Appendix C

Supporting Staff Report

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Bacteria Objectives for Marine and Estuarine Waters Designated for Contact Recreation in the San Francisco Bay Region

Proposed Basin Plan Amendment and Final Staff Report

California Regional Water Quality Control Board
San Francisco Bay Region

April 14, 2010

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1 Introduction

This San Francisco Bay Regional Water Quality Control Board (Water Board) staff report provides the technical background and basis for a proposed amendment to the San Francisco Bay Region Water Quality Control Plan (Basin Plan) to update the water quality objectives for bacteria that are applied to marine and estuarine waters designated for the contact recreation (REC-1) beneficial use. This beneficial use is defined in the Basin Plan as "[U]ses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs."

The proposed action involves five regulatory changes to the Basin Plan. First, we will add to the Basin Plan new enterococcus[1] objectives for marine and estuarine waters used for contact recreation (REC-1) consistent with those specified by California Code of Regulations, Title 17, Section 7958 "Bacteriological Standards" (Assembly Bill 411, Statutes of 1997) and the federal BEACH Act of November 16, 2004 "Water Quality Standards for Coastal and Great Lakes Recreation Waters" 69 FR 67217 et seq. also 40 CFR part 131.41; effective date December 16, 2004.

The other proposed regulatory changes involve implementation of the objectives in NPDES wastewater permits and the requirement that all NPDES permits for discharges containing sanitary waste include effluent limitations for bacteria. The amendment establishes a 30-day geometric mean enterococcus water quality-based effluent limitation for use in NPDES-permitted wastewater discharges to marine or estuarine waters. This new effluent limitation is derived directly from the geometric mean objective. The amendment includes language providing Board staff the flexibility to apply either the enterococcus or total coliform limitation when the contact recreational beneficial use applies. This implementation plan element of the proposed amendment reflects the way NPDES permits are currently being written to address bacteria. The proposed amendment also includes language to provide the Board with the flexibility to consider dilution credit when applying water quality-based bacteriological effluent limitations.

Adding enterococcus objectives and associated effluent limitations to the Basin Plan will better protect human health because the enterococcus indicator bacteria is better correlated to the risk of illnesses associated with exposure to water containing fecal bacteria. The proposed revisions are based on California and national epidemiological research concerning the most appropriate bacterial indicators. The proposed objectives are consistent with the bacterial objectives in the Ocean Plan to protect water contact recreation which apply at all coastal beaches in the region.

Water quality objectives are developed to protect the beneficial uses of a water body, and may differ depending on whether a water body is fresh or saline. These differences are

[1] Enterococcus is a type of bacteria commonly used as an indicator for disease-causing bacteria that can enter waterbodies through fecal contamination originating from humans or animals.

also due to differences in the risk of human exposure (e.g., immersion vs. incidental contact), epidemiological research, and indicator characteristics (e.g., enterococci bacteria survive longer than E. coli in marine water). Bacteria objectives therefore differ for water bodies designated for contact recreation, non-contact recreation and shellfish harvesting. If a water body is designated for all three uses, the most stringent water quality objectives apply (U.S. EPA 2007). The proposed amendment only updates the water quality objectives for water contact recreation at this time, not for shellfish harvesting because there are currently statewide efforts underway to evaluate this beneficial use and to develop a consistent statewide implementation policy.

There are also a number of editorial, non-regulatory changes to the Basin Plan. Appendix B contains an annotated version of the amendment that provides explanation for each proposed change.

1.1 Regulatory Authority

A water quality standard defines the water quality goals of a water body by designating the use or uses to be made of the water, by setting numeric or narrative water quality objectives necessary to protect the uses, and by preventing degradation of water quality through antidegradation provisions (U.S. EPA, 1994). Clean Water Act Section 303(c) requires states to adopt and modify, as appropriate, water quality standards (of which water quality objectives are a component) for surface waters that protect the public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act (33 U.S.C. Section 1313(c)). Water quality objectives must be based on sound scientific rationale and protect the designated beneficial uses of the receiving water (40 CFR 131.11). California Water Code Section 13240 additionally authorizes Water Boards to adopt water quality objectives that reasonably protect beneficial uses and prevent nuisance based on factors listed in Section 13241.

Water Board staff believes that the proposed addition of marine and estuarine enterococcus objectives to protect water contact recreation is appropriate and scientifically defensible. The new objectives enhance protection of water contact beneficial uses and fully comply with state and federal requirements for adopting water quality objectives.

1.2 Report Organization

The report is organized into sections that present the information and analyses required by state and federal law. The sections are as follows:

2. *Project Description*—defines the project, its necessity, and objectives.
3. *Project Background*—provides technical details concerning the new bacterial objectives and other relevant background information for the project.
4. *Implementation Plan*—describes how the new bacteria objectives will be implemented in NPDES permits and how monitoring will be accomplished.
5. *Regulatory Analyses*— provide an overview of the project's compliance with California Water Code (CWC) requirements, and California Environmental Quality Act (CEQA).

6. *References*—lists all the information sources cited and relied upon to prepare this report.

This staff report in its entirety serves as a substitute CEQA environmental document. Specific proposed changes to the Basin Plan are shown in Appendix A. The CEQA environmental checklist is included as Appendix C.

2 Project Description

2.1 Project Definition and Necessity

The project is a proposed Basin Plan amendment to add enterococcus bacteria water quality objectives for contact recreation in marine and estuarine waters and revise effluent limitations for bacteria in NPDES permits. The objectives will apply to all San Francisco Bay segments and Tomales Bay. The same objectives are already contained in the California Ocean Plan which applies to coastal ocean waters in the region. Water quality standards are the cornerstone of all of the other activities of the Water Board and should be based on the best science available to protect beneficial uses. The proposed enterococcus bacteria objectives are based on substantial research concerning the best "indicators" of disease-causing organisms and the relationship between these indicators and rates of illness caused by contact with bacteria-contaminated water.

The regulatory provisions of the proposed project are to:

1. Add new single sample and geometric mean enterococcus water quality objectives to protect the Water Contact Recreation beneficial use in marine and estuarine waters;
2. Add a 30-day geometric mean water quality-based enterococcus effluent limitation in NPDES wastewater permits for discharges to marine or estuarine waters;
3. Make mandatory the inclusion of applicable bacteriological effluent limitations in NPDES permits for discharges that contain sanitary waste;
4. Provide that the Board may, in some circumstances, apply either the enterococcus (preferred) or total coliform effluent limitation for discharges into receiving waters with the water contact recreation beneficial use; and
5. Provide that the Board may apply procedures consistent with the "Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bay, and Estuaries of California" (SIP) for determining any allowable dilution credits for water quality-based bacteriological effluent limitations.

The addition of enterococcus objectives is necessary to make the Basin Plan's bacteriological objectives consistent with California law and criteria adopted by the U.S. EPA. The inclusion of the new enterococcus objectives, in turn, necessitates the inclusion of corresponding water quality-based effluent limitations derived from the objectives and designed to ensure that marine and estuarine receiving waters continue to achieve the new objectives. Discharges containing sanitary waste contain potentially harmful bacteria and thus have the potential to cause or contribute to exceedances of water quality criteria for bacteria. A sensible policy is to require all permits of such discharges to include mandatory effluent limits for bacteria.

Allowing the Board flexibility to apply, in some circumstances, the total coliform effluent limit in place of the enterococcus limit allows permitting requirements to be matched to

permit-specific circumstances while maintaining effective water quality protection. Providing the Board with the flexibility to apply dilution to water quality-based bacteriological effluent limitations is consistent with current practice for other water quality based effluent limitations.

2.2 Project Objectives

Specific objectives of the Basin Plan amendment project are as follows:

1. Update the Basin Plan's bacteria water quality objectives by adding enterococcus objectives to protect water contact recreation in marine and estuarine waters and define implementation measures for the updated objectives such that:
    a. The new objectives are consistent with California law and criteria promulgated by U.S. EPA;
    b. Policies are established to implement the objectives in NPDES wastewater permits;
    c. The new objectives are based on the best available scientific information;
    d. The new objectives fully protect the water contact recreation use in marine and estuarine waters in the region;
    e. The implementation plan to achieve the objectives includes water quality-based numeric effluent limitation for enterococcus in NPDES wastewater permits; and
    f. The new regulatory requirements are not more stringent than necessary to meet water quality standards and do not result in unreasonable costs relative to their environmental benefits.

3 Project Background

This chapter describes the physical setting for the project, summarizes information on ambient bacteria concentrations as well as major sources. The chapter also describes the proposed enterococcus objectives and their scientific basis.

3.1 Physical Setting

The new enterococcus objectives will apply in marine and estuarine waters in the San Francisco Bay Region. There are two large embayments where the new objectives will apply, San Francisco Bay and Tomales Bay.

The San Francisco Bay system is the largest coastal embayment on the Pacific Coast of the United States (Nichols and Pamatmat 1988). The watershed encompasses about 155,000 km^2, or 40% of the land area of California (STB 2000). Its waters have a surface area of about 2800 km^2 and are divided into two major hydrographic units, which are connected by the Central Bay to the Pacific Ocean. The northern reach is relatively well flushed because more than half of California's freshwater flows into the Bay through the Sacramento and San Joaquin Rivers from the Central Valley watershed. In contrast, the southern reach receives only limited flushing from the smaller streams draining these smaller local watersheds.

Tomales Bay is located in western Marin County, California, approximately 50 km northwest of San Francisco. The Bay has a surface area of approximately 28 square kilometers (11 square miles). The mouth of Tomales Bay is at the southern end of Bodega Bay, and its body extends in a southeasterly direction along the line of the San Andreas Fault. The Bay is about 12 miles in length with an average width of less than one mile. Tomales Bay is characterized by relatively shallow water, with the average depth being less than 20 feet.

3.2 Ambient Conditions

This project adds new enterococcus objectives to support water contact recreation uses in marine and estuarine waters, but, to provide context, we present Bay Area beach monitoring data for all three bacteriological indicators – enterococcus, fecal coliform, and total coliform. We do not have bacterial indicator data to summarize from open water portions of marine and estuarine waters in the region. We expect that bacterial indicator concentrations in open water will be lower than those near shore because bacteria sources are mainly from shoreline or upland areas and would be reduced via mixing and dilution in open water areas.

California's Beach Watch program[2] compiles monitoring data for several popular Bay Area beaches. The data are collected by East Bay Regional Parks District, San Francisco County Department of Public Health, Marin County, and the San Mateo County Environmental Health Department. The monitoring locations are shown in a series of maps in Appendix D. These locations are generally monitored every week during April

[2] http://beachwatch.waterboards.ca.gov/BeachWatch/index.jsp

through November, and year-round at some beaches. We analyzed these data for the period 2004 through 2009 and tallied exceedances of the Basin Plan's existing single sample, median, and geometric mean criteria for fecal coliform, and total coliform as well as the proposed objectives for enterococcus. Table 3-1 contains the bacteriological criteria against which the data were compared, and Table 3-2 is a summary of how frequently these water quality criteria were exceeded at each beach.

Aside from Fort Baker Horseshoe Cove beaches, there were no San Francisco Bay beaches located in Marin County that had persistent exceedances of either the single sample maximum or geometric mean objectives for enterococcus or fecal coliform. At the Northeast and Northwest portions of Fort Baker Horseshoe Cove beaches, there were modestly frequent exceedances (6-12%) of both the single sample and geometric mean enterococcus objectives. More than 30% of the computed total coliform geometric means at China Camp and McNear's beach exceed the objective, and both of these beaches were added to the 2006 list of impaired waterbodies by the U.S. EPA in 2007 for indicator bacteria.

A number of Tomales Bay beaches in Marin County were also added by the U.S. EPA to the 2006 list of impaired waterbodies for indicator bacteria. Those include Heart's Desire Beach, Millerton Point, Chicken Ranch, Golden Hinde and Lawson's Landing. There were notably low levels of bacteriological indicators at Shell Beach. And only about 8% of the enterococcus geometric means exceeded the objective at Miller Point.

The monitoring data conducted at East Bay beaches show that there are exceedances of all bacteria objectives at Crown Beach (Bird Sanctuary) in Alameda and frequent (> 20% of geometric means) exceedances of the total coliform geometric mean objective at all portions of Keller Beach in Richmond.

Parkside Aquatic Park and Marina Lagoon in San Mateo County both exhibited consistently elevated levels of all three indicators. Coyote Point Park monitoring data do not suggest elevated bacteria levels relative to Basin Plan objectives.

There are several City of San Francisco Bayside beaches that were added to the 2006 impaired waters list due to frequent exceedances of bacteriological criteria. Data at Aquatic Park (mid-beach) exceed the single sample enterococcus criterion 9% of the time and the geometric mean criterion 14% of the time. There are also frequent exceedances of both these criteria at Crissy Field (New Beach) and Candlestick Point (Jack Rabbit Beach and Sunnydale Cove). There are frequent exceedances of criteria for all bacteria indicators at Windsurfer Circle at Candlestick Point.

Table 3-1: Existing and Proposed Bacteriological Limits for Water Contact Recreation

	Total Coliform limit (Basin Plan)	Fecal Coliform limit (Basin Plan)	Enterococcus limit (proposed)
30-day Average	240/100 ml (median)	200/100 ml (geometric mean)	35/100 ml (geometric mean)
Single Sample	10,000/100 ml	400/100 ml (90th percentile)	104/100 ml

Note: Long-term averages based on 5 consecutive samples equally spaced over 30 day period.

Table 3-2: Summary of Beach Watch Bacteria Indicator Data in SF Bay (SWRCB 2009). All beaches are in San Francisco Bay except those in Marin County indicated as being located in Tomales Bay. For each indicator, the number of exceedances of the objective is given along with the percentage of samples exceeding in parentheses.

