California Regional Water Quality Control Board

San Francisco Bay Region

Total Maximum Daily Load for Indicator Bacteria in Pillar Point Harbor and Venice Beach

Staff Report

October 13, 2020

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN FRANCISCO BAY REGION

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1 Introduction

This draft Staff Report summarizes the data, information, and technical analyses that support a proposed Total Maximum Daily Load (TMDL) to reduce bacteria impairment in Pillar Point Harbor and Venice Beach near the City of Half Moon Bay (Figure 1-1). High levels of bacteria at those beaches impair recreational beneficial uses through risk to public health and beach closings.

The Staff Report is prepared in support of an amendment to the Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) that would establish:

- Numeric targets for indicator bacteria densities (concentrations) based on the current Basin Plan water quality objectives. Attainment of targets will protect the health of water contact recreational users of the beaches;
- TMDL and load and wasteload allocations to achieve the targets; and
- An implementation plan to achieve the load and wasteload allocations.

The Basin Plan amendment also includes some minor non-regulatory updates to harmonize our Basin Plan with the revised water quality objectives for bacteria included in the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SWRCB 2018).

1.1 Regulatory Background

The federal Clean Water Act (CWA) requires California to adopt and enforce water quality standards to protect all water bodies within the State. The Basin Plan delineates the standards applicable to the San Francisco Bay Region, including beneficial uses of waters, numeric and narrative water quality objectives to protect those uses, and provisions to enhance and protect existing water quality (antidegradation). Section 303(d) of the CWA requires states to compile a list of “impaired” water bodies, called the 303(d) list, that do not meet water quality standards and to establish TMDLs for the pollutants causing those impairments, so that the applicable water quality standards can be attained over time.

A TMDL specifies the maximum amount of a pollutant that a water body can receive and still meet water quality standards and allocates the acceptable pollutant load to point and nonpoint sources. A TMDL is defined as the sum of the individual wasteload allocations for point sources, load allocations for nonpoint sources, and natural background, such that the capacity of the water body to assimilate pollutant loads (the loading capacity) is not exceeded. By calculating and allocating load and wasteload allocations, the TMDL provides a road map for eliminating water quality impairments in the water body. The TMDL must account for seasonal variations, protect against uncertainties in the analysis, and include a plan of implementation. Finally, as described above, TMDLs must be incorporated into the Basin Plan.

U.S. EPA has oversight authority for the 303(d) program and is required to review and either approve or disapprove the State’s 303(d) list and each TMDL developed by the State.

Since 2002, Pillar Point Harbor and Venice Beach have been on the 303(d) list for impairment from elevated levels of indicator bacteria. High levels of bacteria indicate the presence of pathogenic organisms that are found in that untreated or insufficiently treated waste from

human and warm-blooded animals (e.g., cows, horses, dogs, etc.) and pose potential health risks to people who recreate in contaminated waters, so a solution is necessary. The proposed TMDL and Implementation Plan are designed to resolve bacteria impairment at the beaches in Pillar Point Harbor and Venice Beach (Figure 1-1).

