

**CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
LOS ANGELES REGION**

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RESOLUTION NO. R16-XXX

**JOINT OUTFALL SYSTEM
APPROVAL OF PROPOSED SPECIAL STUDIES FOR THE
JOINT WATER POLLUTION CONTROL PLANT
ORDER R4-2011-0151
NPDES CA 0053813**

The California Regional Water Quality Control Board, Los Angeles Region (hereinafter Regional Water Board), finds:

1. The Regional Water Board adopted National Pollutant Discharge Elimination System (NPDES) permit R4-2011-0151 for the Joint Outfall System's¹ (Sanitation District) Joint Water Pollution Control Plant (JWPCP) September 1, 2011.
2. The NPDES permit contains a requirement for the Sanitation Districts to consult annually with the Regional Water Board to determine the need for special studies. Detailed scopes of work for proposals must be presented to obtain Regional Water Board approval and to inform the public. Special studies are intended to focus on refined questions regarding specific effects or development of monitoring techniques. Questions regarding effluent or receiving water quality, discharge impacts, ocean processes in the area of the discharge, or development of techniques for monitoring, arising out of the results of core or regional monitoring, may be pursued through these special studies.
3. On December 03, 2015, representatives from the Sanitation Districts met with Regional Water Board staff to discuss three proposed special studies for 2016: 1) *Comparison of Spatial and Temporal Patterns of Chlorophyll Concentration between Nearshore and Offshore Regions in the Southern California Bight (JWSS-16-001)*, 2) *Baseline Assessment of Hypoxia and Ocean Acidification Events near the Seafloor in Santa Monica Bay (JWSS-16-002)*, and 3) *Assessment of Ichthyoplankton Meta-barcoding for Routine Monitoring (JWSS-16-003)*.
4. Regional Water Board staff believe that these proposed special studies fulfill the requirements of the NPDES permit Monitoring and Reporting Requirements C11758 at I.D.3., will further the Regional Water Board's knowledge of the health of Los Angeles Harbor and Santa Monica Bay and of emerging issues associated with the discharges from both wastewater treatment plants, and recommend that it be approved by the Regional Water Board.

¹ Ownership and operation of the Joint Outfall System is proportionally shared among the signatory parties to the amended Joint Outfall Agreement effective July 1, 1995. These parties include County Sanitation Districts of Los Angeles County Nos. 1, 2, 3, 5, 8, 15, 16, 17, 18, 19, 21, 22, 23, 28, 29, and 34, and South Bay Cities Sanitation District of Los Angeles County.

THEREFORE, BE IT RESOLVED THAT:

1. The Regional Water Board believes that the three Special Studies proposed for 2016, 1) *Comparison of Spatial and Temporal Patterns of Chlorophyll Concentration between Nearshore and Offshore Regions in the Southern California Bight (JWSS-16-001)*, 2) *Baseline Assessment of Hypoxia and Ocean Acidification Events near the Seafloor in Santa Monica Bay (JWSS-16-002)*, and 3) *Assessment of Ichthyoplankton Meta-barcoding for Routine Monitoring (JWSS-16-003)*, merit approval.
2. The Regional Water Board hereby approves the Sanitation Districts' proposals for these special studies.

I, Samuel Unger, Executive Officer, do hereby certify that the foregoing is a full, true, and correct copy of a Resolution adopted by the California Regional Water Quality Control Board, Los Angeles Region, on April 14, 2016.

Samuel Unger, P.E.
Executive Officer



COUNTY SANITATION DISTRICTS OF LOS ANGELES COUNTY

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GRACE ROBINSON CHAN
Chief Engineer and General Manager

February 3, 2016
File No. 31-300.25

Samuel Unger
California Regional Water Quality Control Board
Los Angeles Region
320 West 4th Street, Suite 200
Los Angeles, CA 90013

Dear Mr. Unger:

2016 Special Study Proposals
Joint Water Pollution Control Plant, Joint Outfall System
(NPDES Permit No. CA0053813, CI-1758).

The Joint Outfall System¹ (Sanitation Districts) requests that the California Regional Water Quality Control Board (Regional Board)/ Los Angeles Region considers adoption of the following three proposed Special Studies for 2016:

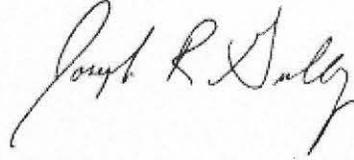
- 1) Comparison of Spatial and Temporal Patterns of Chlorophyll Concentration between Nearshore and Offshore Regions in the Southern California Bight (JWSS-16-001)
- 2) Baseline Assessment of Hypoxia and Ocean Acidification Events near the Seafloor in Santa Monica Bay (JWSS-16-002).
- 3) Assessment of Ichthyoplankton Meta-Barcoding for Routine Monitoring (JWSS-16-003).

These proposals are being submitted in accordance with the Special Studies provision (Provision I.D.3, p. E-4) of the Monitoring and Reporting Program (MRP) for the Joint Water Pollution Control Plant (JWPCP) NPDES permit (Order No. R4-2011-0151). The JWPCP MRP requires the Sanitation Districts to annually consult with the Regional Board on the need for special studies related to the permitted discharge. The Sanitation Districts met with Regional Board staff on December 3, 2015 to discuss these and other potential special studies and were directed to prepare proposals for these three studies. Proposals describing the goals, objectives, general approaches, benefits, deliverables, and expected duration of the proposed studies are enclosed. If you have any questions regarding this letter or proposed study, please contact me at (562) 908-4288, extension 2818.