Beach	# samples exceeding proposed single sample Max (%)	# Geometric Mean exceeding criteria (%)
Marin County Beaches		
China Camp	Entero: 3 (2.3%) Fecal: 0 (0%) Total: 6(5.5%)	Entero: 0 (0%) Fecal: 0 (0%) Total: 25 (31.25%)
McNear's Beach	Entero: 7 (5.1%) Fecal: 0 (0%) Total: 3 (2.73%)	Entero: 5 (5.15%) Fecal: 0 (0%) Total: 28 (36.4%)
Chicken Ranch Beach	Entero: 8 (5.7%) Fecal: 0 (0%) Total: 1 (0.9%)	Entero: 4 (3.8%) Fecal: 0 (0%) Total: 6 (8.0%)
Paradise Cove	Entero: 4 (2.86%) Fecal: 0 (0%) Total: 0 (0%)	Entero: 5 (4.63%) Fecal: 0 (0%) Total: 3 (3.66%)
Schoonmaker Beach	Entero: 1 (0.8%) Fecal: 1 (1.2%) Total: 2 (2.2%)	Entero: 0 (0%) Fecal: 0 (0%) Total: 0 (0%)
Ft. Baker Horseshoe Cove – All Beaches – NE, NW, SW	Entero: 23 (5.6%) Fecal: 9 (3.5%) Total: 7 (2.1%)	Entero: 19 (7%) Fecal: 0 (0%) Total: 8 (3.7%)
Golden Hinde (Tomales Bay)	Entero: 0 (0%) Fecal: NA (NA) Total: 0 (0%)	Entero: 0 (0%) Fecal: NA (NA) Total: 5 (33.3%)
Heart's Desire (Tomales Bay)	Entero: 1 (0.7%) Fecal: 0 (0%) Total: 0 (0%)	Entero: 0 (0%) Fecal: 0 (0%) Total: 0 (0%)
Lawson's Landing (Tomales Bay)	Entero: 7 (5.4%) Fecal: 0 (0%) Total: 0 (0%)	Entero: 9 (9.5%) Fecal: 0 (0%) Total: 0 (0%)
Miller Point (Tomales Bay)	Entero: 4 (3.2%) Fecal: 0 (0%)	Entero: 7 (7.8%) Fecal: 0 (0%)

Beach	# samples exceeding proposed single sample Max (%)	# Geometric Mean exceeding criteria (%)
	Total: 0 (0%)	Total: 1 (1.5%)
Millerton Point (Tomales Bay)	Entero: 5 (4.7%) Fecal: 1 (1.8%) Total: 7 (9%)	Entero: 0 (0%) Fecal: 0 (0%) Total: 7 (28%)
Shell Beach (Tomales Bay)	Entero: 1 (0.8%) Fecal: 0 (0%) Total: 0 (0%)	Entero: 0 (0%) Fecal: 0 (0%) Total: 1 (1.6%)
East Bay Beaches		
Crown Beach – all beaches 2001 Shoreline Dr. Bath House Bird Sanctuary Sunset Rd. Windsurfer Cove	Entero: 44 (7.3%) Fecal: 83 (7.8%) Total: 16 (1.5%)	Entero: 31 (2.6%) Fecal: 28 (3.7%) Total: 36 (4.7%)
Keller Beach –all beaches (mid, North, South)	Entero: 14 (4.0%) Fecal: 13 (2.1%) Total: 24 (3.8%)	Entero: 0 (0%) Fecal: 0 (0%) Total: 105 (23.6%)
San Mateo Beaches		
Parkside Aquatic Park	Entero: 28 (16.6%) Fecal: 43 (23.6%) Total: 27 (14.8%)	Entero: 33 (26%) Fecal: 37 (28%) Total: 64 (48.5%)
Coyote Point Park	Entero: 4 (2.4%) Fecal: 9 (4.9%) Total: 2 (1.1%)	Entero: 0 (0%) Fecal: 2 (1.6%) Total: 1 (0.8%)
Marina Lagoon	Entero: 33 (11.4%) Fecal: 30 (10.3%) Total: 19 (6.5%)	Entero: 40 (18.6%) Fecal: 21 (9.6%) Total: 44 (20.1%)
San Francisco Beaches		
Aquatic Park mid-beach	Entero: 26 (9.3%) Fecal: 21 (7.5%) Total: 1 (0.4%)	Entero: 37 (14.4%) Fecal: 11 (4.3%) Total: 0 (0%)
Aquatic Park Hyde St. Pier	Entero: 7 (2.8%) Fecal: 6 (2.4%) Total: 0 (0%)	Entero: 0 (0%) Fecal: 0 (0%) Total: 0 (0%)
Crissy Field New Beach	Entero: 43 (14.8%) Fecal: 18 (6.2%) Total: 5 (1.7%)	Entero: 62 (23.1%) Fecal: 0 (0%) Total: 0 (0%)
Crissy Field Trees	Entero: 9 (4.95%) Fecal: 6 (3.3%) Total: 1 (0.55%)	Entero: 8 (4.9%) Fecal: 0 (0%) Total: 0 (0%)
Candlestick Point Jack Rabbit Beach	Entero: 32 (11.6%) Fecal: 17 (6.1%) Total: 3 (1.1%)	Entero: 39 (15.2%) Fecal: 0 (0%) Total: 0 (0%)

Beach	# samples exceeding proposed single sample Max (%)	# Geometric Mean exceeding criteria (%)
Candlestick Point Sunnydale Cove	Entero: 62 (20.7%) Fecal: 32 (10.7%) Total: 13 (4.3%)	Entero: 100 (35.8%) Fecal: 17 (6.1%) Total: 27 (9.7%)
Candlestick Point Windsurfer Circle	Entero: 102 (30%) Fecal: 57 (16.8%) Total: 53 (15.6%)	Entero: 133 (42.8%) Fecal: 60 (19.3%) Total: 105 (33.8%)

Notes: The exceedance frequencies for the single sample fecal coliform objective were based on exceedances of the Basin Plan's 90th percentile (400 MPN/100 ml) fecal coliform objective. MPN, most probable number, is a statistical estimate of the number of bacteria per unit volume and is determined from the number of positive results in a series of dilution cultures. Medians and geometric means were computed on a rolling basis provided that a minimum of 5 samples were available in any 30-day period.

3.3 Bacteria Sources

Bacterial water quality studies in portions of San Francisco Bay have identified likely pathogen sources based on elevated coliform bacteria levels downstream of the source and from documentation of inadequately treated human waste discharges. These studies suggest that houseboats and vessel discharges in certain recreational boat marinas can be significant potential pathogen sources. The fact that exceedances of fecal coliform objectives are higher at some sampling stations during the wet season than the dry season also suggests that wet-weather-specific sources such as stormwater runoff and sanitary sewer overflows (SSOs) are potential sources of pathogens to the Bay. Wastewater treatment plants are another potential source of bacteria to receiving water. A TMDL is being implemented to protect the shellfish growing areas in Tomales Bay from pathogens. The major sources to this water body are agricultural runoff, faulty on-site disposal systems, boat discharges, open space lands, municipal runoff, and small wastewater treatment facilities and sewage holding ponds (SFBRWQCB 2005).]

Sanitary Sewer Systems

Sanitary sewer overflows usually occur during and after rainstorms when stormwater infiltrates sanitary sewers and overloads system capacity. In addition to the wet-weather overflow discharges, any major sewer line breakage could potentially result in high short-term loading of untreated human waste to the Bay. Table 3-3 is a summary of SSOs by county for the period 2004 through March 2009. The data from 2004 through 2007 suggest that roughly two-thirds of SSOs occur during the wet season. These SSOs combined with higher volumes of stormwater runoff likely lead to higher concentrations of pathogens in the Bay during the wet season.

Table 3-3 Sanitary Sewer Overflows (SSOs) by County from 2004-2009 (SFBRWQCB 2009a)

County	Number of SSOs from 12/1/04 – 3/13/09	Total Spill Volume (million gallons)	Percent during Wet Season (November through May)*
Alameda	1026	14	68%
Contra Costa	701	11.5	70%
Marin	905	2	65%

County	Number of SSOs from 12/1/04 – 3/13/09	Total Spill Volume (million gallons)	Percent during Wet Season (November through May)*
Napa	36	1.1	84%
San Francisco	19	0.005	33%
San Mateo	1470	13	69%
Santa Clara	1130	0.58	66%
Solano	378	1	75%
Sonoma	110	2.8	94%

* Percentages of SSOs occurring during the wet season are available only for period 2004-2007.

Stormwater Runoff

Much of the information available about bacteria in stormwater comes from studies in Southern California. Because many people engage in water contact recreation in the warmer Southern California waters, the impact of stormwater on coastal water quality is well known. Research has been conducted in Southern California showing the presence of bacteria in stormwater both during the dry and wet seasons. Increased urbanization has been shown to result in increased runoff and pollutant loading to receiving waters. The high amounts of impervious surfaces associated with urban landscapes result in increased magnitude and frequency of surface runoff during wet-season and dry-weather conditions. We can reasonably apply results from urbanized southern California watersheds to similarly urbanized watersheds ringing the Bay.

Field studies conducted to assess the coastal water quality impact of stormwater runoff from the Santa Ana River during the wet season showed that stormwater runoff from the river leads to fecal indicator bacteria concentrations exceeding California ocean bathing water standards by up to 500% in the immediate vicinity of the discharge. Because of the configuration of engineered stormwater conveyances, the discharge of stormwater runoff from urban watersheds can occur days after the cessation of rain, when the potential for human exposure to pathogens by marine recreational contact is significant (Ahn et al. 2005).

Mean dry season storm drain E. coil counts in urbanized Southern California waters were assessed in Ballona Creek and the Los Angeles River and found to be 47,000 (MPN)/100 mL and 21,000 MPN/100 mL for Ballona Creek and the Los Angeles River, respectively (Stein and Tiefenthaler 2005). These bacterial counts are more than 150 times higher than the applicable freshwater contact recreation standards. Bacterial counts from in-river and storm drain samples consistently and uniformly exceed water quality standards in almost all locations surveyed in the study (Stein and Tiefenthaler 2005).

Bacteria in stormwater runoff was also identified by the San Francisco Baykeeper in sampling conducted in marinas in the Bay. Over an eighteen month period from September 2004 through July 2005, Baykeeper collected more than 400 samples from four marinas located in geographically different parts of the San Francisco Bay: Clipper Yacht Harbor in Sausalito, Corinthian Yacht Club in Tiburon; Berkeley Marina in Berkeley, and Jack London Marina in Oakland. Of the 422 water samples collected and analyzed, only 19 (5%) had bacteria levels that exceeded one or more of the water quality standards listed in Table 3-1. No strong correlation was observed between bacteria levels

and the day of the week or the season. A correlation between elevated bacteria levels and the presence of a storm drain was apparent; seventeen of the 19 (89%) samples that exceeded a water quality standard were collected from stations located adjacent to a municipal storm drain (Baykeeper 2006).

Vessels (Recreational, Live-aboard, and Anchor-out Boats)

Based on a marina survey conducted by the California Department of Boating and Waterways in August 2004, there are 99 recreational marinas with a total of more than 20,000 slips San Francisco Bay (Table 3-4; DBW 2004). Most boats are designed for active self-propelled navigation and also to accommodate living onboard. Boats that are used as long-term private residences as well as for navigation are referred to as "live-aboards." Currently, there are more than 1300 live-aboards berthed in San Francisco Bay marinas (DBW 2004). Waste discharge from vessels will result in water pollution. Improper disposal of human waste by boaters poses a threat to public health as it can result in shellfish contamination, beach closures, and loss of recreational opportunities.

Tomales Bay is estimated to support a summer weekend recreational boating community of approximately 450 boats. With thousands of boats using the Bay each year, boaters could be a potentially significant source of human pathogens to the Bay. There are presently no sewage pump-out facilities or dump stations (for boats with holding tanks) within the Bay, increasing the risk of Bay pollution from boats. It is possible that illicit waste discharges from boats are contributing fecal contamination to the Bay. Since the wastes are of human origin, these potential discharges pose a significant threat to water quality and public health (SFBRWQCB 2005).

Table 3-4 San Francisco Bay Boat Marinas (DBW 2004)

County	Marinas	Slips	Boats Requiring Pumpout	Vessels with Portable Toilets	Transient Boats Requiring Pumpout (boats/yr)	Live Aboards at Marina
Alameda	26	6541	4368	454	1341	517
Contra Costa	12	2826	1444	472	369	189
Marin	31	3713	2262	186	2965	251
Napa	2	200	150	10	60	7
San Francisco	7	2031	1225	275	5100	53
San Mateo	10	3045	1730	270	812	226
Santa Clara	3	77	2	0	0	0
Solano	5	1618	1059	27	1750	88
Sonoma	3	492	69	52	300	3
	99	**20543**	**12309**	**1746**	**12697**	**1334**

Richardson Bay in Marin County has a large number of anchor-outs and live-aboard vessels and houseboats. Although all houseboats in Richardson Bay have been sewered, the adequacy, integrity, and reliability of these sewage systems remain questionable. Water quality monitoring in Richardson Bay clearly shows that waters in the vicinity of the houseboats and vessel marinas have consistently exhibited a high number of WQO

exceedances. Episodic and/or chronic sewage discharges from faulty and un-maintained systems contribute to the impairment. A TMDL for pathogens has been adopted for Richardson Bay and includes implementation actions for marinas, houseboats, live-aboards and anchor-outs as well as other sources. The TMDL includes the proposed enterococcus objective as a numeric target subject to the adoption of the objective into the Basin Plan (SFBRWQCB 2008).

Wildlife

A variety of terrestrial wildlife, such as birds and rodents, inhabit the open space lands adjacent to San Francisco and Tomales Bays and may contribute pathogens to these waters either directly or through stormwater runoff. No accurate information as to the magnitude and geographic dispersion of this waste source is available, however.

Marine birds and mammals are also present in both embayments. Migratory waterfowl are numerous during the winter months. Increased numbers of sea birds are also attracted to San Francisco Bay during the Pacific Herring spawning season, from December through February.

A study focusing on two managed ponds near Coyote Creek and Alviso Slough in South San Francisco Bay provides some insight as to how waterfowl may impact San Francisco Bay bacterial concentrations throughout the year. Shellenbarger and colleagues (2008) measured bird abundance and indicator bacteria concentrations in winter and summer 2006 and constructed a box model to determine if these ponds were serving as a source or sink for bacteria. They found that the ponds were a net source of bacteria to San Francisco Bay during the winter months, probably due to the presence of large numbers of migratory birds active in the ponds during this season. Although concentrations of bacteria were higher in the summer, the ponds tended to act as a net sink for bacteria during this season (Shellenbarger et al. 2008).

Because of the great variety, complex distribution and dispersal patterns, and fluctuating populations of water birds it is very difficult to assess their impact on water quality in the Bay. They can cause localized, intermittent impacts, especially during the winter months. As with avian populations, marine mammals follow the herring runs into San Francisco Bay, and may also cause intermittent impacts on water quality in some areas in winter.

Wastewater Treatment Plants

Municipal wastewater treatment plants discharge approximately 600 million gallons per day of treated, disinfected wastewater to San Francisco Bay (personal communication, NPDES permit staff). This large volume of water has low concentrations of bacteria due to treatment and disinfection as shown in Table 3-5. Treatment and disinfection achieve levels in effluent generally much lower than water quality objectives. A review of available data for wastewater treatment plants between 2002 and April 2009 revealed only four instances in which a facility exceeded the proposed 35 MPN/100 ml default enterococcus effluent limitation.

Table 3-5 Statistical summary of bacteriological data for wastewater discharge San Francisco Bay between 2002 and April 2009. Concentrations are in MPN/100 ml (SFBRWQCB 2009b).

	Total	Fecal	Entero
Number of Samples	36202	23186	9804
Median	2	4	2
Mean	109	59	12.3
75^{th} percentile	20	20	7

There are eleven small wastewater treatment facilities within the Tomales Bay watershed, including one facility that accepts septage waste. The Water Board prohibits direct discharge from treatment facilities into Tomales Bay or the creeks within the watershed. While these small wastewater treatment facilities have the potential to contaminate waters due to isolated and unexpected incidents such as a system malfunction or breaching of the holding ponds, under normal operating conditions they are not considered to be a significant ongoing source of pathogens to the Bay (SFBRWQCB 2005).

Agricultural Runoff (Tomales Bay)

A variety of bacteria and protozoa found in livestock waste can be transmitted to humans and pose serious health problems. Because the Tomales Bay Watershed is dominated by animal agriculture land use (Dairies and grazing account for almost 55% of the land uses by acreage), and due to the proximity and hydrological accessibility of these land uses to the Bay, agricultural runoff carrying animal waste from grazing lands and/or confined animal facilities (beef, dairy, sheep, horse farms), is a significant source of pathogen loading to Tomales Bay and its tributaries.