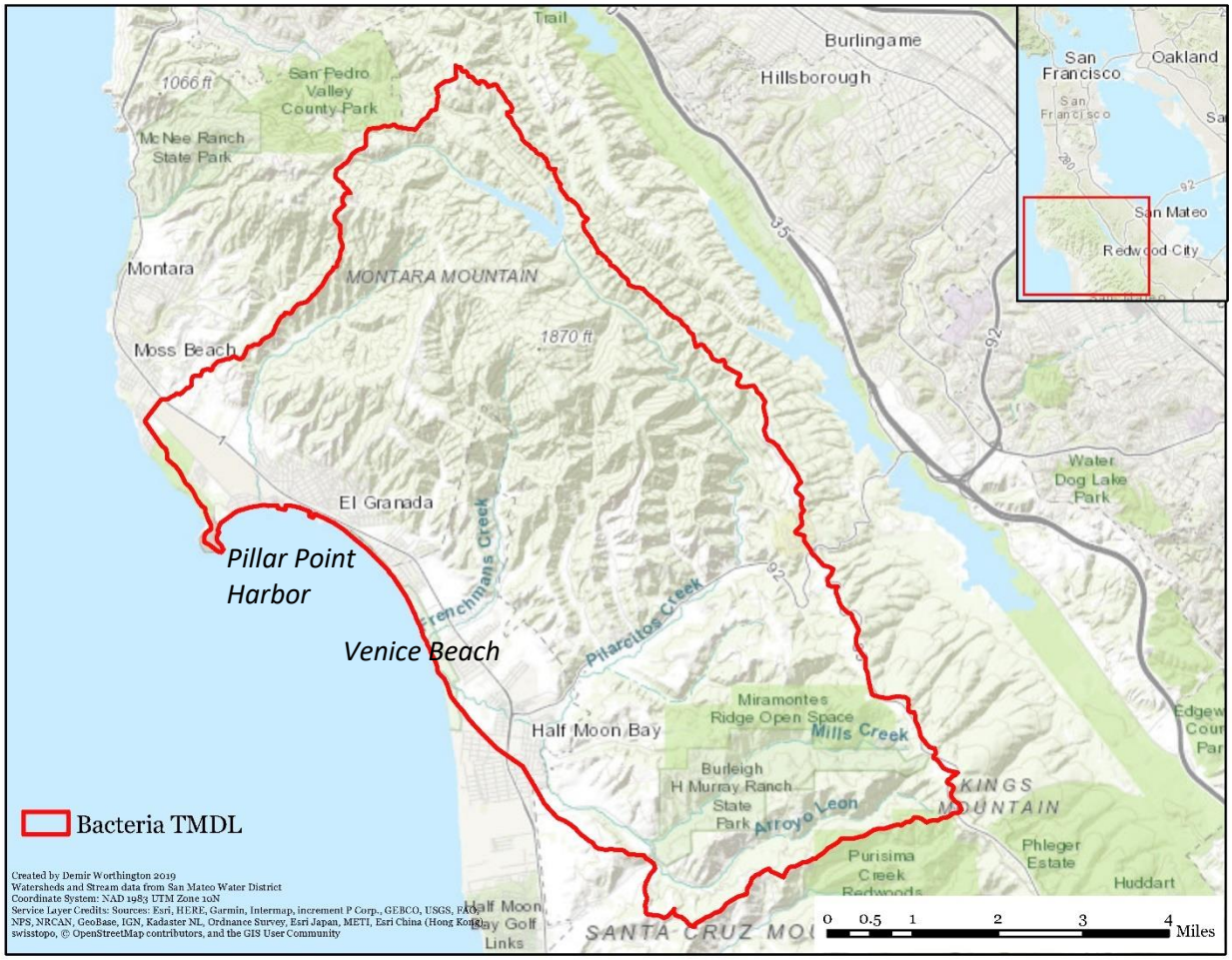


Figure 1-1 Location of Pillar Point Harbor and Venice Beach

This Report conforms with the Section 57004 of the California Health and Safety Code, which requires external scientific peer review of the scientific basis for any rule proposed by any board, office or department within California Environmental Protection Agency. Based on the interpretation of Health and Safety Code, section 57004 we have determined that the proposed Basin Plan amendment to establish a bacteria TMDL for Pillar Point Harbor and Venice Beach does not rely on new science that would require a peer review. The proposed amendment applies the earlier, extensively peer-reviewed scientific findings that supported previous bacteria TMDLs, such as those in Richardson Bay (2009), San Pedro Creek and Pacifica State Beach (2013), and San Francisco Bay Beaches (2017) TMDLs. Furthermore, the TMDL targets are consistent with the U.S. EPA 2012 Recreational Water Quality Criteria, which underwent extensive internal, external and public review process, and are based on the State-wide bacteria provisions in the Water Quality Control Plan for Inland Surface Water and Enclosed Bays and Estuaries of California, adopted in 2018 (SWRCB 2018), which were also peer reviewed.

