton assemblage (including HABs).

Budget Justification

The P1 budget will cover the cost of three mapping surveys, including: mapping boat preparation, field time, and data curation (USGS-BGC: $66k, 3 surveys @ $22k/survey); discrete sample analysis (nutrients, chl-a, phytoplankton by 18s/16s sequencing, $20k); and SFEI labor (joining subset of cruises, post-survey sample processing, data curation, and project management, $14k). The other three surveys will be covered by the NOAA MERHAB grant.

P2 Synthesis #1 Investigate factors contributing to highly-variable nitrogen concentrations and phytoplankton biomass/production in South/Central Bays (2021, 2022, 2023, (2024)) **P3 Synthesis #2 Characterize long-term variability in environmental forcings that regulate phytoplankton production/community**	**Total FY25 Work**	**Other Funds**	**Permit FY25 Funds**
Team: SFEI, USGS-BGC, other collaborators (TBD)	P2 $140,000 P3 $140,000	0 0	P2 $140,000 P3 $140,000

Overview

Building quantitative understanding of the processes that influence SFB water quality is a central goal of the NMS. Most NMS mechanistic studies undertaken thus far have investigated the processes that shape long-term or 'chronic' conditions, including the seasonal, spatial, and interannual variability in water quality. Anticipating potential conditions under future environmental scenarios, including acute or extreme events, has also been a high priority, but one that has received limited investigation.

Both types of system responses, and the underlying causal factors, will remain science priorities going forward, including the need for increased attention directed toward future scenarios. The two synthesis projects included here target science questions and mechanisms/processes that are central to understanding/predicting long-term or chronic conditions and to characterizing the risk of acute/episodic events.

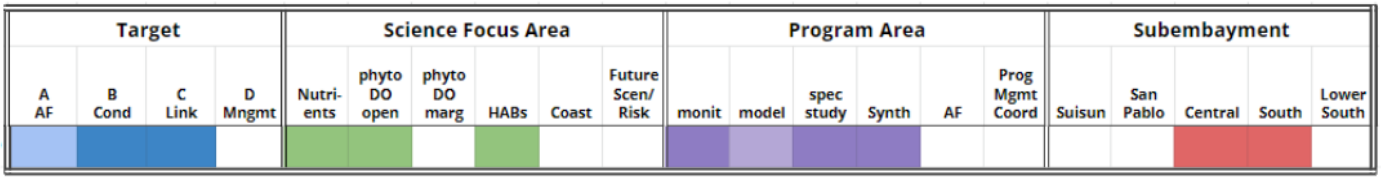
Project P2 will use field data collected during wy2021, 2022*, 2023, and 2024 to characterize the space-time variability in key processes that regulate dissolved inorganic nitrogen (DIN) concentrations, phytoplankton biomass, primary production rates, and dissolved oxygen levels in South and Central Bays. Intensive field sampling was carried out in this region during all four years, including six shoal mapping surveys per year and five water quality moorings. In addition, DIN and chl levels were highly variable spatially, seasonally, and among years, increasing the likelihood that key mechanisms can be identified.

Project P3 will focus on environmental forcings that are known (or hypothesized) to influence phytoplankton production and/or community in SFB, and in particular on characterizing their long-term variability or trends over time. Potential forcings to explore include: temperature (air, water), wind (speed, direction), suspended sediment

concentrations (including from remote-sensed data), basin-scale forcings (e.g., el Nino, PDO), upwelling indices, solar insolation (or cloud/fog-cover). While the goal will be to explore as many relevant forcings as feasible, we will focus first on a high-priority subset and carry the processing and analysis of each of those to near-completion (e.g., 90%), before shifting to the next tier. High-priority parameters or forcings include suspended sediment concentrations, wind, air/water temperature, and solar insolation. For suspended sediments, we plan to explore the feasibility of utilizing remote-sensed estimates of turbidity, with the goals of characterizing conditions in data-limited regions like the shallow shoal regions of South Bay and San Pablo Bay; and extending the record back as far as possible (e.g., ~2000 or earlier).

*Analysis of wy2022 data will only include March-July, not during the August 2022 HAB event. HAB event data are being explored through other project(s).

Alignment with NMS Priorities



Work Products

a. Two technical reports, one for each topic, prepared in the form of manuscripts.
b. For P3, long-term datasets of physical forcings that can also be used (other projects) for potential future scenario model simulations.

Budget Justification

The P1 and P2 budgets will support SFEI labor (data analysis, interpretation, report preparation; $100,000 per project), and support for external collaborators ($20,000 per project).

P4 Synthesis #3: Improved estimates of shoal light attenuation (K_D) and evaluation of in-situ (estimated) vs. discrete measured phytoplankton community composition.	**Total FY25 Work**	**Other Funds**	**Permit FY25 Funds**
Team: SFEI, USGS-BGC	$70,000	0	$70,000*

*Total Project Budget = $300,000, NMS funding will be combined with $227,000 of internal USGS funding

This goals of this project are to:

- Harmonize water quality monitoring methods between long-term deep channel monitoring and mapping surveys for phytoplankton biomass (chl-a) and community composition.
- Calibrate/validate light attenuation coefficient measurements in shoal regions of SFB

The project will be supported by the NMS ($70,000) and internal USGS funding ($230,000), with work carried out in collaboration with partners from the USGS Water Science Center Biogeochemistry group (USGS-BGC).