Small On-Site Sewage Disposal Systems (Tomales Bay)

On-site sewage disposal systems are very rare along the San Francisco Bay shoreline, and Bay area counties make efforts to switch the discharge to a sewer system when they are discovered (personal communication with Water Board Watershed Division staff). In contrast, the unincorporated areas around Tomales Bay and its tributaries are served entirely by various types of on-site sewage disposal systems (OSDS) including septic tank and leach-field systems, holding tanks, and seepage pits. According to the California Department of Health Services, up to 1600 parcels have OSDS within 100 feet of Tomales Bay. The majority of the parcels lack sufficient available land to install an OSDS that meets the required sanitary setbacks and construction standards. The soils in this region are of poor quality to serve as septic absorption fields. Therefore, OSDSs at many residences are likely to function poorly due to site conditions, and they are likely to fail during flood events. Faulty OSDSs are considered a significant pathogen source to the Bay and its tributaries and pose a risk to public health (SFBRWQCB 2005). A project in Marshall funded partially through Proposition 13 (Costa Machado Act) monies is nearly complete. This effort is intended to improve and protect coastal water quality by replacing or upgrading existing privately-owned septic tanks and constructing a new central community wastewater collection system and common leachfield. The goal of the project is remove the pollution contribution of the older septic systems along the immediate shoreline (County of Marin 2008).

3.4 Updated Objectives

Current fecal and total coliform objectives, as well as the proposed enterococcus water quality objectives to protect the water contact beneficial use in marine and estuarine waters in the San Francisco Bay region, are shown in the following table.

Table 3-6 Current and proposed bacteria objectives (in MPN/100 ml) to protect water contact recreation uses in the San Francisco Bay region.

Indicator	Central Tendency Objective	Acute Objective
Fecal Coliform **(current)**	Geometric mean < 200	90^{th} percentile < 400
Total Coliform **(current)**	Median < 240	No sample > 10,000
Enterococcus **(marine and estuarine waters, proposed)**	Geometric mean < 35	No sample > 104

This project will add enterococcus objectives to support water contact recreation uses in marine and estuarine waters of the San Francisco Bay region. Specifically, we propose a geometric mean objective of 35 MPN/100 ml and a single sample maximum of 104 MPN/100 ml.

The proposed objectives are those currently recommended by the U.S. EPA. However, in 2007, the U.S. EPA initiated a process for developing and publishing new or revised water quality criteria for pathogens and pathogen indicators for recreational waters. The first phase of the process is underway and involves conducting scientific studies on pathogen indicators. The information generated through these studies will then be evaluated and submitted for scientific review. The agency will then formulate policy options for the revised indicators and obtain input from a wide range of stakeholders including other federal, local, and state agencies concerning the policy options. The U.S. EPA will then draft and publish proposed criteria for broad public input and review. The time frame for publishing the final criteria is 2012 (U.S. EPA 2007). It is not possible to anticipate the outcome of this process, but it may result in the need to update the Basin Plan's bacteriological objectives.

The proposed enterococcus objectives for this project were derived from a statistical model relating the incidence or risk of disease (from human or animal fecal wastes) among swimmers to the quality of the water as measured by the density of the infectious agent itself or an appropriate indicator (Cabelli 1983). The regression model relating number of illnesses per 1000 swimmers against enterococcus density (indicator having the strongest correlation with disease) was developed from epidemiological studies at several marine water beaches (Cabelli 1983). The U.S. EPA determined that the level of risk associated with its prior fecal coliform geometric mean objective of 200 MPN/100 ml was 19 illnesses per 1000 swimmers for marine beaches or 1.9%. U.S. EPA evaluated this same level of risk in the enterococcus regression model to derive the geometric mean enterococcus objective (USEPA 1986).

The maximum acceptable bacterial density for a single sample is set higher than that for the geometric mean in order to avoid unnecessary beach closings based on single

samples. To set the single sample maximum, it is necessary to specify the desired chance that the beach will be left open when the protection is adequate. This chance, or confidence level, was based on U.S. EPA judgment. The proposed single sample maximum enterococcus objective of 104 MPN/100 ml was derived from the regression model using the 75% confidence level for application to designated beach areas that may be heavily used (USEPA 1986).

The California State Legislature passed Assembly Bill 411, the Beach Water Quality Monitoring Act, in 1997, requiring weekly monitoring of enterococcus, fecal coliform, total coliform and other microbiological indicators during the period from April 1 to October 31 for public beaches in coastal waters. Assembly Bill 411 also required the Department of Health Services to establish bacteriological standards to be used for public notification. The Department subsequently adopted regulations that include, among others, the single sample and geometric mean standards that we propose in this project. In 2002, Assembly Bill 2534 was passed which extended the law to include inland bays and estuaries.

4 Implementation Plan

The new enterococcus objectives require a program of implementation consisting of ambient and effluent monitoring, potential actions to control various inputs of bacteria, water quality based effluent limitations derived from the new criteria and guidance for how bacteriological objectives should be implemented in NPDES wastewater permits. The effluent limits, effluent monitoring and ambient monitoring program will be implemented immediately and continue indefinitely.

Potential control measures to control urban runoff as well as various non-point sources may be implemented after determining that specific areas are not meeting bacteriological water quality standards. These potential control measures are not regulatory requirements of this project, but their impacts will be evaluated because it is reasonably foreseeable that entities would implement bacteria source control measures to meet these standards. In cases where impaired waterbodies have been identified, TMDLs may be developed. These TMDLs would be adopted as a separate Basin Plan amendment and a separate CEQA substitute environmental document would be prepared.

Effluent Limitations for Bacteriological Indicators

The proposed amendment includes the addition of a geometric mean water quality-based enterococcus effluent limitation equivalent to the new geometric mean objective. There are also some changes to the Basin Plan's Chapter 4 and Table 4-2. The bacteriological indicator effluent limitations were moved from Table 4-2 to a new table, Table 4-2A, and the new enterococcus limitation was added to this newly created table. We also made clarifying changes to the footnotes of both these tables. Edits to Section 4.5.5.1 provide an introduction to the newly created Table 4-2A and explain the implementation procedures for the effluent limitations contained in this new table.

One of the fundamental purposes of treating sanitary sewage is to remove fecal bacteria prior to discharge to receiving waters to protect public and environmental health. Every facility discharging treated sanitary waste is subject to a variety of operational upsets, including capacity exceedance, which can compromise the plant's effectiveness at accomplishing the basic function of removing harmful fecal bacteria. When such operational challenges occur, the inadequately treated discharge is likely to cause or contribute to exceedances of water quality criteria for bacteria. Because of the likelihood of operational difficulties, as well as the importance of maintaining effective regulatory vigilance concerning this vital basic purpose of wastewater treatment, the proposed amendment includes a requirement that all permits for such discharges shall include effluent limitations for bacteria.

Use of the geometric mean, but not the single sample criterion for deriving effluent limitations is consistent with the U.S. EPA guidance. The U.S. EPA considers geometric mean bacteria indicator criteria more relevant (than single sample criteria) for ensuring that appropriate actions are taken to protect and improve water quality (U.S. EPA 2004). Therefore, water quality-based effluent limitations derived from the geometric mean criteria are better suited than those derived from the single sample criteria to ensure that

effluent discharges are not adversely impacting water quality. Geometric mean effluent limitations are problematic for intermittent discharges occurring in wet weather because of the difficulty obtaining samples for calculating a valid geometric mean. For this reason, the proposed amendment adds language to the Table 4-2A footnotes to clarify that the Water Board will only implement the total coliform maximum daily effluent limitations for such intermittent wet weather discharges.

In this same guidance document, the U.S. EPA recognizes that "some states provide mixing zones for bacteria and derive permit limits that account for in-stream dilution." The approach taken in the proposed amendment is to establish the enterococcus geometric mean bacteriological criteria as the default "end-of-pipe" effluent limitation and to provide the Board the flexibility to adjust this limitation as well as other water quality-based default bacteria limitations to account for dilution in a manner consistent with procedures in the SIP. Establishing the allowable dilution credit through the permitting process generally requires the permitted entity to conduct a detailed dilution study for their specific discharge environment.

For discharges into marine and estuarine receiving waters with the water contact recreation beneficial use, the Water Board will implement the enterococcus effluent limitation. For such discharges, on a case-by-case basis, the Water Board will implement the total coliform effluent limitation in place of the enterococcus effluent limitation. This may occur, for example, when wastewater treatment plants <u>are required by the Water Board or another agency to monitor routinely for total coliform (e.g., for recycled/reclaimed water).</u>~~must also meet total coliform limits to achieve water quality objectives for recycled water~~. For discharges to receiving waters with the shellfish harvesting beneficial use, or to receiving water designated as freshwater, the Water Board will implement the total coliform effluent limitations.

Effluent Monitoring Program

The implementation program requires the inclusion of numeric water quality-based effluent limitations in NPDES municipal wastewater permits for fecal coliform and enterococcus in addition to current total coliform limits. Consequently, the NPDES permits will also include effluent monitoring requirements at a frequency appropriate for ensuring compliance with the limits.

Ambient Monitoring Program

Beach monitoring for bacterial indicator organisms is conducted on an ongoing basis by the East Bay Regional Parks District, San Francisco County Health Department, Marin County, and the San Mateo County Environmental Health Department. These data are collected at the numerous beaches (shown in the maps in Appendix D) to ensure that water quality is suitable for water contact recreation. It is reasonable to assume that this monitoring will continue as part of these counties' mandate to protect public health in their jurisdictions.

5 Regulatory Analyses

This section provides the regulatory analyses required when adding water quality objectives and an associated implementation plan to the Basin Plan. California Water Code §13241 requires consideration of a variety of factors when establishing a water quality objective. The California Environmental Quality Act (CEQA) requires an environmental impact analysis when adopting a Basin Plan amendment under the Water Board's certified regulatory program (California Public Resources Code § 15251 [g]). This section also includes a discussion of economic considerations in accordance with Public Resources Code § 21159 [a] [3] [c] which requires an analysis of economic factors related to costs of implementation of the new rules or regulations. Because this project does not modify a beneficial use designation or relax a water quality objective, this section does not need to include an antidegradation analysis[3]. The enterococcus objectives are as stringent or more stringent than the existing objectives for total and fecal coliform.

5.1 California Water Code §13241

CWC Section 13241 identifies six factors that must be considered when establishing a water quality objective.

- Past, present and probable beneficial uses of water;
- Environmental characteristics of the hydrographic unit under consideration; including the quality of water available thereto;
- Water quality conditions that could reasonably be achieved through the coordinated control of all factors that affect water quality in the area;
- Economic considerations;
- The need for developing housing within the region; and
- The need to develop and use recycled water

Past, Present and Probable Beneficial Uses

The Current Basin Plan defines beneficial uses and water quality objectives for waters in the San Francisco Bay region. The beneficial uses cited in Chapter 2 of the Basin Plan for Tomales Bay and San Francisco Bay segments are:

- Water Contact Recreation
- Non-contact Water Recreation
- Wildlife Habitat
- Preservation of Rare and Endangered Species
- Estuarine Habitat (San Francisco Bay only)
- Fish Migration
- Fish Spawning

[3] Administrative Procedures Manual: Water Quality, Chapter 8, Water Quality Control Plans and Policies (2001).

- Industrial Service Supply (San Francisco Bay only)
- Shellfish Harvesting
- Navigation (San Francisco Bay only)
- Commercial and Sport Fishing

These beneficial uses adequately represent past, present and probable future uses. Revision of water quality objectives for protection of human health due to water contact recreation does not affect protection of beneficial uses that are based on aquatic life, wildlife or other uses, since effluent limitations are based on the most stringent objective when all beneficial uses of the receiving water are considered.

The proposed objectives are fully protective of marine and estuarine water contact recreation because the enterococcus indicator strongly correlates with disease caused by exposure to fecal pollution.

Environmental Characteristics of the Hydrographic Unit

The hydrographic unit for the application of enterococcus objectives is all non-coastal marine and estuarine waters of the San Francisco Bay region. The environmental characteristics and existing water quality conditions of these waters are discussed in sections 3.1 through 3.3 of this report.

Water Quality Conditions that Could Reasonably be Achieved

The summary of beach monitoring data in Section 3.2 shows that about one-third of the surveyed beaches had exceedance frequencies of the enterococcus objectives greater than 5%, and there are several beaches on the Clean Water Act Section 303(d) impaired waters list due to high levels of bacteria. Improvements in the bacteriological quality of marine and estuarine waters in the San Francisco Bay region can be reasonably achieved through the coordinated control of all factors. This control will result from future actions taken to address impaired water bodies included on the 303(d) list.

For those waters on the 303(d) list for bacteria, the state is required to determine the amount that bacteria sources must be reduced to meet the applicable standards and eliminate beneficial use impairment. This allocation of allowable pollutant discharge from various sources is called a total maximum daily load, or TMDL. TMDLs for bacteria will need to consider a variety of factors to achieve a successful outcome. One of the first steps is to identify the sources contributing to the problem and the timing of those sources. For example, some impaired beach areas are mainly threatened by high bacteria concentrations in stormwater runoff during the wet season. Other areas may be threatened by bacteria from dry season urban runoff or leaking septic systems onshore. All of these sources are controllable so water quality supporting beneficial uses may be reasonably achieved through the coordinated control of these and other factors.

Economic considerations

The economic analysis requires, at a minimum, a review of available information to determine whether:

- The proposed water quality objectives are currently being attained; or if not,
- What methods are available to achieve compliance with the water quality objective and the costs of those methods of compliance (SWRCB 1999).

In addition to the CWC §13241 economic analysis requirements, CEQA requires that whenever a state or regional board adopts rules that require the installation of pollution control equipment or establish a performance standard or treatment requirement, the board must conduct an environmental analysis of the reasonably foreseeable methods of compliance [Pub. Res. Code §21159, 14 CCR 15064]. Based on the review of water quality data (Section 3.2), it appears that several beaches may not be attaining the proposed objectives. Therefore, we will consider economics relative to the foreseeable measures to control or remedy non-point and urban stormwater runoff sources of bacteria that may be impacting such areas. Both the CEQA analysis of reasonably foreseeable methods of compliance and the CWC §13241 economic analyses of the proposed amendment are provided in this section.

Economic Considerations of NPDES Wastewater Effluent Limits

There are no substantial, foreseeable economic impacts that would result from the implementation of the proposed enterococcus effluent limitations in NPDES wastewater permits. Many wastewater NPDES permits already include the proposed enterococcus limit. With the adoption of the proposed enterococcus marine and estuarine water quality objectives and the associated water quality-based effluent limit consistent with these objectives, nearly all future NPDES permits would have the enterococcus effluent limit[4]. There are some facilities without enterococcus effluent limits currently in their permit that will receive them once the amendment is adopted. Recent treatment plant performance (see Table 3-5) data suggests that current typical wastewater treatment plant operational practices and performance (including current disinfection practices using chlorine or ultra-violet radiation) are adequate to achieve compliance with the proposed enterococcus effluent limitation. The mean, median, and 75th percentile enterococcus concentrations in effluent are well below the proposed geometric mean effluent limitation, and sustained high concentrations that would result in monthly geometric means exceeding proposed geometric mean effluent limit are very rare. Because of this typical good performance and the fact that many facilities already contain the proposed enterococcus effluent limitation in their permit, there are no anticipated additional treatment requirements (or associated economic impacts) resulting from this project.

For those facilities not already monitoring for enterococcus (because they have no effluent limit), they will be required to do so when they receive an effluent limit. There will be no additional monitoring costs for those NPDES facilities whose permits already

[4] A small number of NPDES wastewater permits have effluent limits based on the slightly lower freshwater enterococcus U.S. EPA criteria of 33 MPN/100 ml, but compliance considerations are essentially equivalent for effluent limits of 33 and 35 MPN/100 ml.

require monitoring for enterococcus to demonstrate compliance with the current effluent limitations. The cost of the enterococcus monitoring is between $50 and $75 per sample (Schafer 2010) so most facilities will incur costs between $3000 and $4500 per year for this monitoring. Those facilities already monitoring for enterococcus will have no additional expense.