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Very truly yours,

Joseph R. Gully

A handwritten signature in black ink, appearing to read "Joseph R. Gully". The signature is written in a cursive style with a large, looping initial "J".

Supervising Environmental Scientist
Technical Services Department

JRG:lg

Enclosures

CC: Cris Morris, RWQCB
Elizabeth Erikson, RWQCB
Michael Lyons, RWQCB
David Hung, RWQCB
Andrew Hall, LACSD
Alex Steele, LACSD

**Sanitation Districts of Los Angeles County
Joint Water Pollution Control Plant**

**Proposed Special Study
2016**

**COMPARISON OF SPATIAL AND TEMPORAL PATTERNS OF CHLOROPHYLL
CONCENTRATION BETWEEN NEARSHORE AND OFFSHORE REGIONS IN THE
SOUTHERN CALIFORNIA BIGHT (JWSS-16-001)**

Goals and Objectives:

The goal of the proposed Special Study is to supplement an existing study conducted as a part of the Nutrients component of the 2013 Southern California Bight (SCB) Regional Monitoring Program (Bight'13 Nutrients). The overarching goal of the Bight'13 Nutrients project was to investigate the role of anthropogenic nutrient discharges on nutrient cycling and primary productivity in the SCB. One part of the Bight'13 Nutrients project was the analysis of seventeen years of chlorophyll data collected by ocean dischargers in the SCB under their National Pollutant Discharge Elimination System (NPDES) permit requirements (**Figure 1**). The chlorophyll analysis component of the Bight'13 Nutrients project had three main study objectives:

- 1) Characterize the following aspects of the surface and subsurface chlorophyll features in the SCB and the variability of these features over time
 - a) Spatial scale(s) and extent
 - b) Depth
 - c) Intensity and magnitude
- 2) Understand the patchiness of chlorophyll features in the SCB
- 3) Examine the large scale natural climatic factors associated with the identified chlorophyll features

The historical analysis of the NPDES permit derived ocean monitoring chlorophyll data revealed interesting spatial and temporal patterns in the subsurface chlorophyll maximum layers (SCML) in the nearshore. Specifically, while there was a large amount of variability in the intensity of the SCMLs around the Sanitation Districts' ocean outfalls, during the most recent four-year period (2011-2014) the prevailing patterns in the chlorophyll maximum were a gradual deepening and decrease in magnitude, seemingly resulting from broader environmental patterns associated with the California Current System, not localized anthropogenic nutrient inputs. However, confirmation that these trends are not locally driven by anthropogenic nutrients requires analysis of similar data collected offshore and far removed from local anthropogenic sources of nutrients and other impacts. Fortunately, such data is routinely collected and made available to the public by the California Cooperative Oceanic Fisheries Investigations (CalCOFI) program (**Figure 2**). Therefore, this proposed special study would build on the existing chlorophyll analysis by adding a fourth study objective:

