

State of California
California Regional Water Quality Control Board, Los Angeles Region

RESOLUTION NO. R12-006
Approving the City of Oxnard's Proposed Special Study for the
Oxnard Wastewater Treatment Plant

WHEREAS, the California Regional Water Quality Control Board, Los Angeles Region (hereinafter Regional Water Board), finds that:

1. The Regional Water Board adopted Waste Discharge Requirements (WDRs) and a National Pollutant Discharge Elimination System (NPDES) permit (Order No. R4-2008-0029) for the Oxnard Wastewater Treatment Plant on October 2, 2008. The permit was amended on March 4, 2010 (Order No. R4-2010-0048), to reflect the maximum diversion of 6.25 million gallons per day (MGD) for the production of recycled water for nonpotable reuse.
2. The NPDES permit contains a requirement for the City of Oxnard (City) to consult annually with the Regional Water Board to determine the need for special studies. Detailed scopes of work for proposals shall be presented to obtain Regional Water Board approval and to inform the public. Special studies are focused on refined questions regarding specific effects or development of monitoring techniques and are anticipated to be of short duration and/or small scale, although multiyear studies also may be needed. Questions regarding effluent or receiving water quality, discharge impacts, ocean processes in the area of the discharge, or development of techniques for monitoring the same, arising out of the results of core or regional monitoring, may be pursued through special studies.
3. On June 20, 2011, representatives from the City met with Regional Water Board staff to discuss the following proposed special study for 2012: bioaccumulation monitoring approach using bagged mussels suspended at four locations (two near the ocean outfalls and two background).
4. Regional Water Board staff believe that the proposed special study fulfills the requirements of the NPDES permit and recommend that it be approved by the Regional Water Board.

THEREFORE, BE IT RESOLVED THAT:

1. The Regional Water Board believes that the following proposed special study for 2012: bioaccumulation monitoring approach using bagged

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mussels suspended at four locations (two near the ocean outfalls and two background) merits approval.

2. The Regional Water Board hereby approves the City of Oxnard's special study proposal.

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 5, 2012.



Samuel Unger, P.E.
Executive Officer

Introduction

The City of Oxnard, as part of its ocean receiving water monitoring program, is required by the Los Angeles Regional Water Quality Control Board (Order No. R42008-0029, NPDES No. CA0054097) to periodically conduct special studies that focus on refined questions of specific effects or development of monitoring techniques that are anticipated to be of short duration and/or small scale (Attachment E- MRP, pg E-3, I.A.3.c). The monitoring program currently includes an annual tissue bioaccumulation program, whereby fish and benthic macro invertebrates are collected at three stations in sufficient numbers for tissue analysis of inorganic and organic contaminants. The main objective of this program is to determine if potential contaminants emanating from the City's ocean outfall are accumulating in resident fish and/or invertebrates living closely associated with bottom sediments. This program has been ongoing for over 20 years and the results have been reported in the annual ocean monitoring and assessment reports that are submitted to the Regional Board each spring.

In recent years the utility of this program has been questioned for logistical, environmental and analytical assessment reasons, including:

1. White croaker (*Genyonemus lineatus*), which were traditionally used for the bioaccumulation project, have declined in abundance and size during the past five years and have not been collected during the past three years in numbers sufficient to conduct these analyses. As a result, in 2008 the Regional Board allowed the City to switch from white croaker to speckled sanddab (*Citharichthys stigmaeus*) a more abundant, bottom dwelling species.
2. Even with the change to speckled sanddabs, the number of bottom trawls required to collect 80 to 100 individuals for chemical analysis sometimes reaches six to eight per station. This technique uses a 15' head rope length net that is dragged across the bottom on different transects each time. This represents a large area of bottom that is disturbed on an annual basis.
3. Sand stars (*Astropecten verrilli*) have been collected by divers for bioaccumulation due to their historic high abundances in the vicinity of the outfall and the fact that they live closely associated with bottom sediments. In recent years they have become difficult to find and those that are collected are 75% smaller. This indicates that the sampling program is potentially having an impact on the sand star community.
4. Sand stars are typically not collected by other agencies with similar bioaccumulation programs, so that comparative data is not available. The Southern California Regional Monitoring Program has never collected sand stars for bioaccumulation purposes.

For these reasons, the City would like to propose a special study using bivalve mussels, deployed in arrays near to and far from the outfall terminus to assess the accumulation of contaminants in tissues.

Study Questions and General Approach

The bioaccumulation monitoring program is intended to address a few key questions important to the public, regulators and permittees:

1. Are potential contaminants emanating from the City of Oxnard's ocean outfall accumulating in the tissues of fish and/or invertebrates living *closely associated with bottom sediments*?
2. How do tissue concentrations of contaminants near the outfall compare in the *same or similar organisms in the southern California region*?
3. Are tissue contaminant concentrations of ecological or human health concern?