Economic Considerations of Ambient Monitoring

There are no foreseeable additional economic impacts that would result from the ambient monitoring elements of the implementation program for the proposed objectives. Beach monitoring for bacterial indicator organisms, including enterococcus, is already conducted on an ongoing basis by local county agencies to ensure that water quality is suitable for water contact recreation. A commonly used analytical technique for enterococcus is the Enterolert® Rapid Enterococci Test (IDEXX 2001), which costs roughly $5 per test (Weber Scientific 2009). No new monitoring requirements are proposed as part of this project.

Economic Considerations of Urban Runoff and Non-Point Source Control

Point sources are those where the discharge to a waterbody is at a discrete physical location, or point. Urban runoff is considered a point source because storm drain outlets discharge to a waterbody at a point. In contrast, non-point sources are spatially distributed in a catchment or watershed. For example, pesticides are applied to agricultural fields in a distributed fashion but can then migrate to surface water or ground water. However, some of the same control measures used to control bacteria from urban runoff may also be used to control non-point sources. This is because, while urban runoff discharges are considered point sources, the pollutants in urban runoff are usually diffusely distributed within the catchment. Because of this spatial distribution of source origin, control measures for urban runoff and non-point sources often rely on similar practices.

Control of bacteria from urban runoff and non-point sources is not a required regulatory element of the current project. However, because it is possible that some areas where water contact occurs are influenced by such sources, it is foreseeable that some control of non-point sources of bacteria will be necessary. The scope of this project does not include identification of those areas that are not attaining the enterococcus criteria. Thus, it is not possible to specify in detail which measures will be necessary to control such sources in order to attain water quality standards in all locations. In any case, the Water Board is prohibited from specifying the manner of compliance with its regulations (Water Code § 13360), and accordingly, the actual compliance strategies will be selected by the local agencies and other permittees. That said, foreseeable methods of controlling or remediating non-point or urban runoff bacteria inputs are generally well known. A list of foreseeable structural measures for controlling or remediating bacteria in urban environments was developed for bacteria TMDLs for southern California beaches and the pathogen TMDL from Tomales Bay and is provided in the following table along with estimated unit costs where possible. Implementation of these measures may be subject to additional future environmental review by the appropriate lead agency.

Table 5-1 Reasonably Foreseeable Control and Remediation Measures for Bacteria

Method	Description	Estimated Unit Cost
Low-Flow Diversions	These are structural devices that route urban runoff from streets and small watersheds away from the storm drain system or waterway and redirects it into the sanitary sewer system, where the contaminated runoff then receives treatment and filtration before being re-used or discharged.	$71K annualized capital cost to construct (20 year financing @ 7% interest) and $63K annual operation and maintenance.
Beach Sand Replacement	This measure involves replacing existing beach sand with new clean coarse sand to improve the permeability and drainage characteristics.	N/A
Beach Resurfacing	Resurfacing beaches with gravel or other larger particle-sized rock aggregates is another way to improve permeability.	N/A
Enhanced Circulation Devices	Enclosed beaches are usually characterized by weak circulation and the slow flushing of waters off the beach, specifically of ankle-deep, nearshore waters. Increasing circulation in these shallow nearshore waters can mix and dilute fecal indicator bacteria, resulting in lower bacterial densities at the beach. There are a number of devices available for increasing circulation, as well as options to increase circulation through modifying channels and increasing tidal or wind driven flows.	$30K to $66K per unit (depending on type) for purchase and 10 years of operation and maintenance.
Wet-weather Regional and sub-regional structural BMPs	Stormwater washes pollutants off from watershed surfaces such as roof-tops, pavement, streets, and lawns. Wet-weather flow is a much more difficult problem to control than dry-weather flow because of the much larger volume. Sources are diffuse and often require sub-regional and regional coordination and cooperation to control. Examples of these BMPs include: vegetated biofiltration systems and other infiltration improvements like porous paving,	$1M to $2M per site for sub-regional structural BMPs, and about $284K per square mile of serviced watershed for regional structural BMPs (capital and operation/maintenance).

Method	Description	Estimated Unit Cost
	retention ponds, sub-surface flow wetlands.	
Administrative Controls (for urban runoff)	Enforcement of existing pet disposal ordinances, better enforcement of existing litter ordinances, posting additional signage, continuing feral cat population control, proposing stricter penalties, and application of Low Impact Development requirements to newly developed and redeveloped areas.	Costs for administrative $34K to $170K per square mile of watershed.
Outreach and Education (for urban runoff)	Encourage residents to clean up after their pets, pick up litter, minimize runoff from agricultural, residential, and commercial facilities, and control excessive irrigation.	$85K per square mile of watershed.
On-Site Sewage Disposal Systems (OSDS)	Ensure that existing systems are operated and maintained so as to prevent contamination. Ensure that new systems are designed and constructed so as to prevent contamination. Discourage new discrete systems where community systems are reasonably available.	Annual costs between $284,000 and $1.1 million for the Tomales Bay watershed. Watershed contains approximately 1300 high priority OSDS in 28 square kilometer watershed.
Grazing Lands	Control measures include livestock rotation, fencing to keep animals away from waterways, installation of off-stream water troughs.	Annual costs between $111K and $451K for the Tomales Bay watershed where 55% of the land use is grazing or dairy.
Boat Discharges	Require use of a Coast Guard-approved Marine Sanitation Device (MSD) on all boats with installed toilets. An MSD is any equipment for installation onboard a vessel, other than a toilet, which is designed to receive, retain, treat or discharge sewage and any process to treat such sewage.	One time cost of $53K to $70K to pay for signage, provide a pump-out facility, and develop a boating management plan for Tomales Bay recreational boaters.

Notes: Information on grazing, OSDS, agricultural, and boat control measure is from SFBRWQCB 2005). All other control measure information from LARWQCB 2007.

Need for Housing

The proposed enterococcus water quality objectives would not restrict the development of housing in the San Francisco Bay Region because they do not result in discharge requirements that affect housing or any economic costs related to housing development.

Nor does the proposed amendment constrain the ability of wastewater treatment facilities to respond to population growth, as dischargers can already comply with effluent limitations based on the proposed water quality objectives.

Need to Develop and Use Recycled Water

Adopting the proposed enterococcus objectives will have no foreseeable impact on the quality and no impact on the quantity of wastewater available for recycling or reclamation in the region. Most recycled water in the region is made available through municipal wastewater treatment plants. The effluent limitations proposed through this project are equivalent to those already in NPDES wastewater permits so there is no impact on recycled water quantity or quality.

5.2 Environmental Analysis

CEQA requires agencies to review the potential for their actions to result in adverse environmental impacts. Consistent with Public Resources Code § 21159, the substitute document does not engage in speculation or conjecture, but rather considers only the possible environmental impacts of reasonably foreseeable methods of compliance, the reasonably foreseeable feasible mitigation measures, and the reasonably foreseeable alternative means of compliance, which would avoid or reduce the identified impacts. The water quality planning process is a certified regulatory program approved by the Secretary of Resources as exempt from CEQA's requirements for preparation of an environmental impact report or negative declaration. As part of the regulatory program, the State Water Board's regulations at 23 Cal. Code of Regs. §3720 et seq. require any standard, rule, regulation or plan proposed for board approval to be accompanied by a completed Environmental Checklist and a written report containing (1) a brief description of the proposed activity; (2) reasonable alternatives to the proposed activity and (3) mitigation measures to minimize any significant environmental impacts of the proposed activity. Upon completion of the written report, the Water Board is required to provide a Notice of Filing of the report to the public. This Staff Report including Appendix C, Environmental Checklist and these analyses, meet the requirements of CEQA for adopting Basin Plan amendments and serves as a substitute environmental document.

Project Description

The project is a proposed Basin Plan amendment to add enterococcus water quality objectives for contact recreation in marine and estuarine waters and add effluent limitations consistent with the new objectives for use in NPDES wastewater permits. The proposed enterococcus objectives are consistent with those in the California Code of Regulations, title 17, section 7958 "Bacteriological Standards" (Assembly Bill 411, Statutes of 1997) and the federal BEACH Act of November 16, 2004 "Water Quality Standards for Coastal and Great Lakes Recreation Waters" 69 FR 67217 et seq. also 40 CFR part 131.41; effective date December 16, 2004.

The proposed enterococcus effluent limit is the geometric mean objective for five effluent samples spaced over a calendar month. We are not proposing to implement an effluent limitation derived from the single sample objective because USEPA intended the single

sample maximum values would be used for making beach notification and beach closure decisions, not for determining appropriate actions for protecting and improving water quality. Surveillance of ambient conditions already occurs and will continue to be conducted via beach monitoring programs coordinated through county health departments. The quality of wastewater effluent will be monitored because NPDES wastewater permits will include monitoring requirements at a frequency appropriate for ensuring compliance with the proposed and existing bacterial effluent limitations. Sections two through five of this report contain additional information about the project, the project objectives are detailed in section 2.2 and Appendix A contains the proposed amendment language. Appendix C contains the Environmental Checklist for the proposed project.

Consideration of Alternatives for the Proposed Amendment

Four project alternatives are considered: (1) no action (no Basin Plan Amendment), (2) proposed Basin Plan Amendment, (3) adding different enterococcus objectives dependent upon the level of beach use, and (4) adding the same enterococcus objectives and geometric mean effluent limitation as in the proposed project but also including a single-sample effluent limitation.

No Action

Under this alternative, the Water Board would not amend the Basin Plan to adopt the proposed enterococcus objectives, and no new implementation activities would be initiated. This alternative would not meet all the project objectives set forth in Section 2.2. Specifically, the *'No Action'* alternative would not meet the project objective that the Basin Plan's water quality objectives are consistent with California law and objectives adopted by U.S. EPA. And, the *'No Action'* alternative would mean not adding enterococcus objectives. Therefore the Basin Plan's bacteriological water quality objectives would not be based on the best available scientific information – which tells us that enterococcus is the best indicator of disease-causing organisms to protect the water contact recreation beneficial use.

Proposed Basin Plan Amendment

The proposed project is the adoption of the Basin Plan Amendment presented in Appendix A. The technical background for Basin Plan Amendment is provided in Sections 2 through 4 of this report and is described, in brief, above. Because this alternative is the only one considered that meets all project objectives, it is the preferred alternative. In addition, this is the environmentally superior alternative because it would establish the most widely applicable objectives of the alternatives considered.

Enterococcus Objectives as a Function of Level of Use

Under this alternative, the geometric mean enterococcus objective that would apply would depend on how much water contact recreation occurs. The single sample maximum objective would be as follows:

Designated (heavily used beach)	104 MPN/100 ml
Moderately Used Area	124 MPN/100 ml
Lightly Used Area	276 MPN/100 ml

Infrequently Used Area	500 MPN/100 ml

These are U.S. EPA bacteriological criteria and are shown in Table 3-2 of the Basin Plan but are not currently water quality objectives in the San Francisco Bay Region. This approach requires investigations or judgments concerning the intensity of water contact recreation throughout San Francisco and Tomales Bays. If these investigations or judgments are in error, it is possible that some areas would be incorrectly designated as having less intensive water contact recreation than they truly have. Moreover, these use patterns are not static so such designations would require periodic updating to remain accurate. Therefore, there is some doubt whether this approach would fully protect the water contact recreation use in marine and estuarine waters in the region. And, if investigations must be periodically conducted to distinguish beaches by intensity of use, the cost of such efforts would constitute an unreasonable cost relative to the environmental benefit. This alternative does not meet all project objectives.

Application of a Single-Sample Effluent Limitation

Under this alternative, the implementation plan would include not only an effluent limitation for NPDES wastewater discharges corresponding to the geometric mean enterococcus objective of 35 MPN/100 ml but would also include a short-term daily maximum effluent limitation corresponding to the 'do not exceed' objective of 104 MPN/100 ml. There were 96 (of 9800) single sample enterococcus effluent concentrations greater to or equal than 104 MNP/100 ml during the period 2002 through April 2009. In all but a handful of these instances, the geometric mean for the month would be less than 35 MPN/100 ml. If these data are taken to be representative of expected future performance, then application of a single sample maximum effluent limitation would result in many daily maximum effluent violations and force wastewater treatment facilities to incur expense in either paying the fines or trying to improve performance in order to avoid such violations.

The U.S. EPA intended the single sample maximum values to be used for making beach notification and beach closure decisions. The geometric mean is considered more relevant for assuring that appropriate actions are taken to protect and improve water quality because it is more reliable and less subject to random variation. [Federal Register, Volume 69, No 220], and the U.S. EPA has provided guidance recommending implementation of the geometric mean criteria as effluent limitations (U.S. EPA 2004). Taking in view the plausible effluent limit violations along with U.S. EPA guidance regarding the single sample criteria, this alternative would not meet the project objective that new regulatory requirements should not be more stringent than necessary to attain and maintain water quality standards and do not result in unreasonable costs relative to their environmental benefits. This alternative, therefore, does not meet all project objectives.

Preferred Alternative

The proposed Basin Plan amendment meets all the project objectives and will not result in any significant adverse environmental impacts. None of the other considered alternatives, including *'No Action'*, meets all the project objectives. Therefore, the proposed Basin Plan amendment is the preferred alternative.

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Appendix A – Basin Plan Amendment

PROPOSED BASIN PLAN AMENDMENT

Revisions indicated in single underline/strikeout represent new or revised language compared to existing version of Basin Plan. Revisions indicated in double underline/strikeout represent new or revised language with respect to the version of the amendment circulated on February 4, 2010.

Table 3-1: Water Quality Objectives for ~~Coliform~~ Bacteria[a]

Beneficial Use	Fecal Coliform (MPN/100ml)	Total Coliform (MPN/100ml)	Enterococcus (MPN/100ml)[g]
Water Contact Recreation	geometric mean < 200 90th percentile < 400	median < 240 no sample > 10,000	geometric mean < 35 no sample > 104
Shellfish Harvesting[b]	median < 14 90th percentile < 43	median < 70 90th percentile < 230[c]	
Non-contact Water Recreation[d]	mean < 2000 90th percentile < 4000		
Municipal Supply: - Surface Water[e] - Groundwater	geometric mean < 20	geometric mean < 100 < 1.1[f]	

Notes:

a. Based on a minimum of five consecutive samples equally spaced over a 30-day period.

b. Source: National Shellfish Sanitation Program.

c. Based on a five-tube decimal dilution test or 300 MPN/100 ml when a three-tube decimal dilution test is used.

d. Source: Report of the Committee on Water Quality Criteria, National Technical Advisory Committee, 1968.

e. Source: California Department of Public Health ~~Services (DOHS)~~ recommendation.

f. Based on multiple tube fermentation technique; equivalent test results based on other analytical techniques, as specified in the National Primary Drinking Water Regulation, 40 CFR, Part 141.21(f), revised June 10, 1992, are acceptable.

g. Applicable to marine and estuarine waters only. Numeric values are based on Section 7958 of Title 17 of the California Code of Regulations, 69FR 67217 et seq., and 40 CFR Part 131.41 (effective date December 16, 2004).

4.5.5.1 LIMITATIONS FOR CONVENTIONAL POLLUTANTS

Table 4-2 contains effluent ~~Effluent~~ limitations for conventional pollutants ~~are contained in Table 4-2~~ for discharges to inland surface waters and enclosed bays and estuaries within the region.