- 4) Comparison of nearshore and offshore chlorophyll features in the SCB

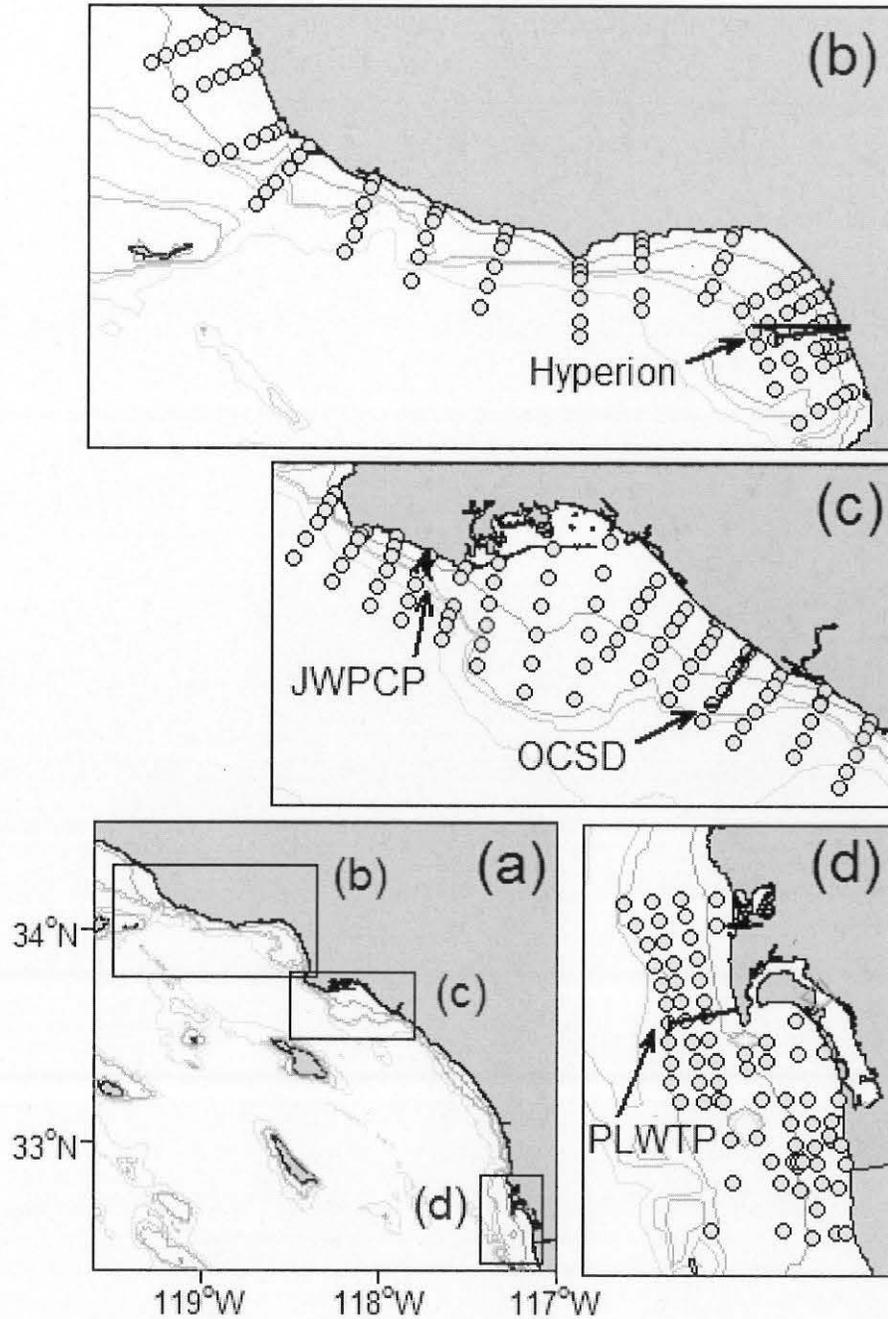


Figure 1. Sanitation District monitoring stations where chlorophyll data has been collected during monitoring surveys. (a) Southern California Bight indicating grid locations, (b) City of Los Angeles, Hyperion Treatment Plant and City of Oxnard grids, (c) Sanitation Districts of Los Angeles County, Joint Water Pollution Control Plant and Orange County Sanitation District grids, and (d) City of San Diego Point Loma Wastewater Treatment Plant grid.

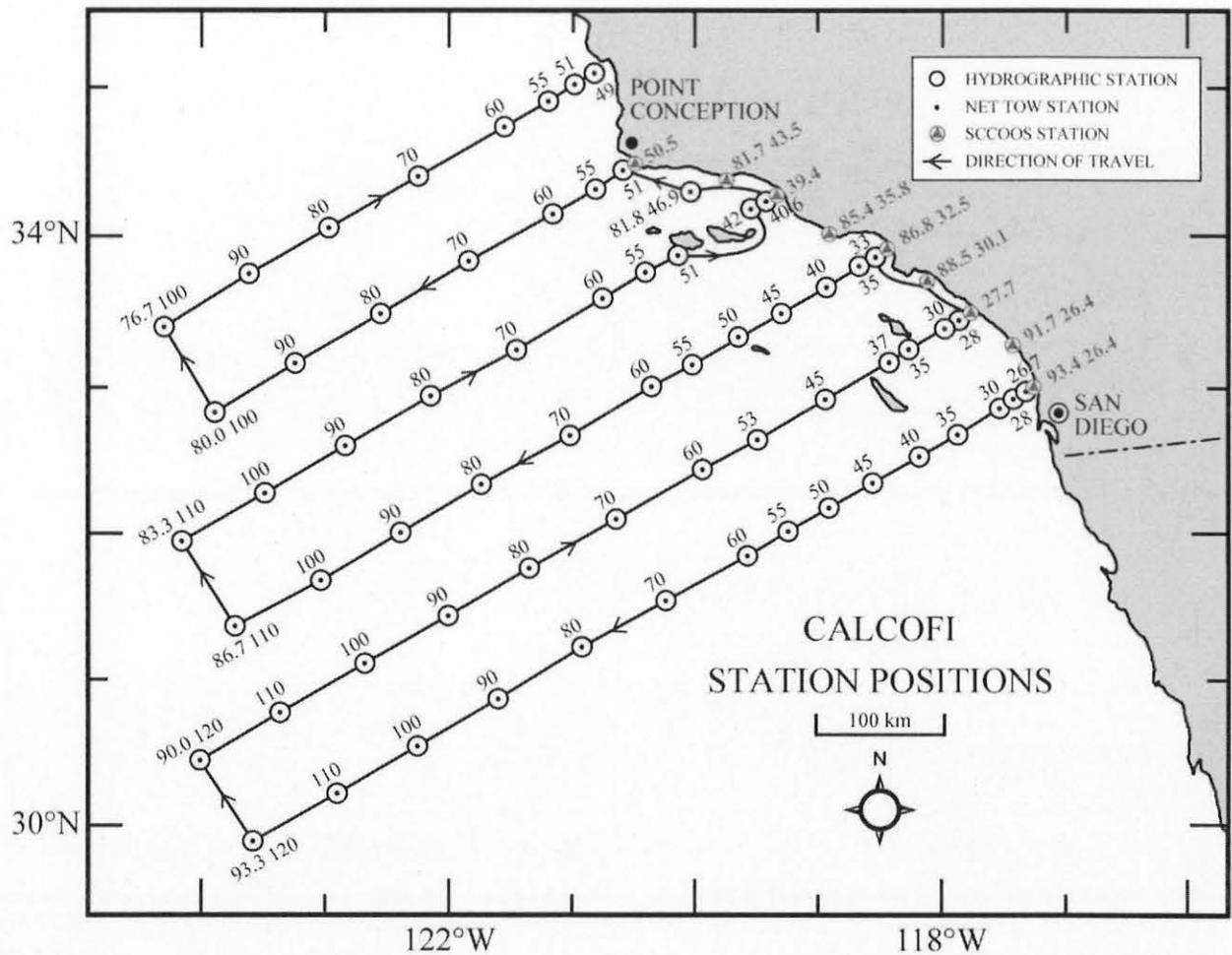


Figure 2. CalCOFI stations where comparable chlorophyll data to the NPDES monitoring surveys are collected.