Question 1: As discussed in the previous section, the collection of resident fish and invertebrate species in the Oxnard receiving water area has become difficult or impossible in recent years. Our suggested approach to this problem and the focus of this special study will be to deploy arrays of bivalve mussels (*Mytilus californianus*) near to and far from the terminus of the outfall for a period of three months. Mussels feed by filtering particulate organic material, phytoplankton and bacteria from the water column. Since contaminants tend to adhere to particles in the water column, it follows that mussel tissues accumulate these contaminants if they are present.

After three months the arrays will be retrieved, and then mussel tissue will be removed and analyzed for the suite of chemical parameters currently included in the City's NPDES permit for bioaccumulation. Differences in contaminant concentrations between stations will be assessed statistically and reported to the LARWQCB in the Annual Report for 2012 (due March 2013).

Question 2: The data collected from this special study will be compared to mussel bioaccumulation data collected by NOAA during the past 26 years at 280 sites located along the Pacific, Atlantic and Gulf coasts. It should be noted that mussels collected for the NOAA program are taken from naturally occurring mussel beds and are not deployed in arrays in the same way that we are proposing. As a result, the NOAA mussels are exposed to the water quality conditions at a site throughout their entire lifecycle.

In addition to the NOAA study, numerous municipal discharge agencies conduct annual mussel bioaccumulation programs near their outfalls with deployment designs similar to

the one proposed here. These data will be used to put the results of the Oxnard special study into perspective.

Question 3: Contaminant concentrations measured in mussels near the Oxnard outfall will be compared, where possible, to human consumption standards developed by OEHHA, EPA or the FDA. Ecological impacts from contaminants on mussels will be much more difficult to assess. A scan of the literature will be conducted to assess if contaminant concentrations in the Oxnard mussels are similar to concentrations found in other studies of early life stage and adult mussels.

Sampling Design

Mussel arrays will be deployed in triplicate at four locations offshore of the City of Oxnard on the same depth contour as that of the outfall terminus (See map). Mussel arrays will be deployed during summer for three months. Mussel tissues will be dissected and analyzed for the contaminant suite specified in the City's NPDES permit. These data will be assessed spatially using parametric statistics, compared to concentrations found in mussels from other studies and compared to human health consumption standards developed by OEHHA, EPA and the FDA where applicable.

Details of the special study are provided in the sections below.

Reference Mussels

Mussels (*Mytilus californianus*) for this survey will be collected at one of several sites in the Channel Islands where there are few sources of anthropogenic contaminants. Mussels for the survey will be brought into the laboratory and placed in holding tanks at ambient seawater temperatures (15 C°) for a period of 5 days to clean out their digestive tract. At the beginning of the study, control mussels will be placed in three separate mesh bags (similar to those that will be deployed in the field) and placed in the freezer for the duration of the study. These mussels will represent a baseline for tissue concentrations and will be compared to the field deployed mussel concentrations.

Station Locations & Deployment Arrays

Replicate mussel arrays will be deployed at four stations during a three month period during the summer to early fall of 2012 (Table 1 and Figure 1). Station SS2 will be located at the terminus of the Oxnard outfall in the zone of initial dilution (ZID). Station SS1 will be located 2 Km SE of the terminus and SS4 will be 2Km to the NW. Station SS3 will be located at the terminus of the new brine outfall to assess its contribution of contaminants bioaccumulating in mussel tissue.

The bottom depth at each site might vary somewhat depending on topography, but the bagged mussels will be hung 5 meters from the surface at each site. This depth should put them in proximity to the freshwater effluent field which is buoyant and rises toward

the surface. Also, it will ensure they are deep enough to avoid small boat traffic. Coordinates for sites may change somewhat once operations begin.

Table 1. Special study station locations, depths and distances.

Station Name	Station Depth (m)	Latitude	Longitude	Distance to terminus (Km)	Direction from terminus
SS1	16	34.112075	-119.173604	2	SE
SS2	16	34.122610	-119.191266	0	-
SS3	?	34.124061	-119.199514	0.8	W
SS4	16	34.133522	-119.208543	2	NW