Table 4-2A contains both daily maximum and longer-term effluent limitations for bacteriological indicator organisms. All NPDES permits for discharges that contain sanitary waste shall include the applicable effluent limitations from Table 4-2A. The water quality-based effluent limitations in Table 4-2A may be adjusted to account for dilution in a manner consistent with procedures in the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (see footnotes 'a' and 'e' in Table 4-2A.

TABLE 4-2 EFFLUENT LIMITATIONS FOR CONVENTIONAL POLLUTANTS

(ALL UNITS IN MG/L, EXCEPT AS OTHERWISE NOTED)

PARAMETERS:	3-DAY AVERAGE	7-DAY AVERAGE	DAILY MAXIMUM	INSTAN-TANEOUS LIMIT	~~SEVEN SAMPLE MEDIUM~~	~~5 SAMPLE MEDIUM~~
Biochemical Oxygen Demand (BOD5)[a,b]	30	45				
Suspended Solids (SS)[a]	30	45				
85% removal of BOD and SS [a,c]						
~~Total Coliform Organisms [a,d] (in MPN.100ml)~~						
~~Shallow Water Discharge [e] (in immediate vicinity of public contact or shellfish harvesting)~~			~~240~~		~~2.2~~	
~~Deep Water Discharge~~			~~10,000~~			~~240~~
pH [df] (in pH units)						
- Shallow Water Discharge				6.5-8.5		
- Deep Water Discharge				6.0-9.0		
Residual Chlorine [df] (free chlorine plus chloramines)				0.0		
Settleable Matter [f,ge] (in ml/l-hr)	0.1		0.2			
Oil & Grease [d f]	10		20			

NOTES:

a. These effluent limitations apply to all sewage treatment facilities that discharge to inland surface waters and enclosed bays and estuaries. The Water Board may also apply some of these limitations selectively to certain other non-sewage discharges, but they will not be used to preempt Effluent Guideline Limitations established pursuant to Sections 301, 302, 304, or 306 of the federal Water Pollution Control

Act, as amended. (Such Effluent Guideline Limitations are included in NPDES permits for particular industries.)

b. The federal regulation allows the parameter BOD to be substituted with Carbonaceous BOD at levels that shall not exceed 25 mg/l as a 30-day average, nor 40 mg/l as a 7-day average.

c. The arithmetic mean of the biochemical oxygen demand (5-day 20ºC) and suspended solids values, by weight, for effluent samples collected in any month shall not exceed 15 percent of the arithmetic mean of the respective values, by weight, for simultaneous influent samples.

~~d. (1) The Regional Board may consider substituting total coliform organisms limitations with fecal coliform organisms limitations provided that it can be conclusively demonstrated through a program approved by the Regional Board that such substitution will not result in unacceptable adverse impacts on the beneficial uses of the receiving water.~~

~~(2) The Regional Board may consider establishing less stringent requirements for any discharges during wet weather.~~

~~e. Exceptions to these requirements may be granted by the Regional Board where it is demonstrated that beneficial uses will not be compromised by such an exception. Discharges receiving such exceptions shall not exceed a five-sample median of 23 MPN/100 ml nor a maximum of 240 MPN/100 ml during dry weather.~~

~~f~~d These effluent limitations apply to all treatment facilities.

~~g~~e Discharges from sedimentation and similar cases should generally not contain more than 1.0 ml/l-hr of settleable matter. Design and maintenance of erosion and sediment control structures shall comply with accepted engineering practices as identified in the Association of Bay Area Government's (ABAG's) *Manual of Standards for Erosion and Sediment Control Measures*.

TABLE 4-2A EFFLUENT LIMITATIONS FOR BACTERIOLOGICAL INDICATORS

(ALL UNITS IN MPN/100ml)

PARAMETERS:	DAILY MAXIMUM	SEVEN SAMPLE ~~MEDIUM~~ MEDIAN	5 SAMPLE ~~MEDIUM~~ MEDIAN OR GEOMETRIC MEAN
Enterococcus[a,b]			35 (as geometric mean)
Total Coliform Organisms [b,c]			
Shallow Water Discharge [d] (in immediate vicinity of public contact or shellfish harvesting)	240	2.2	
Deep Water Discharge[e]	10,000		240 (as median)

NOTES:

a. This water quality-based effluent limitation shall be implemented as a geometric mean of a minimum of 5 effluent samples spaced over a calendar month. Fewer samples may be used on a case-by-case basis if allowed in the waste discharge requirements. Equivalent test results based on other analytical methods applicable to enterococcus approved in 40 CFR 136.3(a) are acceptable.

b. ~~These effluent limitations apply to all sewage treatment facilities that discharge to inland surface waters and enclosed bays and estuaries.~~
For discharges into marine and estuarine receiving waters with the water contact recreation beneficial use, the Water Board will implement the enterococcus effluent limitation. For such discharges, on a case-by-case basis, the Water Board ~~will~~ may implement the total coliform effluent limitation in place of the enterococcus effluent limitation. This may occur, for example, when wastewater treatment plants are required by the Water Board or another agency to monitor routinely for total coliform (e.g., for recycled/reclaimed water). ~~must also meet total coliform limits to achieve water quality objectives for recycled water~~.

For discharges to receiving waters with the shellfish harvesting beneficial use, or to receiving water designated as freshwater, the Water Board will implement the total coliform effluent limitations.

For intermittent discharges that occur only during wet weather, the Water Board will implement the total coliform maximum daily effluent limitation.

For combined sewer overflows, notwithstanding any other provisions of this plan, discharges from the City of San Francisco's combined sewer system are subject to the U.S. EPA's Combined Sewer Overflow Policy.

Furthermore, ~~T~~the Water Board may ~~also~~apply ~~some of~~ these limitations selectively to ~~certain other~~ non-sewage discharges, but these limitations shall not ~~they will not be used to~~ preempt Effluent Guideline Limitations established pursuant to Sections 301, 302, 304, or 306 of the federal Water Pollution Control Act, as amended. ~~(Such Effluent Guideline Limitations are included in NPDES permits for particular industries.)~~

c. (1) The ~~Regional~~ Water Board may consider substituting total coliform organisms limitations with fecal coliform organisms limitations provided that it can be conclusively demonstrated through a program approved by the ~~Regional~~Water Board that such substitution will not result in

unacceptable adverse impacts on the beneficial uses of the receiving water.
(2) The ~~Regional~~ Water Board may consider establishing less stringent requirements for any discharges during wet weather.

d. The Water Board may grant ~~E~~exceptions to these requirements ~~may be granted by the Regional Board~~ where it is demonstrated that beneficial uses will not be compromised by such an exception. Discharges receiving such exceptions shall not exceed a five-sample median of 23 MPN/100 ml nor a maximum of 240 MPN/100 ml during dry weather.

e. The deep water discharge total coliform effluent limitation is a water quality-based effluent limitation.

Appendix B – Annotated Basin Plan Amendment

PROPOSED BASIN PLAN AMENDMENT

Revisions indicated in single underline/strikeout represent new or revised language compared to existing version of Basin Plan. Revisions indicated in double underline/strikeout represent new or revised language with respect to the version of the amendment circulated on February 4, 2010. Numeric footnotes provide background for proposed changes. Alphabetical footnotes belong to Tables 3-1, 4-2, and 4-2A.

Table 3-1: Water Quality Objectives for ~~Coliform~~ [5]Bacteria[a]

Beneficial Use	Fecal Coliform (MPN/100ml)	Total Coliform (MPN/100ml)	Enterococcus[6] (MPN/100ml)[g]
Water Contact Recreation	geometric mean < 200 90th percentile < 400	median < 240 no sample > 10,000	geometric mean < 35 no sample > 104
Shellfish Harvesting[b]	median < 14 90th percentile < 43	median < 70 90th percentile < 230[c]	
Non-contact Water Recreation[d]	mean < 2000 90th percentile < 4000		
Municipal Supply: - Surface Water[e] - Groundwater	geometric mean < 20	geometric mean < 100 < 1.1[f]	

Notes:

a. Based on a minimum of five consecutive samples equally spaced over a 30-day period.
b. Source: National Shellfish Sanitation Program.
c. Based on a five-tube decimal dilution test or 300 MPN/100 ml when a three-tube decimal dilution test is used.
d. Source: Report of the Committee on Water Quality Criteria, National Technical Advisory Committee, 1968.
e. Source: California Department of Public Health (CDPH~~DOHS~~) recommendation.
f. Based on multiple tube fermentation technique; equivalent test results based on other analytical techniques, as specified in the National Primary Drinking Water Regulation, 40 CFR, Part 141.21(f), revised June 10, 1992, are acceptable.
g. Applicable to marine and estuarine waters only. Numeric values are based on Section 7958 of Title 17 of the California Code of Regulations, 69FR 67217 et seq., and 40 CFR Part 131.41 (effective date December 16, 2004)[7].

4.5.5.1 LIMITATIONS FOR CONVENTIONAL POLLUTANTS

Table 4-2 contains effluent ~~Effluent~~ limitations for conventional pollutants ~~are contained in Table 4-2~~ for discharges to inland surface waters and enclosed bays and estuaries within the region.

Table 4-2A contains both daily maximum and longer-term effluent limitations for bacteriological indicator organisms. All NPDES permits for discharges that contain sanitary waste shall include the applicable effluent limitations from Table 4-2A. The water quality-based effluent limitations

[5] The table now contains objectives for enterococcus, and not just coliform bacteria.
[6] This column contains the new enterococcus objectives.
[7] This footnote explains where the new objectives apply and where they were promulgated.

in Table 4-2A may be adjusted to account for dilution in a manner consistent with procedures in the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* (see footnotes 'a' and 'e' in Table 4-2A.[8]

TABLE 4-2 EFFLUENT LIMITATIONS FOR CONVENTIONAL POLLUTANTS

(ALL UNITS IN MG/L, EXCEPT AS OTHERWISE NOTED)

PARAMETERS:	3-DAY AVERAGE	7-DAY AVERAGE	DAILY MAXIMUM	INSTAN-TANEOUS LIMIT	~~SEVEN SAMPLE MEDIUM~~[9]	~~5 SAMPLE MEDIUM~~
Biochemical Oxygen Demand (BOD5)[a,b]	30	45				
Suspended Solids (SS)[a]	30	45				
85% removal of BOD and SS [a,c]						
~~Total Coliform Organisms [a,d] (in MPN.100ml)~~						
~~Shallow Water Discharge [e] (in immediate vicinity of public contact or shellfish harvesting)~~			~~240~~		~~2.2~~	
~~Deep Water Discharge~~			~~10,000~~			~~240~~
pH [d,f] (in pH units)						
- Shallow Water Discharge				6.5-8.5		
- Deep Water Discharge				6.0-9.0		
Residual Chlorine [d,f] (free chlorine plus chloramines)				0.0		
Settleable Matter [f,g,e] (in ml/l-hr)[10]	0.1		0.2			
Oil & Grease [d,f]	10		20			

NOTES:

a. These effluent limitations apply to all sewage treatment facilities that discharge to inland surface waters and enclosed bays and estuaries. The Water Board may also apply some of these limitations selectively to certain other non-sewage discharges, but they will not be used to preempt Effluent Guideline Limitations established pursuant to Sections 301, 302, 304, or 306 of the federal Water Pollution Control Act, as amended. (Such Effluent Guideline Limitations are included in NPDES permits for particular industries.)

[8] This new paragraph introduces the new Table 4-2A and provides guidance on how the bacteria effluent limitations should be implemented in permits. The distinction between water quality-based and technology based effluent limitations is important because only water quality-based are eligible for adjustment for dilution.

[9] The last two columns of this table were deleted along with the rows for total coliform effluent limitations and footnotes 'd' and 'e' because these limitations are now part of Table 4-2A.

[10] Footnote now letter 'd' should not apply to the settleable matter effluent limitation because this footnote was removed as part of a Basin Plan amendment in 2004 (Amendment to the Water Quality Control Plan for San Francisco Bay Region to Update Water Quality Objectives and NPDES Implementation Provisions) but the change was not made to the Basin Plan.

b. The federal regulation allows the parameter BOD to be substituted with Carbonaceous BOD at levels that shall not exceed 25 mg/l as a 30-day average, nor 40 mg/l as a 7-day average.

c. The arithmetic mean of the biochemical oxygen demand (5-day 20ºC) and suspended solids values, by weight, for effluent samples collected in any month shall not exceed 15 percent of the arithmetic mean of the respective values, by weight, for simultaneous influent samples.

~~d.~~ ~~(1) The Regional Board may consider substituting total coliform organisms limitations with fecal coliform organisms limitations provided that it can be conclusively demonstrated through a program approved by the Regional Board that such substitution will not result in unacceptable adverse impacts on the beneficial uses of the receiving water.~~

~~(2) The Regional Board may consider establishing less stringent requirements for any discharges during wet weather.~~

~~e.~~ ~~Exceptions to these requirements may be granted by the Regional Board where it is demonstrated that beneficial uses will not be compromised by such an exception. Discharges receiving such exceptions shall not exceed a five-sample median of 23 MPN/100 ml nor a maximum of 240 MPN/100 ml during dry weather.~~

~~f~~d These effluent limitations apply to all treatment facilities.

~~g~~e Discharges from sedimentation and similar cases should generally not contain more than 1.0 ml/l-hr of settleable matter. Design and maintenance of erosion and sediment control structures shall comply with accepted engineering practices as identified in the Association of Bay Area Government's (ABAG's) *Manual of Standards for Erosion and Sediment Control Measures*.

TABLE 4-2A EFFLUENT LIMITATIONS FOR BACTERIOLOGICAL INDICATORS[11]

(ALL UNITS IN MPN/100ml)

PARAMETERS:	DAILY MAXIMUM	SEVEN SAMPLE ~~MEDIUM~~ MEDIAN	5 SAMPLE ~~MEDIUM~~ MEDIAN OR GEOMETRIC MEAN
Enterococcus[a,b]			35 (as geometric mean)
Total Coliform Organisms [b,c]			
Shallow Water Discharge [d] (in immediate vicinity of public contact or shellfish harvesting)	240	2.2	
Deep Water Discharge[e]	10,000		240 (as median)

NOTES:

a. This water quality-based effluent limitation shall be implemented as a geometric mean of a minimum of 5 effluent samples spaced over a calendar month. Fewer samples may be used on a case by case basis if allowed in the waste discharge requirements. Equivalent test results based on other analytical methods applicable to enterococcus approved in 40 CFR 136.3(a) are acceptable.[12]

b. ~~These effluent limitations apply to all sewage treatment facilities that discharge to inland surface waters and enclosed bays and estuaries.~~
For discharges into marine and estuarine receiving waters with the water contact recreation beneficial use, the Water Board will implement the enterococcus effluent limitation. For such discharges, on a case-by-case basis, the Water Board ~~will~~ may implement the total coliform effluent limitation in place of the enterococcus effluent limitation. This may occur, for example, when wastewater treatment plants must also meet total coliform limits to achieve water quality objectives for recycled water.

For discharges to receiving waters with the shellfish harvesting beneficial use, or to receiving water designated as freshwater, the Water Board will implement the total coliform

[11] This new table contains only effluent limitations for bacteriological indicators. In creating this table, we moved the total coliform effluent limitations from Table 4-2 and added the new enterococcus limitation. We also corrected a typo in the column headers ('median' instead of 'medium'). We also indicated if the limitation should be implemented as a median or geometric mean.