Benefits:

The proposed Special Study provides critical insight into the role of the California Current on the recent chlorophyll responses observed in the SCB; which in turn improves understanding of the interplay between anthropogenic nutrient discharges and global drivers on nearshore chlorophyll response. It will also provide an empirical perspective on algal biomass that will complement the dynamic ocean modeling effort already funded by NOAA. Such insight and knowledge is also consistent with the needs of the Santa Monica Bay Restoration Commission’s Pelagic Ecosystem Comprehensive Monitoring Program.

Approach:

Determination of spatial and temporal patterns in algal biomass offshore in the SCB (high chlorophyll features) will be conducted using existing datasets collected by the CalCOFI program. No new data will be collected for this study. Data comparable to that collected by the

NPDES monitoring programs (i.e. sensor profiles of chlorophyll fluorescence) is available, quarterly, from winter 2004 thru summer 2015. The CalCOFI dataset will be analyzed in the same manner as the chlorophyll datasets for the Bight'13 Nutrients program to determine the spatial patterns of the surface and subsurface chlorophyll features offshore and compare the results to the already completed nearshore analysis.

The specific analyses to be completed are as follows:

- 1) Calculate the depths, magnitudes and thickness of Subsurface Chlorophyll Maximum Layers (SCMLs) and analyze their spatial and temporal variations
- 2) Analyze the factors potentially affecting SCML depth:
 - a) Water column stability
 - b) The depth of the euphotic layer
- 3) Compare similarities/differences with nearshore analysis
- 4) Explore the relationship between the SCML depths and large-scale climatic cycles (ENSO, PDO, NPGO, etc.)

All data is available from the CalCOFI website: <http://calcofi.org/data/ctd.html>. Data analysis will be conducted by Dr. Nikolay Nezlin at the Southern California Coastal Water Research Project (SCCWRP). Dr. Nezlin conducted the Bight '13 analysis of the NPDES chlorophyll data and is best suited to ensure a comparable analysis of the CalCOFI data.

Project Duration:

Data analysis will commence after this Special Study is approved by the Los Angeles Regional Water Quality Control Board (LARWQCB) expected in the Spring of 2016. Primary data analysis will be completed for review by the project members by summer 2016. The draft technical report will be prepared and published by SCCWRP staff and is expected to be released in the fall of 2016. The final report will be included as a chapter in the Bight'13 Nutrients Final Report which is expected to be finalized in December 2017.

Deliverables:

The primary deliverable will be SCCWRP's technical report scheduled for release in the summer of 2017. Until release of SCCWRP's final report, Sanitation Districts' staff will provide quarterly progress reports to the Los Angeles Regional Water Quality Control Board.

Collaborators:

The Bight'13 Regional Monitoring Program Nutrients Subcommittee; which includes staff from SCCWRP, OCSD, the City of San Diego, City of Los Angeles, Hyperion, and the City of Oxnard.

**Sanitation Districts of Los Angeles County
Joint Water Pollution Control Plant**

**Proposed Special Study
2016**

**BASELINE ASSESSMENT OF HYPOXIA AND OCEAN ACIDIFICATION EVENTS
NEAR THE SEAFLOOR IN SANTA MONICA BAY (JWSS-16-002)**

Goals and Objectives:

Existing quarterly monitoring of oceanic conditions is not sufficient to define duration, frequency, and magnitude of ocean acidification and hypoxia (OAH) events. Furthermore, the pH electrode technology used on the monitoring device is not sufficiently accurate to measure subtle shifts in pH or aragonite saturation associated with OAH. The California Current Acidification Network (C-CAN) recommends high frequency sampling using moorings and state of science sensor technology for measuring pH (i.e. ISFET pH sensors). C-CAN also recommends sampling at least two carbonate chemistry parameters (e.g. pH and pCO₂), in order to properly characterize the carbonate chemistry and determine the aragonite saturation level, which is most directly relevant to the health of shelled marine species.

The goal of the proposed Special Study is to deploy a mooring near Santa Monica Bay (SMB), to continuously collect oxygen, pH and pCO₂ data from a location near the sea floor for a period of two years to assess the magnitude, frequency, and duration of hypoxia and low aragonite saturation events in various layers within the water column. The main study objectives are summarized below:

1. Establish a baseline dataset to assess and track OAH in the SMB
 - a. Collect continuous, high quality data to identify variability patterns in oxygen, pH, and CO₂ using state-of-art sensors to:
 - i. Identify seasonal, event scale and instantaneous extremes
 - ii. Contribute to trends analyses
 - iii. Support a variety of biogeochemical assessment studies
2. Provide data for validation of models being developed to assess the contribution of local anthropogenic nutrients sources to OAH and inform restoration efforts by the Santa Monica Bay Restoration Commission (SMBRC)
3. Contribute to the development of a long-term, high frequency coastal water quality monitoring network to assess spatial and temporal trends in OAH and high chlorophyll (HABs) events and their associated impacts within coastal waters of Los Angeles County and beyond
4. Develop expertise in the operation and maintenance of moorings equipped with next generation oxygen and acidification sensors