Project work is described in detail in Appendix A and summarized here. Work will include the following:

Phytoplankton biomass and community composition

- augment instruments aboard the *R/V* Peterson (deep channel, C1) with chlorophyll-a and auxiliary pigment sensors that match the sensors used during mapping surveys (P1) and at NMS moorings.
- analyze chl-a sensor and discrete sample data to refine, validate, and quantify uncertainty of sensor-based chl estimates; and evaluate spatial variability in sensor-vs-discrete relationships (e.g., shoal vs. channel) and the performance (accuracy, uncertainty) of different sensors
- compare phytoplankton community composition estimates obtained from the Fluoroprobe sensor with community composition measurements from discrete samples (microscopy, sequencing; see C1)

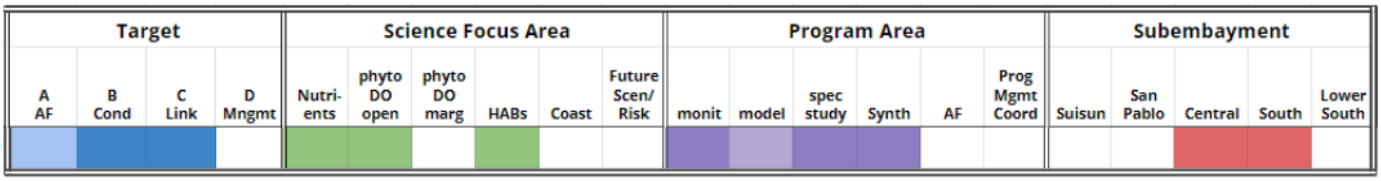
Measure light attenuation during shoal mapping surveys, and develop K_D vs. turbidity relationships

- during mapping surveys (C2), collect vertical measurements of light penetration (PAR vs. depth) and turbidity at ~15-20 locations when boat stops for discrete sample collections.
- develop K_D vs. turbidity relationships; compare with deep channel measurements aboard the R/V Peterson; characterize spatial variability and quantify uncertainty.

Work products will include: two technical reports (one for each topic) that will also submitted as manuscripts to peer-reviewed journals; datasets including the above described data.

NMS funding will be used to i) support SFEI labor to collaborate on analysis and interpretation; ii) purchase a Fluoroprobe that will be deployed aboard the R/V Peterson during the project (depending on findings, a decision will be made whether to continue deploying on R/V Peterson cruises or use for other purposes, e.g., deploying at a mooring site).

Alignment with NMS Priorities



Work Products

c. QA/QC'd datasets

d. Two technical reports, one for each topic, prepared in the form of manuscripts

Budget Justification

The P4 budget will support the purchase of a bbe Fluoroprobe ($55,000), along with SFEI labor for contributing to data analysis, interpretation, and report preparation ($15,000). USGS funding will support USGS labor related to additional field work to conduct vertical light/PAR measurements, data QA/QC/management, and data analysis/interpretation and report preparation.

P5 NMS Science Planning: 2024-2028 management-related science priorities **P6 Assessment Framework: planning on-going work and priority analyses**	**Total FY25 Work**	**Other Funds**	**Permit FY25 Funds**
Team: SFEI, working with WB and stakeholders	P5 $10,000 P6 $10,000	0 0	P5 $10,000 P6 $10,000

Overview

Nutrients in San Francisco Bay have been regulated over the last ten years under two successive 5-year Bay-wide nutrient permits, the second of which is set to expire on June 30 2024). The Water Board released a draft version of Permit #3 or public review and comment in early April 2024 (anticipated start date: July 1 2024).

From 2019-2024, the work pursued by the NMS science program was guided by priorities identified in a multi-year science plan developed in 2018-2019. The goals of projects P5 and P6 are, in general, to identify priority science work to pursue over the next 5 years that will target upcoming management decisions, with P6 focused specifically on Assessment Framework priorities and P5 considering the overall science program (e.g., monitoring, modeling, and assessment framework; and across diverse science focus areas).

Project P5: July-September. Working with subsets of the NMS SC, SFEI staff will:

- develop a draft set of science priorities aligned with management questions/decisions identified by regulators and stakeholders.
- identify: decisions or trade-offs; a draft/strawman multi-year (plan); and a proposed approach for engaging the NMS-SC (Oct-Feb) to evaluate priorities/trade-offs and revise/refine the science plan

Project P6: July-September. Work with WB staff and a subset of the NMS-SC (e.g., the AF-subcommittee) to

- pursuing an approach similar to P5, but focused only on the Assessment Framework (AF), identify AF priority work
- focus in particular on immediate-term work, to start in October 2024 (supported by other funds)
- with any remaining funds (from the $10k), begin the FY2025 technical work

Work Products

a. P5: strawman set of priorities & workplan/approach for working with NMS-SC on Science Plan development (Oct-Feb)

b. P6: goals and intended applications for additional AF work; priority work/scope; technical work will begin in fall 2024.

Budget Justification

Funding for P5 and P6 will support planning work (Jul-Sep) (SFEI labor). For P6, if priority technical work is easily/quickly identified, remaining funds will be applied to pursuing that work, which could begin in Q1.