[12] This table footnote 'a' provides guidance for the implementation of the enterococcus effluent limitation. This guidance is consistent with how the corresponding water quality objective should be implemented with samples spaced over a calendar month. This footnote also makes it clear that analytical methods may be used for determining compliance with the objective if they are approved for enterococcus in 40 CFR 136.3(a).

[13] The footnotes 'b' and 'c' and 'd' were edited for clarity and to accommodate the inclusion of the enterococcus limitation as well as the changes to the text of section 4.5.5.1. Footnote 'b' restricts application of the enterococcus limitation to discharges into marine and estuarine waters and explains how the enterococcus and total coliform limitations will be implemented in NPDES permits. This footnote also explains how bacterial limits will be implemented for the special case of intermittent discharges for which implementation of geometric mean limits is problematic.

Footnote 'e' merely emphasizes the fact that the deep water total coliform effluent limitation is identical to the total coliform effluent limitation and is, hence, a water quality-based effluent limitation.

effluent limitations.

For intermittent discharges that occur only during wet weather, the Water Board will implement the total coliform maximum daily effluent limitation.

For combined sewer overflows, notwithstanding any other provisions of this plan, discharges from the City of San Francisco's combined sewer system are subject to the U.S. EPA's Combined Sewer Overflow Policy.

Furthermore, ~~T~~the Water Board may ~~also~~apply ~~some of~~ these limitations selectively to ~~certain other~~ non-sewage discharges, but these limitations shall not ~~they will not be used to~~ preempt Effluent Guideline Limitations established pursuant to Sections 301, 302, 304, or 306 of the federal Water Pollution Control Act, as amended. ~~(Such Effluent Guideline Limitations are included in NPDES permits for particular industries.)~~[13]

c. (1) The ~~Regional~~ Water Board may consider substituting total coliform organisms limitations with fecal coliform organisms limitations provided that it can be conclusively demonstrated through a program approved by the ~~Regional~~Water Board that such substitution will not result in unacceptable adverse impacts on the beneficial uses of the receiving water.
(2) The ~~Regional~~ Water Board may consider establishing less stringent requirements for any discharges during wet weather.

d. The Water Board may grant ~~E~~exceptions to these requirements ~~may be granted by the Regional Board~~ where it is demonstrated that beneficial uses will not be compromised by such an exception. Discharges receiving such exceptions shall not exceed a five-sample median of 23 MPN/100 ml nor a maximum of 240 MPN/100 ml during dry weather.

e. The deep water discharge total coliform effluent limitation is a water quality-based effluent limitation.

Appendix C – Environmental Checklist

THE PROJECT

1. Project title: Basin Plan amendment to add enterococcus objectives to support contact-recreation in marine and estuarine waters in the San Francisco Bay region.
2. Lead agency name and address:
   San Francisco Bay Regional Water Quality Control Board
   1515 Clay Street, suite 1400
   Oakland, CA 94612
3. Contact person and phone number:
   Richard Looker (510) 622-2451

4. Project location: The new enterococcus objectives will apply in marine and estuarine waters in the San Francisco Bay Region. There are two embayments where the new objectives will apply, San Francisco Bay and Tomales Bay. The objectives contained in the California Ocean Plan apply to coastal ocean waters in the region.
5. Description of project: The project is described in brief on page 25 of this report.

The environmental factors checked below could be potentially affected by this project. See the checklist on the following pages for more details.

☒	Aesthetics	☐	Agriculture and Forestry Resources	☒	Air Quality
☒	Biological Resources	☐	Cultural Resources	☒	Geology/Soils
☒	Greenhouse Gas Emissions	☒	Hazards & Hazardous Materials ☐	☒	Hydrology/Water Quality
☒	Land Use/Planning	☐	Mineral Resources	☒	Noise
☐	Population/Housing	☒	Public Services	☐	Recreation
☒	Transportation/Traffic	☒	Utilities/Service Systems	☒	Mandatory Findings of Significance

1) AESTHETICS. Would the project:

a) Have a substantial adverse effect on a scenic vista?	☐	☐	☒	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☒	☐
d) Create a new source of substantial light or glare that would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

The reasonably foreseeable non-point source control measures will have a less than significant impact on scenic vistas or the existing visual character or quality of the site or surroundings. These impacts are discussed for each type of control measure.

Construction of low-flow diversions could potentially result in a temporary impairment of scenic vista or view open to the public and create aesthetically offensive site open to the public view. Project construction would require site grading, construction materials stockpiling and storage, and the use of construction equipment. This construction impact would be localized and short-term, lasting during the normal working hours at specific locations. Construction BMPs like screening and landscaping can help avoid aesthetic

impacts. Construction materials and equipment shall be removed from the site as soon as they are no longer necessary. After construction, the scenic vista or view would return to the condition it was prior to the construction.

Temporary impacts to aesthetics could occur during the replacement of beach sand. This replacement impact would be localized and short-term, lasting during the normal working hours at specific locations. Excess excavated material shall be removed from the site immediately. After construction, the scenic vista or view would return to the condition it was prior to the construction.

Beach sand replacement with gravel or other larger particle-sized rock could cause the obstruction of scenic vista or view open to the public during excavation and replacement. During construction, BMPs like screening and landscaping can help mitigate aesthetic impacts during excavation and replacement. In addition, the visitors and swimmers may prefer seeing beach sand rather than large sized gravel or rocks. Implementing parties can take aesthetic value and public preferences into account in terms of rock type (gravel, pebbles) and color into account when planning a beach resurfacing.

Enhanced circulation in harbors could potentially result in impairments of scenic vista or view open to the public and create an aesthetically offensive site open to the public view. Enhanced circulation devices can be redesigned to simulate the appearance of rocks and other natural pieces of scenery. Strategic placement of enhanced circulation devices may also help avoid the aesthetic impact of the devices.

Construction of wet-weather structural BMPs could potentially result in a temporary impairment of scenic vista. This construction impact would be localized and short-term, lasting during the normal working hours at specific locations. Construction BMPs like screening and landscaping can help mitigate aesthetic impacts. Construction materials and equipment should not be stored on public streets. Excess excavated material should be removed from the site immediately. Once constructed, densely vegetated biofiltration systems may actually improve the aesthetic appeal of highly urbanized, industrial, and agricultural locations.

2) AGRICULTURAL AND FOREST RESOURCES.

In determining whether impacts to agricultural resources are significant environmental impacts, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:

a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping & Monitoring Program of the California Resources Agency, to non-agricultural uses?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)) or timberland (as defined by Public Resources Code section 4526)?	☐	☐	☐	☒
d) Result in the loss of forest land or conversion of forest land to non-forest use?	❒	❒	❒	☒
e) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to	❒	❒	❒	☒

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact

non-agricultural use or conversion of forest land to non-forest use?

We do not anticipate that the project would impact agricultural or forest resources.

3) AIR QUALITY. Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:

a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☒	☐
c) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☒	☐
d) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☒	☐

The project is not expected to conflict or obstruct implementation of any applicable air quality plan or result in a cumulatively considerable net increase of any criteria air pollutant.

If any structural device is implemented to control non-point sources of bacteria, there could be short-term increases in traffic caused by ongoing maintenance of these devices (e.g., delivery of materials) are potential sources of increased air pollutant emissions, which could lead to violation of air quality standards on a short-term basis and exposure of sensitive receptors to substantial pollutant concentrations or creation of objectionable odors. There could also be dust from construction activities and earth moving. The project scale of these structural devices is anticipated to be small, and the duration of any impact will be short. Moreover, the Asbestos Airborne Toxic Control Measure for Construction, Grading, Quarrying, and Surface Mining Operations requires that construction and grading operations be conducted in accordance with an Asbestos Dust Mitigation Plan that has been approved by the local air district. These plans must contain dust mitigation measures addressing topics such as the control of dust tracked out from the construction site, and the limitation of dust emissions from the offsite transportation of excavated soil. Therefore, we anticipate that any impacts would be less than significant

Construction and installation of structural devices for controlling non-point source pollution may result in objectionable odors in the short-term due to exhaust from operation equipment and vehicles, but these impacts are temporary and localized to construction activities alone. Construction BMPs can be implemented to avoid air quality impacts, and the use low emission vehicles will help as well. Also, BAAQMD public nuisance regulations prohibit the discharge of air contaminants or other material in any amounts which cause injury, detriment, nuisance or annoyance to any considerable number of persons or the public; or which endangers the comfort, repose, health or safety of any such persons or the public, or which causes, or has a natural tendency to cause, injury or damage to business or property.

Non-structural BMPs could result in the creation of objectionable odors in urbanized areas caused by exhaust from maintenance vehicles. Objectionable odors due to engine exhaust would be temporary and dissipate once the vehicle has passed through the area. Objectionable odors from exhaust could be reduced if gasoline or propane engines were used instead of diesel engines. Compliance with BAAQMD nuisance regulations would limit the impact of these odors.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
4) BIOLOGICAL RESOURCES. Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the DFG or USFWS?	☐	☐	☒	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the DFG or USFWS?	☐	☐	☒	☐
c) Have a substantial adverse effect on federally-protected wetlands as defined by Section 404 of the federal Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, *etc*.) through direct removal, filling, hydrological interruption or other means?	☐	☐	☒	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

a-c) Likely measures to control bacteria in urban runoff are not likely to negatively impact biological resources for categories a) through c) . Measures to control bacteria in urban runoff are implemented in urban environments and are not likely to be located in areas that are home to threatened or sensitive species, areas that have sensitive riparian habitat, or federally-protected wetlands.

Likely control measures for bacteria in non-urban environments (fencing enhancements, manure management, grazing lands management, boat discharge control, septic tank control) are highly unlikely to negatively impact biological resources in categories a) through c) because they do not involve activities (construction, earth moving, permanent structures) that have a high potential for such impacts..

Further, the scale of any potential impacts is likely to be small, and there are several permits that would need to be obtained depending on the location of the project, and these permits would prohibit or, at the least, require mitigation measures to protect sensitive biological communities. Any project over one acre would fall under the State Water Board's construction general permit that has provisions that would protect against biological impacts. For projects taking place in jurisdictional waters, Clean Water Act section 404 permits would be required as well as state Waste Discharge Requirements which would be issued by the Water Board. In addition, required local permits would trigger a biological survey and CEQA determination. The Water Board has the permitting authority to impose conditions that will provide protection for biological resources and insure that any needed mitigation measures will be implemented.

d) Foreseeable control measures are very unlikely to impact the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory corridors, or impede the use of native wildlife nursery sites. Structural measures to control bacteria are not likely to be located where they could have this impact, and likely measures in non-urban environments are not of a nature that they would disrupt movement of fish or wildlife.

e-f) The Basin Plan amendment itself does not conflict with any local policies or ordinances protecting biological resources such as trees, or with any adopted Habitat Conservation Plan, Natural Community Plan, or other approved local, regional or state habitat conservation plan. There is no evidence to suggest that projects proposed to comply with Basin Plan amendment requirements would conflict with these plans.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
5) CULTURAL RESOURCES. Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?	☐	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☐	☒
We do not anticipate that the project would impact cultural resources.				
6) GEOLOGY and SOILS. Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☒	☐
i) Rupture of a known earthquake fault, as delineated in the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines & Geology Special Publication 42.	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☒	☐
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☒	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☒	☐
d) Be located on expansive soils, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☒	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternate wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒

For some types of structural BMPs, infiltration of collected stormwater could potentially result in unstable earth conditions if loose or compressible soils are present, or if such BMPs were to be located where infiltrated stormwater flowing as groundwater could destabilize existing slopes. Such conditions may create risk of loss, injury, and death.
However, these impacts can be avoided because the grading, construction, and building permit processes would include consideration of all of these geological impacts.

Construction and building permits can ensure that geological impacts are avoided by requiring that infiltration type BMPs be located away from areas with loose or compressible soils, and away from slopes that could become destabilized by an increase in groundwater flow. Infiltration type BMPs can also be built on a small enough scale to avoid these types of impacts. If implementing parties install facilities such as

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact

detention basins or waste treatment lagoons on a scale that could result in unstable earth conditions or in changes in geologic substructures, potential impacts could be avoided through proper geotechnical investigations, siting, design, and ground and groundwater level monitoring to ensure that structural BMP are not employed in areas subject to unstable soil conditions.

Depending on the structural BMPs selected in urbanized areas, the proposal may result in minor surface soil excavation or grading during construction of structural BMPs resulting in increased disturbance of the soil. However, much of the urbanized areas have already undergone soil compaction and hardscaping. Standard construction techniques, including but not limited to, shoring, piling and soil stabilization can mitigate any potential short-term impacts. In addition, structural BMPs can be designed and sited in areas where the risk of new soil disruption is minimal. Soil disruptions, displacements, or compaction during construction activities would be similar to typical temporary capital improvement construction and maintenance activities currently performed by municipalities and no long-term impacts to the soil are expected. These types of impacts would be avoided or minimized by the requirements of grading and construction permits.

Grading during construction of structural BMPs may result in increased disturbance of the soil. The impacts on soil disruptions, displacements, compaction, or overcoming during construction activities can be minimized by proper siting and design. Sub-regional wet weather BMPs can be situated in highly developed and compacted areas to avoid areas with more susceptible soil. Regional Structural BMPs can also be located in highly developed and compacted areas or optimally sited and designed such that adjacent and underlying soil would not be adversely affected with the construction of detention basins or wetlands. Required grading permits of substantial projects would require that these potential impacts were minimized or avoided.

We also anticipate that most projects that would be implemented in response to a requirement of this project would be small and their impacts less than significant.

7) GREENHOUSE GAS EMISSIONS -- Would the project:

a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	❒	❒	☒	❒
b) Conflict with any applicable plan, policy or regulation of an agency adopted for the purpose of reducing the emissions of greenhouse gases?	❒	❒	❒	☒

Installation and maintenance of structural BMPs, will result in the generation of greenhouse gas emissions. However, the projects are relatively small and the duration of impact will be short. Therefore, the greenhouse gas emissions will be small and the impact is deemed less than significant.

8) HAZARDS and HAZARDOUS MATERIALS. Would the project:

a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☒	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☒	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within ¼ mile of an existing or proposed school?	☐	☐	☒	☐
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code §65962.5 and, as a result, would it create a significant hazard to the public or to the environment?	☐	☐	☒	☐

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or a public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☒	☐
h) Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

The potential hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials stemming from this project is small and any occurring impacts will be less than significant. Transport of potentially hazardous materials may occur during ambient monitoring or construction/maintenance of structural BMPs. Persons conducting ambient monitoring may transport and use chemical reagents for use in sample preservation or processing, but these amounts of very small. Hazardous substances like solvents, grease, oil, and others may be transported and used in the construction and maintenance of structural BMPs. These substances may be released to the environment during such transportation or storage on-site. Such releases may be in close proximity to a school. The impacts associated with such releases can largely be avoided through strict adherence to proper handling and disposal procedures so impacts, if any, will be rare and minor.

9) HYDROLOGY and WATER QUALITY. Would the project:

a) Violate any water quality standards or waste discharge requirements?	☐	☐	☒	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (*e.g.*, the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☒	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☒	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☐
f) Otherwise substantially degrade water quality?	☐	☐	☐	☒
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☒	☐
i) Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☒	☐
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

The project would not have any foreseeable negative environmental impacts related to items b, f, g, or j.

Installation of some types of structural BMPs could lead to violation of water quality standards. Construction activities may foreseeably create erosion or sediments which could lead to violation of water quality standards in receiving waters. However, these impacts can be avoided or mitigated as discussed in Section 6 (geology/soils).