Benefits:

High-precision, time-series data on pH and pCO₂ is currently absent from monitoring programs in SMB. Existing monitoring activities for acidification, aragonite saturation state, and hypoxia in the SMB are limited to synoptic monitoring, which provides excellent spatial coverage but no

data on the high frequency changes in OAH in the Bay. Discharger and Regulatory agencies alike see the value in time series data for making management decisions and are moving towards deployment of moorings within the Bay for a standard suite of water quality parameters. Inclusion of a high precision instrument package for pH, pCO₂, and dissolved oxygen on these moorings would provide valuable time-series information on OAH within SMB. Furthermore, incorporation of pH, pCO₂ and dissolved oxygen sensors would bring monitoring in SMB in-line with the West Coast-wide monitoring strategy proposed by the C-CAN.

The proposed Special Study will provide a proof of concept for using state of science instruments (pH, pCO₂, and oxygen) deployed to collect high frequency time-series data at a representative location on the shelf in the SMB. The collected data will be made available in support of ongoing research on OAH in SMB, including model validation, and C-CAN applications. These efforts are consistent with the objectives of the SMBRC Pelagic Ecosystem Comprehensive Monitoring Program and the data will also be presented and analyzed in future State of the Bay Reports.

Approach:

The mooring design will consist Satlantic SeapHOX (includes an ISFET pH sensor integrated with an SBE-37 CTD unit) and SAMI pCO₂ sensor. The Sanitation Districts will also co-locate a thermistor string to continuously measure water column stratification. Santa Monica Bay Restoration Commission (SMBRC) staff will lead development and submission of a QA plan that will be approved by the EPA prior to data collection. Sanitation Districts of Los Angeles staff will provide field support for the deployment, maintenance, retrieval, and data analysis/interpretation. Southern California Coastal Water Research Project will provide short and long-term data management and storage.

During the first year of deployment, the mooring will be sited just offshore of the Sanitation Districts of Los Angeles County's (Sanitation Districts) light energy monitoring station L1 (**Figure 1**) in approximately 25 meters of water. The instrument package will be suspended approximately 15 meters below the surface within the upper mixed layer of the water column. This configuration will be used to provide validation data for the OAH model being developed as well as baseline OAH event data for the surface layer.

After the first year of deployment, the mooring and thermistor string will likely be relocated to deeper water (~70 meters) offshore of Sanitation Districts water quality monitoring station 3103 (**Figure 2**) and the instrumentation suspended approximately 10 meters above the bottom. It is anticipated that this configuration would be used for the second year of the study to obtain a baseline for OAH events near the bottom where potential biological effects are likely the greatest. These data will also be used for OAH model validation of the deep layer.

Project Duration:

Following anticipated approval of the Special Study in April 2016, delivery of sensors and assembly of mooring hardware is expected by July of 2016. The mooring is expected to be deployed by the Fall of 2016 and data collection for this Special Study will continue for two years. Final data analysis and interpretation is expected to be completed by the end of 2018 with a final report submitted to the Board by May 15, 2018.

Deliverables:

The primary deliverable will be a final report describing the results with particular emphasis on the frequency, magnitude, and duration of OAH events in the nearshore surface and offshore bottom layers. Until submission of the final report, quarterly progress reports will be submitted to the Board.