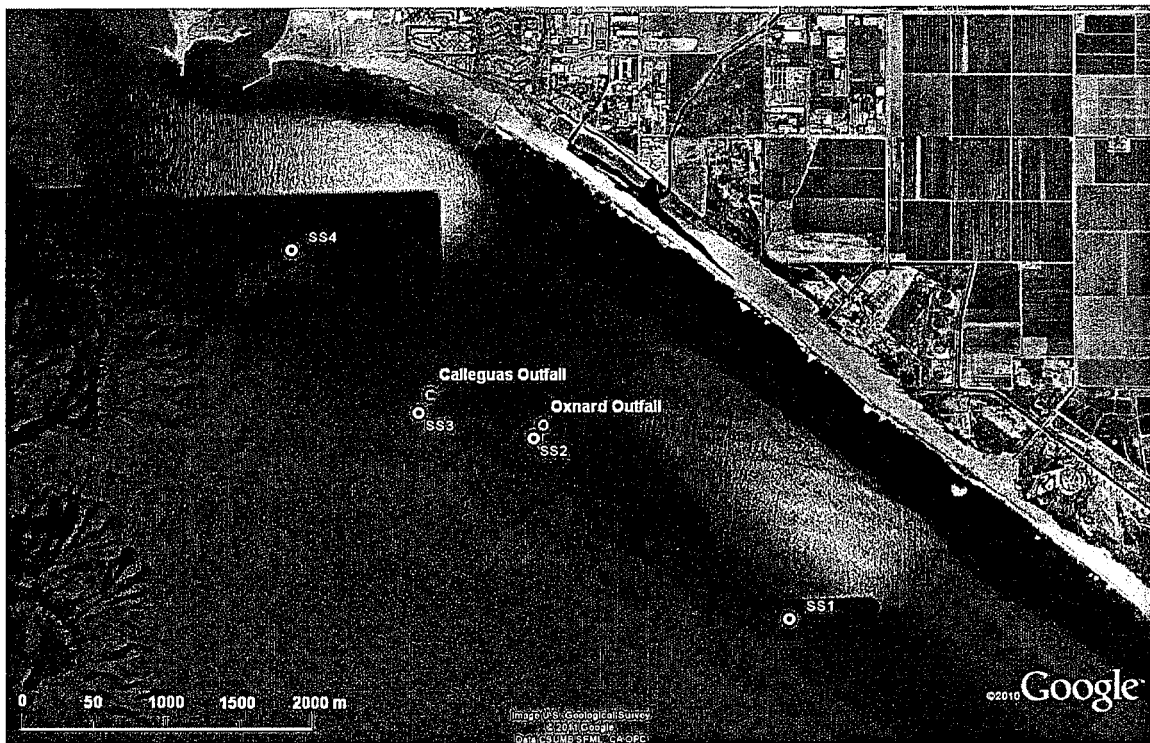


Figure 1. Special study station location map.

Sampling Frequency

Sampling for this special study will occur one time in 2012 sometime between June and November (total deployment duration = 3 months).

Sample Size

Mussel arrays will be deployed in replicate at each of the four stations. Each array will have a mesh bag containing at least 70 mussels of approximately the same size. Therefore, 140 mussels will be deployed at each station. Upon retrieval, the mussels from each set of replicate arrays will be divided into three composite samples. At least 35 mussels will be included in each composite to ensure enough tissue is available for chemical analyses. Therefore, a total of 12 composite samples will be collected for the four stations combined.

Indicators

The list of chemical constituents to be analyzed for is specified in the City of Oxnard's NPDES permit. The data for these parameters shall be expressed in mg/kg dry weight. These are listed below.

Metals

Arsenic; Cadmium; Chromium (total); Copper; Lead; Mercury; Nickel; Silver; Zinc

Organics

Cyanide; Phenolic compounds (non-chlorinated); Phenolic compounds (chlorinated); Total halogenated organic compounds; Aldrin and Dieldrin; Endrin; HCH; Chlordane and related compounds; Total DDT; DDT derivatives; Total PCB; PCB derivatives; Toxaphene; Total PAH; PAH derivatives.

In addition, before dissection the total shell length will be measured. The total tissue weight of each composite sample will also be measured.

Data Analysis

Contaminant concentrations will be compared among stations by ANOVA and appropriate multiple comparison tests. Data will be transformed where necessary to meet assumptions of normality and unequal variances. Data concentrations from each site will be compared to concentrations measured by the NOAA Status and Trends program (NOAA 2010, Sericano et al. 1995) and by several discharge agencies (Hunt 2002, Aquatic Bioassay 1999 to 2010).

Products

The Annual Assessments report for 2013 will contain a section describing the results of this special study in detail using tables, figures and statistically derived findings. Brief progress summaries can be supplied upon demand by either the City of Oxnard or the Regional Board.

Project Schedule

Once the project is approved by the City and Regional Board the following milestones will begin:

July/August 2012	Mussels will be collected from the Channel Islands and held for one week prior to deployment.
July/August 2012	Mussels deployed.
October/November 2012	Mussels recovered from the field, dissected and composited.
January 2013	Chemical analyses complete.
March 2013	Study results reported in Annual Assessment Report.

References

- Aquatic Bioassay. 1998 to 2009. Goleta Sanitation Districts, Annual Receiving Water Monitoring Report. Aquatic Bioassay and Consulting Laboratories, Ventura, CA.
- Hunt C.D., S. Abramson, L.F. Lefkovitz, J. Neff, G. Durell, K.E. Keay, M.P. Hall. 2002 Evaluation of 2001 Mussel tissue contaminant threshold exceedance. Boston: Massachusetts Water Resources Authority. Report 2002-05. 48 p.
- J. L. Sericano, J.L., T. L. Wade, T. J. Jackson, J. M. Brooks, B. W. Tripp, J. W. Farrington, L. D. Mee, J. W. Readmann, J. P. Villeneuve and E. D. Goldberg. 1995. Trace organic contamination in the Americas: An overview of the US National Status & Trends and the International 'Mussel Watch' programmes. Marine Pollution Bulletin, Volume 31, Issues 4-12, April-December 1995, Pages 214-225.
- NOAA. 2010. COAST's National Status and Trends, Mussel Watch Program.
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