Frequent inspection and proper maintenance of the structural BMPs should be sufficient to avoid nuisance impacts (like algae growth or catastrophic failure) leading to violation of water quality standards.

Low-flow diversions and structural wet weather BMPs have the potential to impact the existing drainage pattern of the site or area which could result in erosion or siltation or flooding on or off site. These impacts are likely to be small and can be avoided through proper design and maintenance of the structures. Any impacts that would occur would be less than significant. The permits and CEQA review required prior to their installation would consider such impacts and likely result in design and siting restrictions to avoid these impacts.

Impacts to the flow of flood waters from low flow diversions can be avoided with proper design and siting. Low-flow diversions should all be designed with high flow bypasses. During high flow events, usually during storms, waters entering the storm drain will bypass the diversion to prevent flooding and over taxing POTWs treatment capacity.

Wet-weather structural BMPs collect and/or inhibit stormwater flow, which can alter drainage patterns, and also decrease the rate and amount of surface water runoff. For example, structural BMPs such as vegetated biofiltration would change drainage patterns by increasing absorption rates, which would reduce the amount of surface runoff to creeks. However, increased imperviousness in the watersheds has increased stormwater flows, so a partial reduction in stormwater flow would not be a negative environmental effect.

The small risk of placing structures within a 100 year flood hazard area can easily be avoided or mitigated through proper siting considerations. The local permitting process and CEQA review would certainly look at flood hazard so this impact should be avoided.

10) LAND USE AND PLANNING. Would the project:

a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☒	☐

There is no foreseeable potential for the project to physically divide an established community or conflict with a land use plan or policy. If it is deemed necessary to implement some structural BMP in an area covered by a habit or natural community conservation plan, any conflicts that arise will be minor and can be resolved when planning, designing and siting the structural element.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
11) MINERAL RESOURCES. Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of future value to the region and the residents of the State?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	☒

The project will not result in any foreseeable impacts on mineral resources.

12) NOISE. Would the project result in:				
a) Exposure of persons to, or generation of, noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐
b) Exposure of persons to, or generation of, excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☒	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing in or working in the project area to excessive noise levels?	☐	☐	☒	☐
f) For a project within the vicinity of a private airstrip, would the project expose people residing in or working in the project area to excessive noise levels?	☐	☐	☒	☐

The construction and installation of structural BMPs would result in temporary increases in existing noise levels, but this would be short term and only exist until construction is completed. Further, the reasonably foreseeable activities stemming from this project are small and would be subject to local noise ordinances (which are in place in the vast majority of locations where activities may occur) Therefore, any noise impacts would be less than significant. The noise associated with the construction and installation of structural BMPs would be the same as typical construction activities in urbanized areas, such as ordinary road and infrastructure maintenance and building activities. Contractors and equipment manufacturers have been addressing noise problems for many years and through design improvements, technological advances, and a better understanding of how to minimize exposures to noise, noise effects can be minimized. An operations plan for the specific construction and/or maintenance activities could be prepared to identify the variety of available measures to limit the impacts from noise to adjacent homes and businesses. To comply with local noise ordinances, project implementers would employ techniques like sound barriers, mufflers, and limiting construction and maintenance activities to times when these activities have lower impact, such as periods when there are fewer people near the construction area.

The operation of enhanced circulation devices may result in temporary increases of existing noise levels. Circulation pumps emit noise levels in slight excess of ambient noise levels. Depending on the unit, the slight increase in ambient noise may or may not be significant compared to ambient noise levels. Strategic placement of the devices can reduce the likelihood of exposure to adverse noise levels that may result from the operation of circulation devices. The circulation devices can be reengineered and redesigned to further reduce the noise output. For instance, the devices can be installed with low noise-generating motors and sound dampening panels. Optimal operational timing may also reduce the duration of exposure to adverse

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact

noise levels. In any case, the low level of noise from these devices will be a less than significant noise impact.

13) POPULATION AND HOUSING. Would the project:

a) Induce substantial population growth in an area either directly (*e.g.*, by proposing new homes and businesses) or indirectly (*e.g.*, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

We do not anticipate that the project would impact population and housing.

14) PUBLIC SERVICES.

Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service rations, response times or other performance objectives for any of the public services:

a) Fire protection?	☐	☐	☒	☐
b) Police protection?	☐	☐	☒	☐
c) Schools?	☐	☐	☐	☒
d) Parks?	☐	☐	☒	☐
e) Other public facilities?	☐	☐	☒	☐

During construction and installation of structural BMPs, temporary delays in response time of fire and police vehicles due to road closure/traffic congestion during construction activities may occur. However, any construction activities would be subject to applicable building and safety and fire prevention regulations and codes. The implementing parties could notify local emergency service providers of construction activities and road closures and could coordinate with local providers to establish alternative routes and appropriate signage. In addition, an Emergency Preparedness Plan could be developed for the construction of proposed new facilities in consultation with local emergency providers to ensure that the proposed project's contribution to cumulative demand on emergency response services would not result in a need for new or altered fire protection services. Most jurisdictions have in place established procedures to ensure safe passage of emergency vehicles during periods of road maintenance, construction, or other attention to physical infrastructure. In any case, the installation of structural devices would not create any more significant impediments than such other ordinary activities so the impact on public services would be less than significant.

During construction and installation of structural BMPs, parks or other recreational facilities could be temporarily affected. Construction activities could potentially be performed near or within a park or recreational facilities. Potential impacts would be limited and short-term and could be avoided through siting, designing, and scheduling of construction activities. In the unlikely event that the municipalities might install facilities on a scale that could alter a park or recreational facility, the structural BMP could be designed in such a way as to be incorporated into the park or recreational facility. The impacts on parks or other recreational facilities will be less than significant.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
15) RECREATION. Would the project:				
a) Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☐	☒

The project would have no foreseeable impact on increasing use of existing recreation facilities to the point where deterioration would occur or require construction or expansion of such facilities.

16) TRANSPORTATION / TRAFFIC. Would the project:				
a) Exceed the capacity of the existing circulation system, based on an applicable measure of effectiveness (as designated in a general plan policy, ordinance, etc.), taking into account all relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?	☐	☐	☒	☐
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☒	☐
f) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

We do not anticipate that the project will have any impact on an applicable congestion management program or air traffic patterns. The project will not significantly increase hazards due to project design features and will not conflict with adopted policies supporting alternative transportation.

There may be additional vehicular movement during construction of structural BMPs and during maintenance activities. However, vehicular movement during construction would be temporary, and vehicular movement during maintenance activities would be periodic and only as the vehicle passes through the area. This may generate minor additional vehicular movement with a less than significant impact. In order to reduce the impact of construction traffic, a construction traffic management plan could be prepared for traffic control during any street closure, detour, or other disruption to traffic circulation. The plan could identify the routes that construction vehicles would use to access the site, hours of construction traffic, and traffic controls and detours. The plan could also include plans for temporary traffic control, temporary signage and stripping, location points for ingress and egress of construction vehicles, staging areas, and timing of construction activity which appropriately limits hours during which large construction equipment may be brought on or off site.

Enhanced circulation devices offshore of beaches could potentially impact waterborne traffic. Such impacts are easy to avoid through proper siting and location of these devices. Additional signs and directional buoy and lines can help direct traffic away from circulation devices in the harbors.

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact

Maintenance of structural BMPs may affect existing parking facilities, if maintenance requires use of existing parking. Available parking in an area could be reduced during certain times of the day, week, and/or month, depending on frequency of operation and/or maintenance events. This will be a minor, less than significant impact. Maintenance events should be scheduled to be performed at the same time as other maintenance activities performed by the municipalities, and/or at times when these activities have lower impact, such as periods of low traffic activity and parking demand. Small infrastructure projects, themselves, such as low flow diversions and wet-weather BMPs such as vegetated swales and the use of porous pavement would not displace parking because they would be placed in existing storm drains, swales and parking lots, no additional space would be necessary. Some wet-weather BMPs such as additional detention and infiltration basins could require space, but such BMPs are small and would not require significant space.

17) UTILITIES AND SERVICE SYSTEMS. Would the project:

a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☒	☐
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental impacts?	☐	☐	☒	☐
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental impacts?	☐	☐	☒	☐
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒
e) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☒	☐	☐
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

Reasonably foreseeable control measures for non-point sources or urban runoff may involve construction of new treatment facilities or storm water drainage facilities. The environmental impacts associated with construction of these systems have already been discussed and evaluated, and these impacts were found to be less than significant.

Low-flow diversions involve the diversion of dry weather flows in storm drains to local Publicly Owned Treatment Works (POTWs). Diversions are retrofitted in existing storm drains discharging into harbor waters. High-flow bypasses are also installed along with the diversions. These bypasses can mitigate and prevent impacts to flooding. High-flow bypasses are designed to bypass the diversion in the event high-flow events, like storm events, to prevent overflow, flooding, and exhaustion of POTW treatment capacity. Depending on the number of diversions installed and flow potential, low-flow diversion may significantly impact the treatable capacity of local POTWs. Implementing parties should determine the optimal number of diversions necessary and the flow potential associated with those diversions. Implementing parties should also consult with local POTWs to determine the average flow rate and treatable capacity of each POTW. Such design considerations may obviate the need to build additional treatment facilities. The impact on POTW treatment capacity will be among the primary considerations in the design and permitting

Issues (and Supporting Information Sources):	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact

of such facilities. It is therefore extremely unlikely that these systems will not have safeguards put in place to cease diversion to the POTW if there is a danger of exceeding the POTW treatment capacity. This impact is therefore considered less than significant with the appropriate mitigation measures for avoiding capacity exceedance. These mitigation measures would very likely be required by the local permitting entity as well as the cooperating POTW to which the water will be routed.

The Regional Board is prohibited from specifying the exact means of compliance. Implementing parties can choose to implement compliance strategies that result in less or no impact on sewer utilities and stormwater drainage.

The stormwater drainage systems may need to be reconfigured and/or retrofitted with structural BMPs to capture and/or treat a portion or all of the stormwater runoff. The alterations and/or additions to stormwater drainage systems will depend on the compliance strategy selected by each implementing party at each location where structural BMPs might be installed. Impacts from construction activities to retrofit or reconfigure the storm drain system as part of BMP installation, and mitigation measures have been considered and discussed in the previous responses to the questions.

It is not foreseeable that either non-structural and or structural BMPs will result in a need for new systems or alterations to water lines. The need for new municipal or recycled water resulting from the project is not foreseeable.

The installation of structural BMPs may generate construction debris. Additionally, installed structural BMPs may collect sediment and solid wastes that will require disposal. However, no new solid waste or disposal systems would be needed to handle the relatively small volume generated by these projects. Construction debris may be recycled at aggregate recycling centers or disposed of at landfills. Sediment and solid wastes that may be collected can be disposed of at appropriate landfill and/or disposal facilities. At any rate, the project will not foreseeably cause any compliance challenges with respect to federal, state, or local statutes governing solid waste disposal.

18) MANDATORY FINDINGS OF SIGNIFICANCE.

a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)	☐	☐	☒	☐
c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒	☐

Potential to degrade: Taken all together, the potential impacts of the project will not cause a significant degradation to the environment. The implementation of this project will likely result in improved water quality in the waters of the Region and will have significant beneficial impacts to the environment over the long term.

Cumulative: Reasonably foreseeable stormwater control measures are expected to have minimal environmental impacts if performed properly after appropriate study and planning. Implementation of mitigation measures, required by law and the implementing agency, would prevent cumulative impacts from occurring.

Authority: Public Resources Code Sections 21083, 21084, 21084.1, and 21087.

Reference: Public Resources Code Sections 21080(c), 21080.1, 21080.3, 21082.1, 21083, 21083.1 through 21083.3, 21083.6 through 21083.9, 21084.1, 21093, 21094, 21151; Sundstrom v. County of Mendocino, 202 Cal. App. 3d 296 (1988); Leonoff v. Monterey Board of Supervisors, 222 Cal. App. 3d 1337 (1990).

Explanations of Impact Assessment

The foregoing analysis of potential environmental impacts is based on the foreseeable monitoring as well as various means of controlling bacteria in marine waters in order to comply with the new objectives in the proposed Basin Plan amendment. These means include dry-weather structural BMPs, wet-weather structural BMPs, fencing guidelines, septic tank control, boat discharge control, grazing procedures, as well as non-structural BMPs such as outreach and education, and administrative actions. It must be stressed that this project has not made a determination that any of these measures are necessary, but if there are waterbodies or portions of waterbodies that are not meeting the proposed objectives, then some of these control measures are foreseeable.

Potential impacts stemming from the project are discussed above and we find that any impacts are less than significant. Most of the foreseeable control measures would not likely result in impacts, and any impacts that may result are likely to be small. Moreover, for those control measures that have the potential to cause impacts (through construction of stormwater BMPs for example) there are common practices to avoid and minimize such impacts currently employed by agencies when planning and implementing stormwater BMPs. Agencies such as California Stormwater Quality Association (CASQA) and Water Environment Research Foundation (WERF) publish handbooks containing guidance on the selection, siting, design, installation, monitoring, and evaluation of stormwater BMPs (CASQA, 2003a, CASQA, 2003b, WERF, 2005).

Pursuant to section 13360 of the Water Code, the Water Board cannot dictate which compliance measures implementing parties may choose to adopt or which mitigation measures they would employ to achieve the proposed enterococcus objectives. However, the Water Board does recommend that appropriate compliance and mitigation measures, which are readily available and generally considered to be consistent with industry standards, be applied in order to reduce, and if possible avoid, potential environmental impacts, such that there is no significant impact. Since the decision to perform these measures is strictly within the responsibility and jurisdiction of the individual implementing parties, such measures can and should be adopted by these agencies. (Title 14, California Code of Regulations, Section 15091(a)(2).)

Based on this review, we conclude that impacts are less than significant in almost all circumstances. The evaluation considered whether the foreseeable bacteria control measures would cause a substantial, adverse change in any of the physical conditions within the area affected by the control measures. In addition, the evaluation considered environmental effects in proportion to their severity and probability of occurrence.

PRELIMINARY STAFF DETERMINATION

❒ The proposed project COULD NOT have a significant effect on the environment, and, therefore, no alternatives or mitigation measures are proposed.

☒ The proposed project MAY have a significant or potentially significant effect on the environment, and therefore alternatives and mitigation measures have been evaluated.

Note: Authority cited: Sections 21083 and 21087, Public Resources Code. Reference: Sections 21080(c), 21080.1, 21080.3, 21082.1, 21083, 21083.3, 21093, 21094, 21151, Public Resources Code; *Sundstrom v. County of Mendocino*, 202 Cal.App.3d 296 (1988); *Leonoff v. Monterey Board of Supervisors*, 222 Cal.App.3d 1337 (1990).

References

California Stormwater Quality Association (CASQA). 2003a. California Stormwater BMP Handbook: Municipal. January 2003. http://www.cabmphandbooks.com.

California Stormwater Quality Association (CASQA). 2003b. California Stormwater BMP Handbook: New Development and Redevelopment. January 2003. www.cabmphandbooks.com.

Water Environment Research Foundation (WERF). 2005. Critical Assessment of Stormwater Treatment and Control Selection Issues. Project No. 02-SW-1 http://www.werf.org/AM/Template.cfm?Section=Research&Template=/CustomSource/Research/ResearchProfile.cfm&ReportId=02-SW1&CFID=707181&CFTOKEN=54086235.