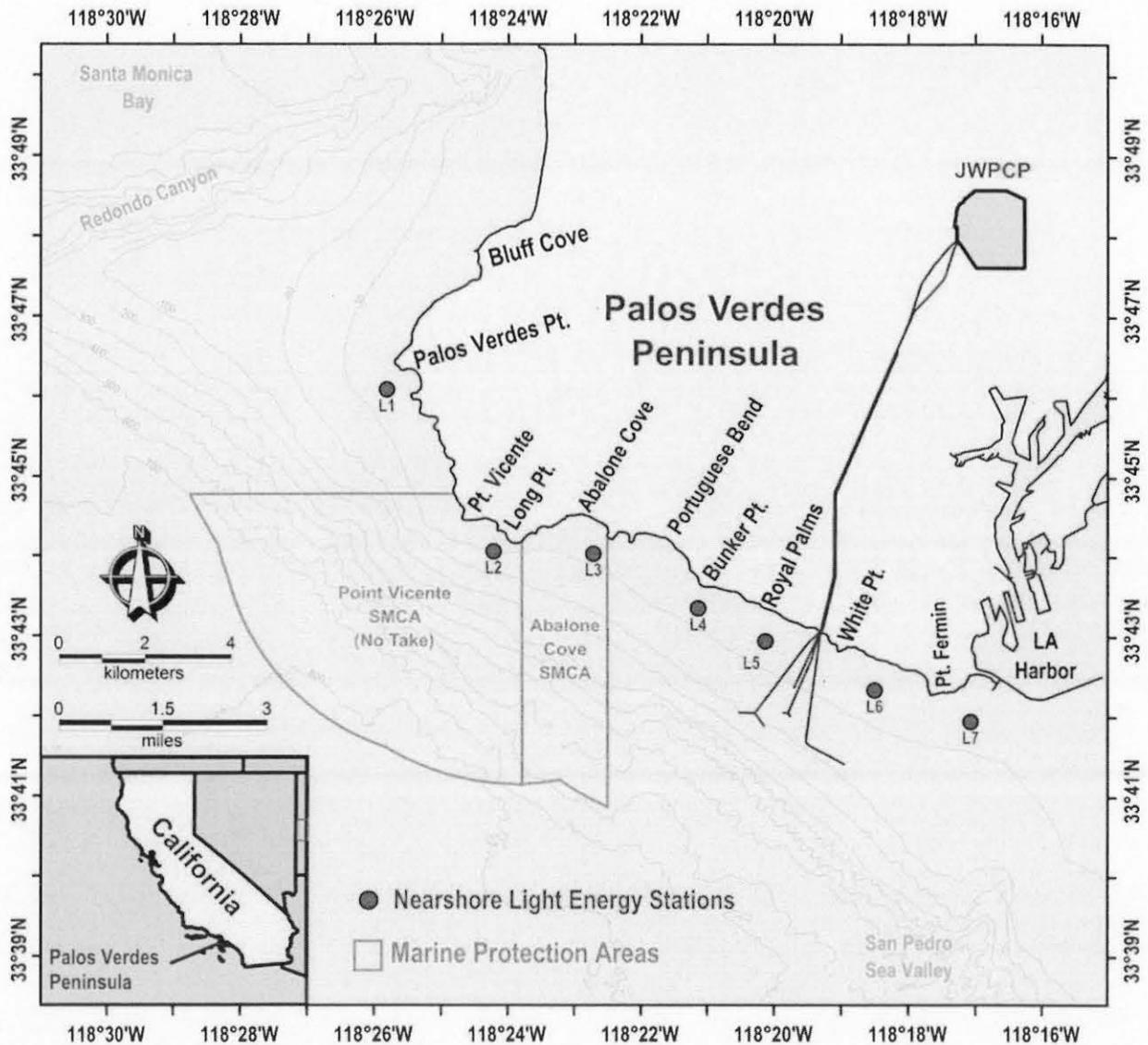


Figure 1 Map of the Sanitation Districts light energy monitoring stations. For year one of the study, the mooring and thermistor string will be co-located just offshore of station L1 with the instrumentation suspended about 15 meters below the surface.

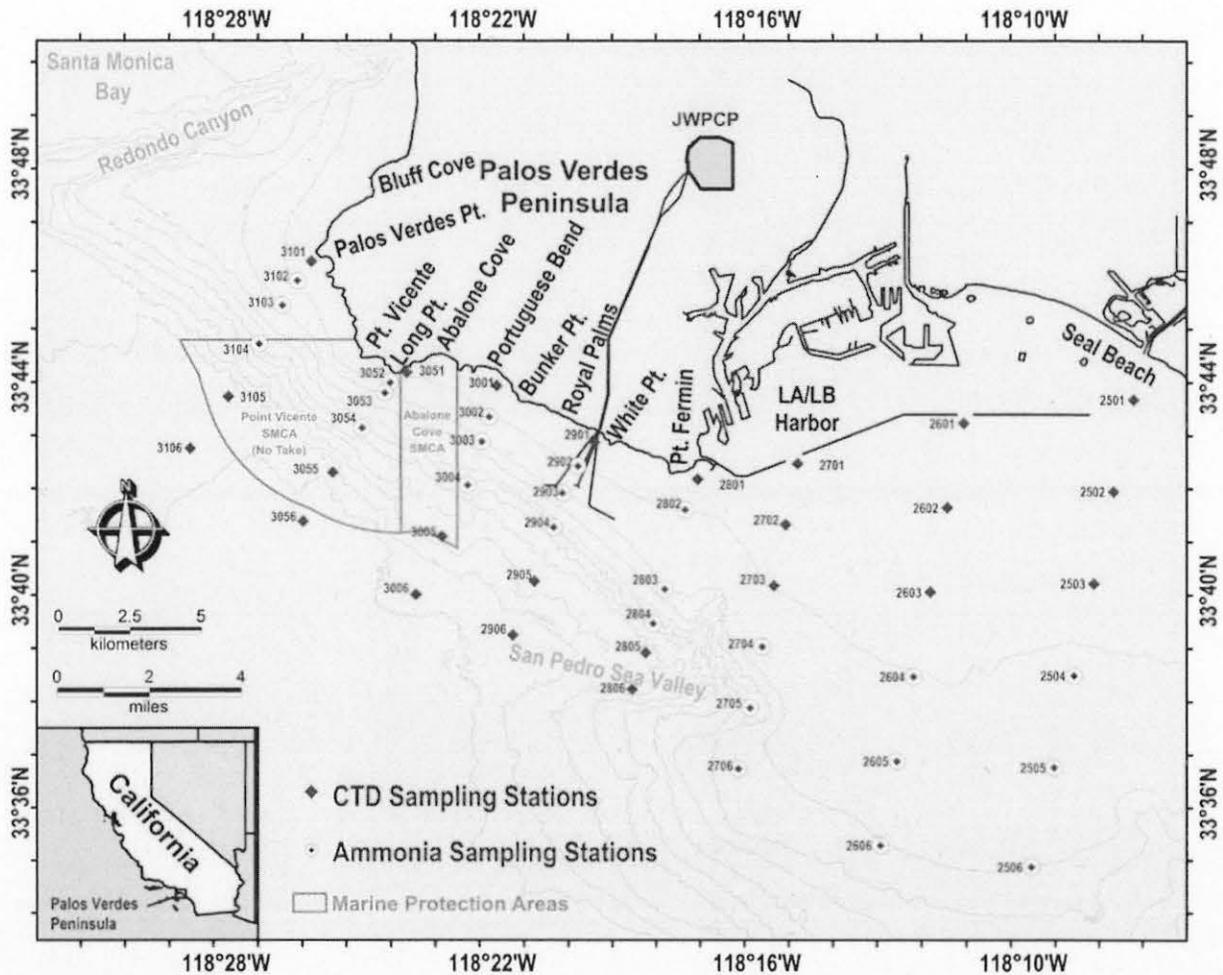


Figure 2. Map of the Sanitation Districts nearshore/offshore water quality monitoring stations. For year two of the study, the mooring and thermistor string will be co-located just offshore of station 3103 in 70 meters of water with the instrumentation suspended about 10 meters above the bottom.

