

**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)**

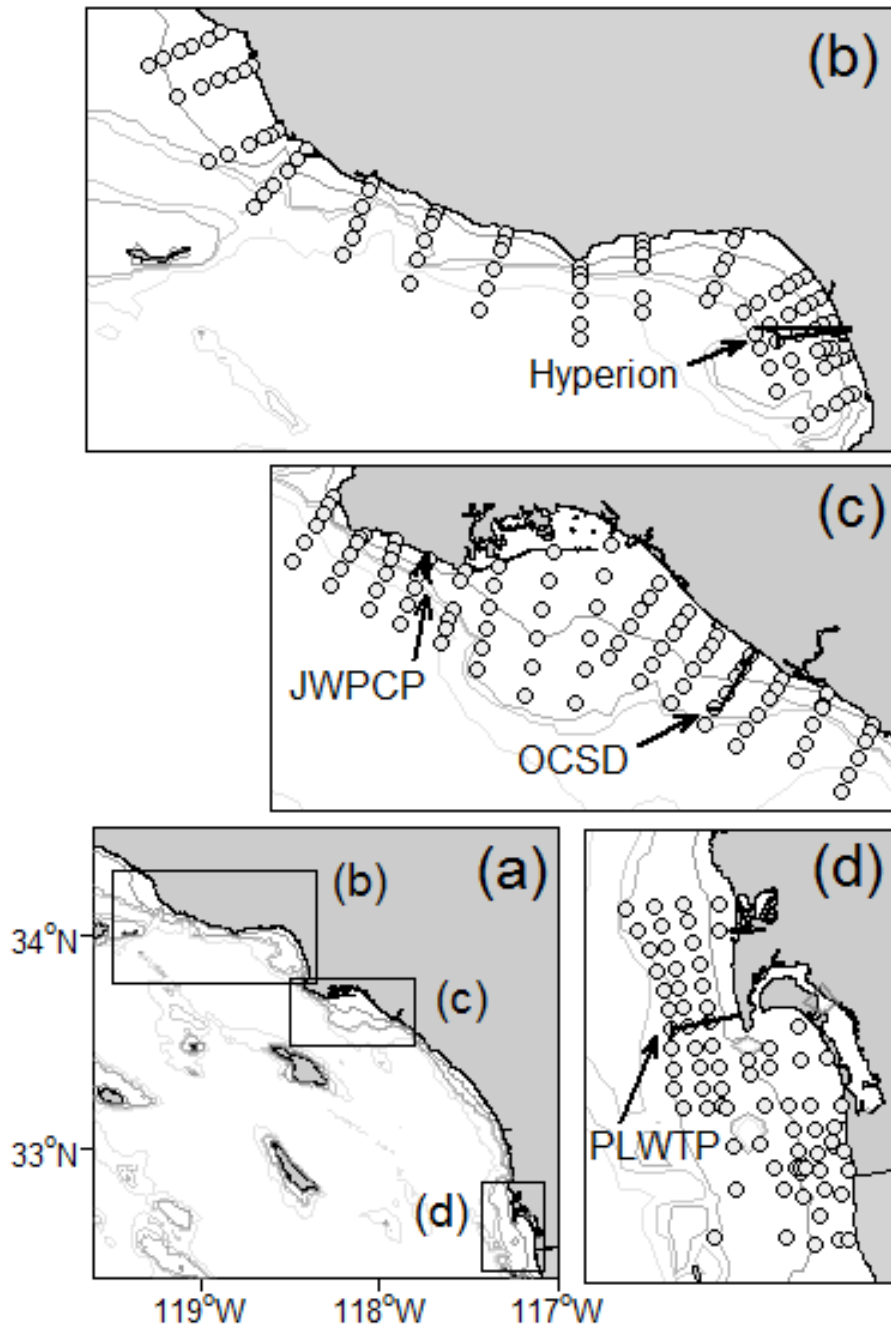
**Goals and Objectives:**

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:

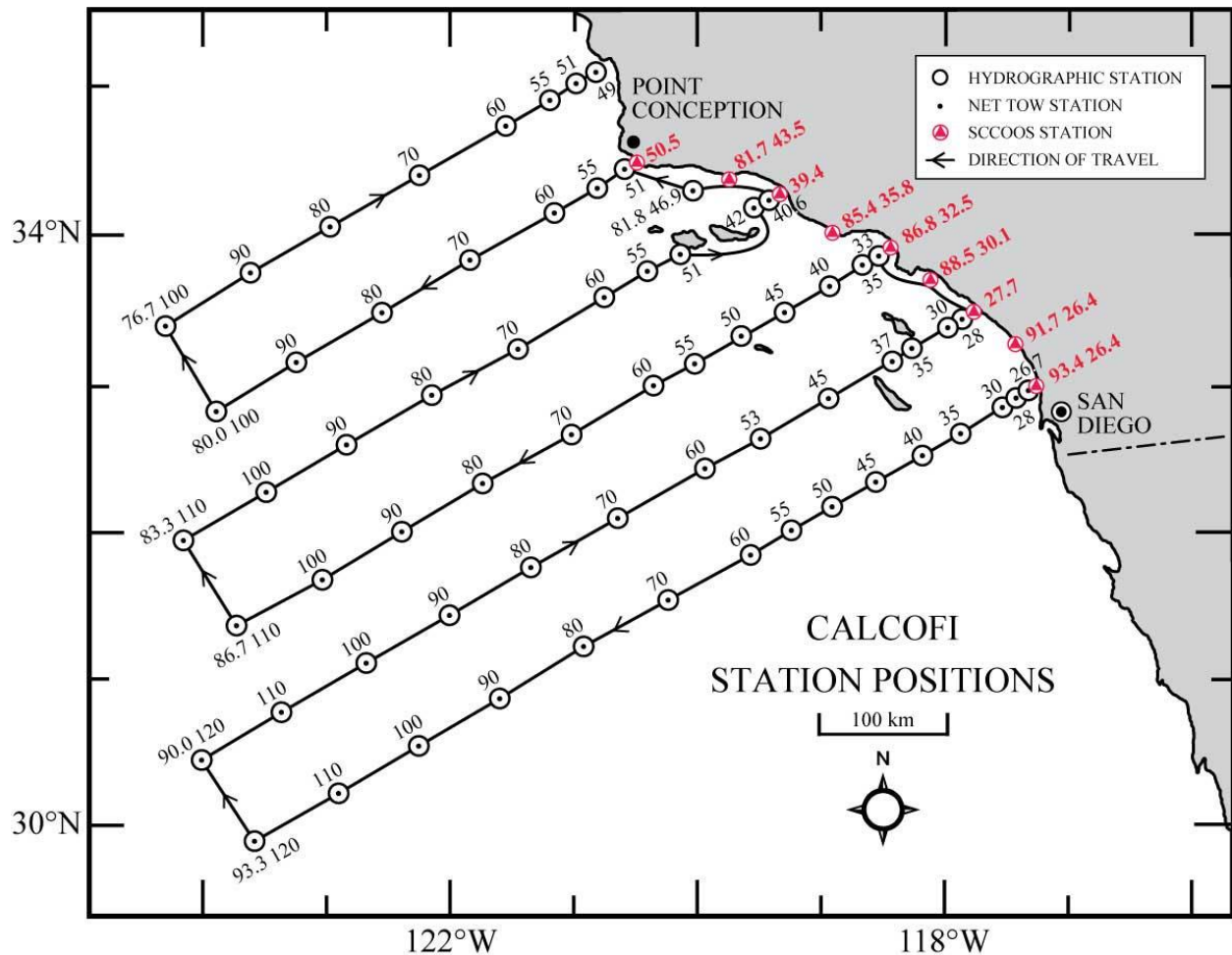
- 1) Characterize the following aspects of the surface and subsurface chlorophyll features in the SCB and the variability of these features over time
  - a) Spatial scale(s) and extent
  - b) Depth
  - c) Intensity and magnitude
- 2) Understand the patchiness of chlorophyll features in the SCB
- 3) Examine 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, OCSB, the City of San Diego, City of Los Angeles, Hyperion, and the City of Oxnard.