Appendix D – Maps of Beach Watch Stations

The following maps show all Beach Watch Monitoring stations in the San Francisco Bay area. Summary information for the monitoring data is available at: beachwatch.waterboards.ca.gov. This surveillance program is primarily intended to ensure that waters are safe for water contact recreation, and intensive monitoring for bacterial indicators is conducted during the months of likely contact recreation, usually April through November.

The first map in the series provides an overview of the region and shows all monitoring stations as well as the location of several inset maps. The inset maps for beaches corresponding to the data in Table 3-2 are presented immediately following the overview map.

Note that all Beach Watch stations in the San Francisco Bay region are shown in the overview map, but detail maps are shown only for the stations located in enclosed bays and estuaries and not the coast side stations.

Beach Watch Overview Map

Beach Watch Station Locations

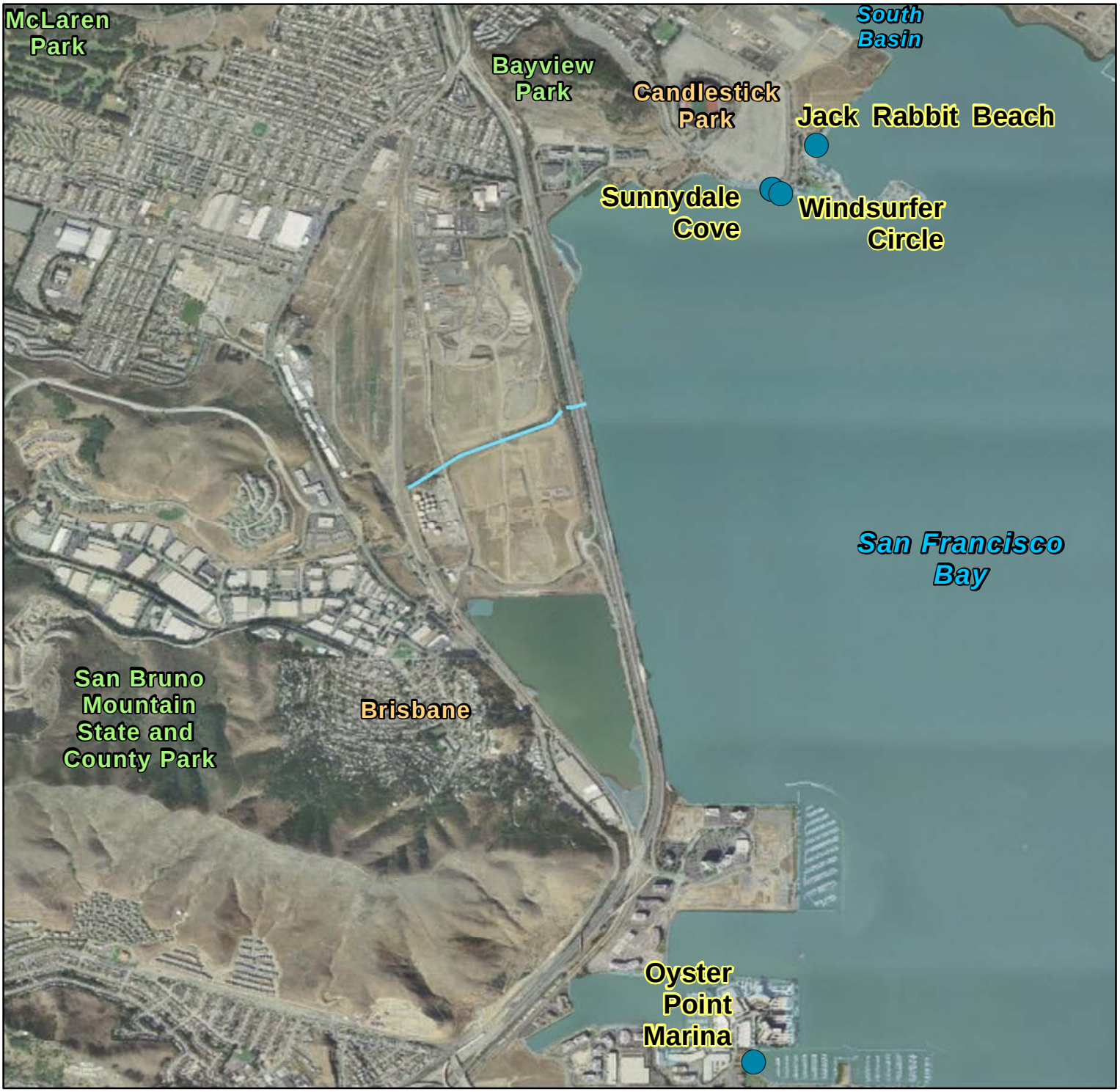
Beach Watch Inset Maps

San Francisco Bay RWQCB Boundary

N

0 5 10 20 Miles

Datum: NAD 1983 **Projection:** GCS North America
Map Date: July 30, 2009 **Map Editor:** M. Klatt (SFEI)



Candlestick Point and Oyster Point

Beach Watch Station Locations

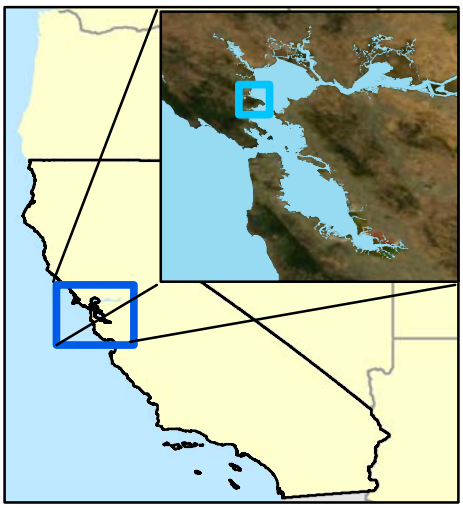
Streams

Streams Layer: NHD 1805
Datum: NAD 1983 **Projection:** GCS North America
Map Date: July 30, 2009 **Map Editor:** M. Klatt (SFEI)

1:32,000

0 0.5 1 Miles

N



China Camp and McNears Beach

Beach Watch Station Locations

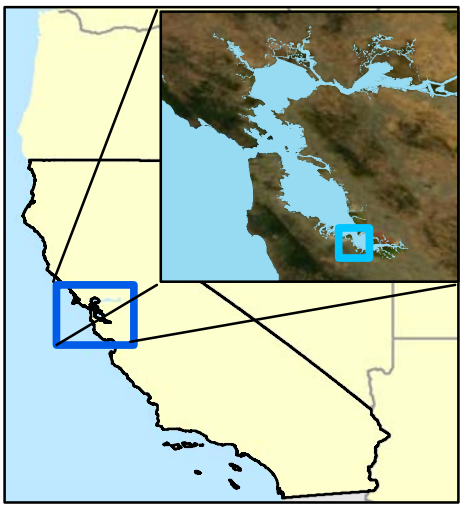
Streams

Streams Layer: NHD 1805
Datum: NAD 1983 **Projection:** GCS North America
Map Date: July 30, 2009 **Map Editor:** M. Klatt (SFEI)

1:32,000

0 0.5 1 Miles

N



Coyote Point and Aquatic Park

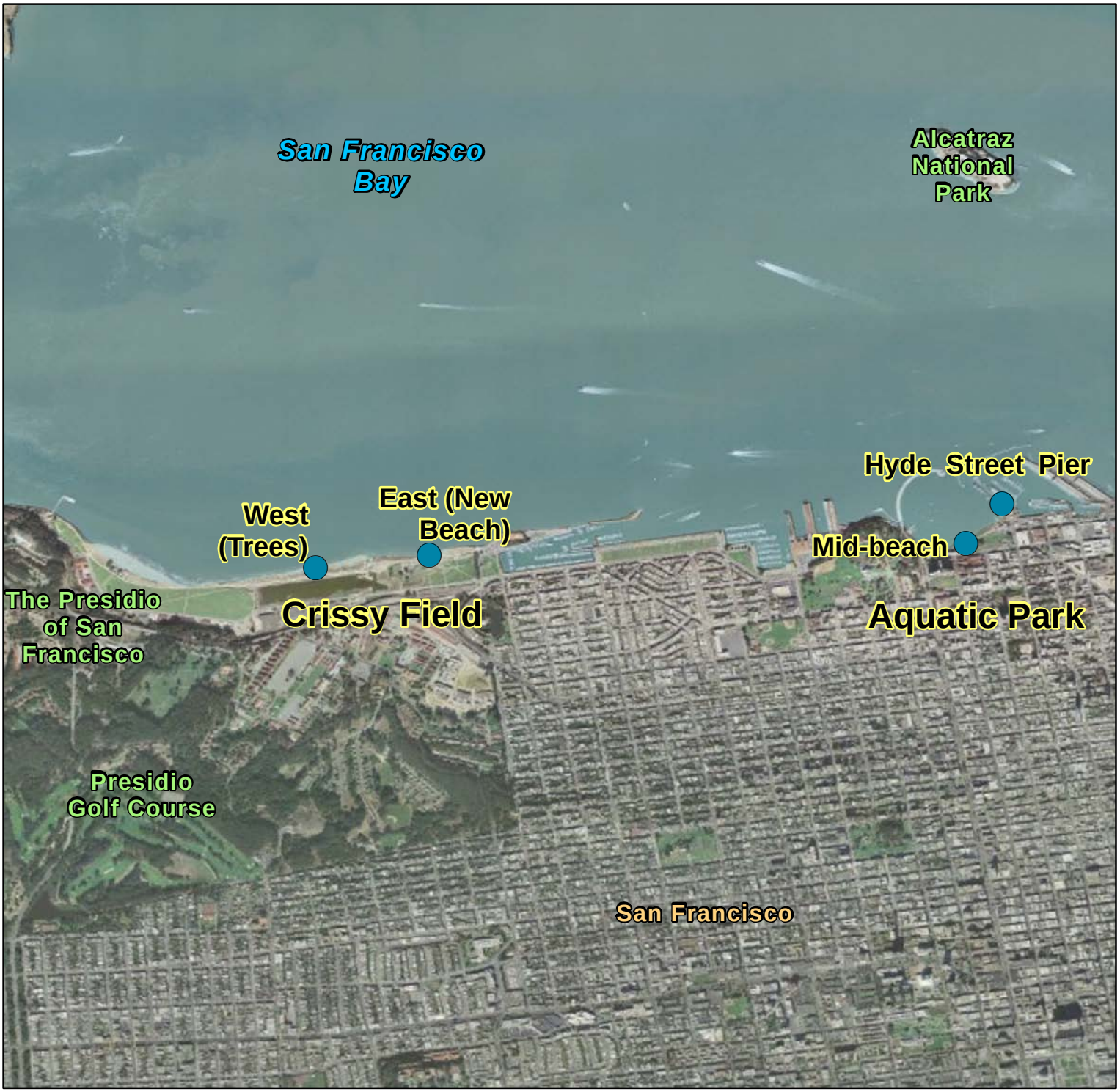
Beach Watch Station Locations

Streams

Streams Layer: NHD 1805
Datum: NAD 1983 **Projection:** GCS North America
Map Date: July 30, 2009 **Map Editor:** M. Klatt (SFEI)

1:32,000
0 0.5 1 Miles

N



Crissy Field and The Aquatic Park

Beach Watch Station Locations

Streams

Streams Layer: NHD 1805
Datum: NAD 1983 **Projection:** GCS North America
Map Date: July 30, 2009 **Map Editor:** M. Klatt (SFEI)

1:32,000

N

0 0.5 1 Miles

Crown Beach

Beach Watch Station Locations

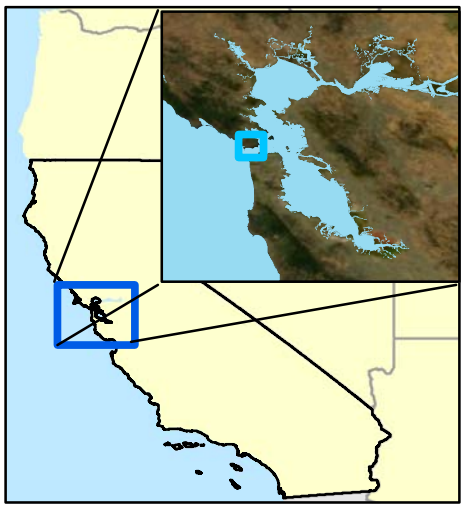
Streams

Streams Layer: NHD 1805
Datum: NAD 1983 **Projection:** GCS North America
Map Date: July 30, 2009 **Map Editor:** M. Klatt (SFEI)

1:32,000

0 0.5 1 Miles

N



Fort Baker, Horseshoe Cove

Beach Watch Station Locations

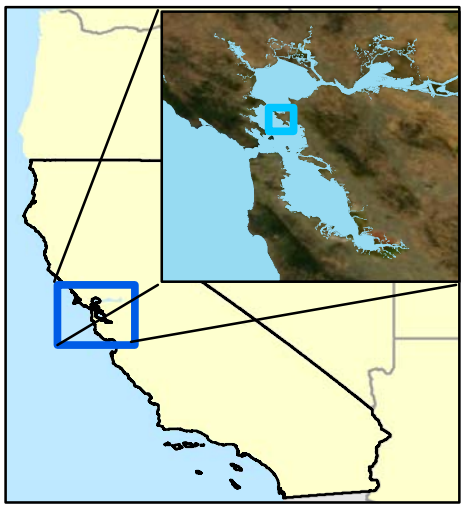
Streams

Streams Layer: NHD 1805
Datum: NAD 1983 **Projection:** GCS North America
Map Date: July 30, 2009 **Map Editor:** M. Klatt (SFEI)

1:8,000

0 0.15 0.3 Miles

N



Keller Beach

Beach Watch Station Locations

Streams

Streams Layer: NHD 1805
Datum: NAD 1983 **Projection:** GCS North America
Map Date: July 30, 2009 **Map Editor:** M. Klatt (SFEI)

N

1:8,000

0 0.1 0.2 Miles

Inner Tomales Bay

Beach Watch Station Locations

Streams

Streams Layer: NHD 1805
Datum: NAD 1983 **Projection:** GCS North America
Map Date: July 30, 2009 **Map Editor:** M. Klatt (SFEI)

1:40,000
0 0.5 1 Miles

N

Outer Tomales Bay

Beach Watch Station Locations

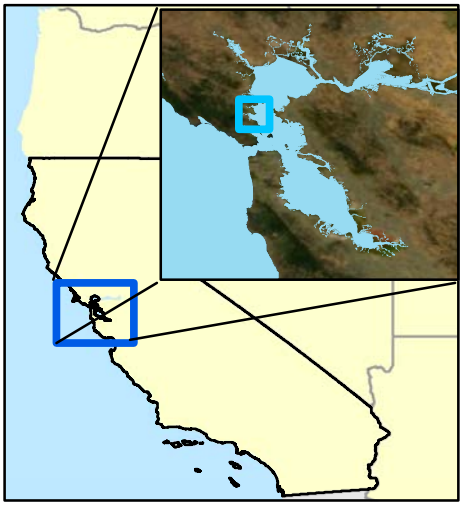
Streams

Streams Layer: NHD 1805
Datum: NAD 1983 **Projection:** GCS North America
Map Date: July 30, 2009 **Map Editor:** M. Klatt (SFEI)

1:40,000

N

0 0.5 1 Miles



Paradise Cove and Schoonmaker Beach

Beach Watch Station Locations

Streams

Streams Layer: NHD 1805
Datum: NAD 1983 **Projection:** GCS North America
Map Date: July 30, 2009 **Map Editor:** M. Klatt (SFEI)

1:32,000

0 0.5 1 Miles

N