Collaborators:

The National Estuary Program, SMBRC, SCCWRP, City of Los Angeles, C-CAN, OAH modeling partners at University of California Los Angeles, University of Washington, and NOAA's Pacific Marine Environmental Laboratory, as well as University of Southern California and University of California Irvine researchers studying biogeochemical cycling in the SMB.

**Sanitation Districts of Los Angeles County
Joint Water Pollution Control Plant
Proposed Special Study
2016**

**ASSESSMENT OF ICHTHYOPLANKTON META-BARCODING
FOR ROUTINE MONITORING (JWSS-16-003)**

Goals and Objectives:

Discharge of treated wastewater through deep ocean outfalls results in the creation of a rising diluted effluent plume that interacts with the pelagic ecosystem, yet little to no NPDES monitoring is conducted to assess potential impacts to this ecosystem. Recognizing this limitation, ichthyoplankton monitoring is a specific objective within Pelagic Ecosystem component of the Comprehensive Monitoring Program (CMP) for Santa Monica Bay. Further, support for implementing the SMBRC CMP is a requirement in the NPDES permits for the Hyperion Treatment Plant (HTP) and Joint Water Pollution Control Plant (JWPCP). Historically, the number of samples combined with the time and specialized taxonomic skills needed to identify fish larvae have made implementation of meaningful ichthyoplankton monitoring prohibitive. However, the use of genetic meta-barcoding may make analysis of samples collected at the intensive spatial and temporal scales required for such monitoring cost-effective.

The overall goal of this research is to develop a framework for cost-effective and informative ichthyoplankton monitoring within the coastal waters of Santa Monica Bay (SMB) and beyond. The main objectives for this Special Study are:

1. Build capacity among local NPDES monitoring groups to collect standardized ichthyoplankton samples for meta-barcoding, consistent with California Cooperative Oceanic Fisheries Investigations (CalCOFI) procedures, in the coastal ocean.
2. Participate along with other large POTWs and other organizations to collect ichthyoplankton samples during Spring 2016
3. Obtain a snapshot of the ichthyoplankton population within SMB coastal waters
4. Test if meta-barcoding is a viable method to identify ichthyoplankton compared to traditional methodology used by CalCOFI.
5. Determine whether meta-barcoding significantly reduces time, cost, and specialized taxonomic expertise needed for ichthyoplankton monitoring.
6. Assess whether meta-barcoding based ichthyoplankton community analysis would allow a meaningful status and trends monitoring program to be implemented within SMB and or/ the Southern California Bight (SCB).

Benefits:

This study will provide a long overdue snapshot of the current ichthyoplankton community within SMB and allow comparison with other nearshore areas of the SCB using traditional morphological taxonomic identifications. If meta-barcoding is deemed an accurate and cost-effective substitute for traditional taxonomic analysis, existing National Pollutant Discharge Elimination System (NPDES) monitoring programs within SMB may implement an ichthyoplankton status and trends monitoring program consistent with the SMBRC CMP.

Further, similar monitoring may be incorporated within future Bight Regional Monitoring Program administered by the Southern California Coastal Water Research Project (SCCWRP) to assess the entire SCB and allow comparisons with conditions in SMB.

Approach:

Samples of ichthyoplankton, including fish eggs, will be collected from sites associated with our NPDES demersal fish and epibenthic invertebrate trawl program (**Figure 1**). Similar samples will be collected on the same day by the City of Los Angeles from their HTP trawl monitoring stations. Samples will be collected via vertical tows with a 150-um mesh paironet (25-cm diameter mouth) and placed in 95% ethanol. Samples will then be transported to SCCWRP where the ethanol will be changed over a series of days. Sample contents will be sorted and morphologically identified to the lowest possible taxonomic level by National Oceanic and Atmospheric Association (NOAA) Southwest Fisheries staff in La Jolla, CA.

After all of the individuals in a sample have been sorted and morphologically identified, the ichthyoplankton species will be reconstituted as a single sample and a random aliquot of the sample will be removed and homogenized for meta-barcoding analysis, while the remaining material will be archived. Meta-barcoding is the use of universal genetic markers to identify multiple species within a single sample, simultaneously. The work involves extraction, amplification, and sequencing of targeted pieces of DNA from a homogenized sample. A yet to be determined contract laboratory will be selected by NOAA Southwest Fisheries to perform the meta-barcoding on these samples. The sequence data will be cleaned, filtered, and then queried against a reference library for adult fish from the Southern Californian region. The reference library is being constructed at SCCWRP by mining the Barcode of Life and GenBank databases for sequences from species known to be present in CalCOFI and Scripps Institution of Oceanography pier sampling.

SCCWRP staff will compare ichthyoplankton sample composition, characterized by meta-barcoding, to that produced by traditional morphological methods to evaluate if the genetic-based methods can produce similar results. Similarity between the methods will be evaluated from ecological (e.g., species composition, functional composition, etc), environmental assessment (e.g., species indicative of water quality issues), and fisheries (e.g., anchovies, Kelp Bass, sardines) perspectives.

Project Duration:

Initial sample collection will occur in the late spring/early summer of 2016. Samples will be processed for morphological and meta-barcoding identification by winter of 2017. Analyses and manuscripts will be completed by summer 2017.

Deliverables:

The results, analyses, and conclusions of this Special Study will be documented in quarterly progress reports and a final comprehensive report will be submitted to the Los Angeles Regional Water Quality Control Board by August 15, 2017. Moreover, and published journal articles resulting from this work will be provided to the LARWQCB when available.

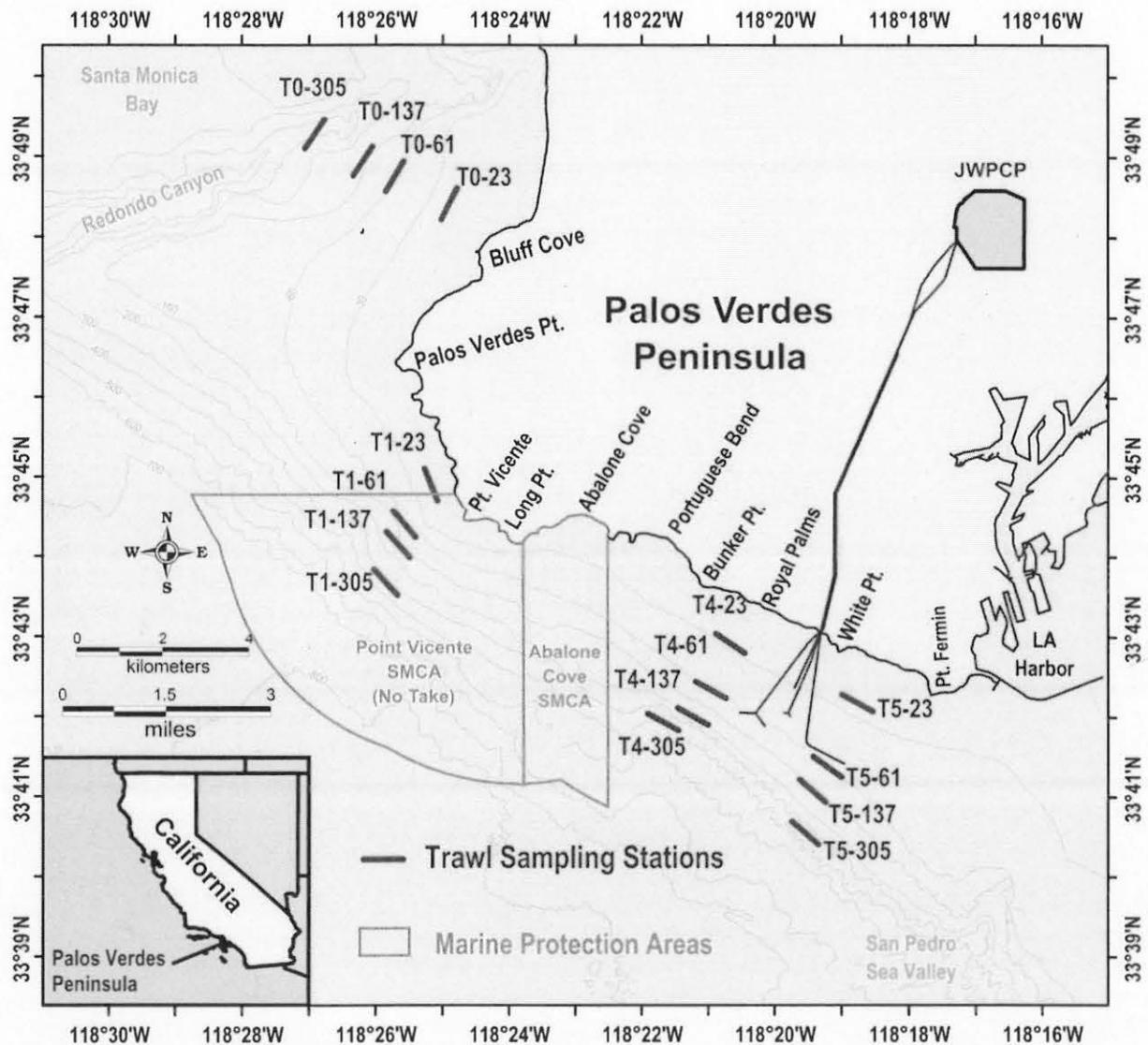


Figure 1 Map of the Sanitation Districts demersal fish and epibenthic invertebrate trawl stations. Ichthyoplankton samples will be collected from each of these sites in the late spring/early summer of 2016 in coordination with simultaneous sampling by City of Los Angeles, HTP staff at their trawl sites.

Collaborators:

The samples collected for this Special Study will be part of a larger effort by staff from SCCWRP, NOAA Southwest Fisheries, CalCOFI, UC Santa Barbara, Scripps Institute of Oceanography, and SCB POTWs, including the Sanitation Districts of Los Angeles County and the City of Los Angeles Environmental Monitoring Division.