The proposed amendment does not depart from the scientific approach of similar Basin Plan amendments for bacteria. Therefore, the proposed amendment has already satisfied the peer review requirement of Health and Safety Code §57004, and no additional peer review is needed.

1.2 Document Organization

Establishing a TMDL requires considering available data and information about a water quality impairment, conducting analyses relevant to the impairment, identifying sources of pollution contributing to the impairment, and allocating responsibility for actions to resolve the impairment.

This Staff Report is organized into chapters that reflect the stages in the TMDL development process. Chapter 1 discusses the background of the project. Problem identification and objectives, physical setting of Pillar Point Harbor and Venice Beach, the applicable water quality standards and available data are discussed in Chapter 2. Chapter 3 sets targets for the TMDL, and Chapter 4 provides our understanding of the potential sources of bacteria loading. Chapter 5 presents the proposed pollutant load and wasteload allocations to the identified pollutant sources. The linkage analysis in Chapter 6 describes the relationship between pollutant sources, allocations, and the proposed targets. Chapter 7 outlines the Implementation Plan, which includes actions and requirements necessary to resolve the water quality impairments and the monitoring necessary to demonstrate attainment of numeric targets and allocations. Chapter 8 discusses the incorporation of the new statewide bacteria water quality objectives into the Basin Plan. Regulatory analyses, including the California Environmental Quality Act (CEQA) analysis, CEQA checklist, and consideration of economics are discussed in Chapter 9.

2 Problem Statement

Bacteria densities in the waters of the beaches in Pillar Point Harbor and Venice Beach regularly exceed the numeric water quality objectives for *Enterococcus*, a genus of bacteria that indicates the potential for fecal contamination and a likely risk of pathogen-induced illness to people. Monitoring data, health advisories, and beach closures in Pillar Point Harbor and Venice Beach show repeated exceedances of *Enterococcus* objectives. These exceedances, impair, or threaten to impair, the water contact and non-water contact beneficial uses at both Pillar Point Harbor and Venice Beach. Bacteria exceedances impair these beneficial uses both directly, e.g., by exposing beachgoers who enter beach waters to a heightened risk of bacterial illness, and indirectly, e.g., by resulting in beach closures that prevent or deter beachgoers from using the beaches, whether or not they make contact with the water.

2.1 Project Definition and Objectives

The project is the adoption of a proposed Basin Plan amendment to establish a Total Maximum Daily Load (TMDL) and an Implementation Plan for controlling bacteria in Pillar Point Harbor and Venice Beach. The Water Board is obligated under Clean Water Act (CWA) section 303(d) to establish this TMDL to address the bacterial impairment. The following components form the basis of the proposed regulatory provisions and define the project:

- Numeric target for *Enterococcus* in water column;
- Density-based total maximum *Enterococcus* loads to the beaches;
- Allocation of the allowable *Enterococcus* concentrations to various source categories as load and wasteload allocations;
- A plan to implement the TMDL that includes actions to reduce bacteria loads to achieve load and wasteload allocations in Pillar Point Harbor and Venice Beach; and
- A monitoring program to evaluate progress in meeting the *Enterococcus* numeric target, and load and wasteload allocations.

The objectives of the proposed Basin Plan amendment are consistent with the mission of the Water Board and with the requirements of the CWA and Water Code (Porter-Cologne Water Quality Control Act). The objectives are to:

- Comply with the CWA requirement to adopt TMDLs for section 303(d)-listed water bodies;
- Protect existing beneficial uses in Pillar Point Harbor and Venice Beach affected by high indicator bacteria levels (i.e., contact and non-contact water recreational uses);
- Set numeric targets to attain relevant water quality standards;
- Avoid imposing regulatory requirements that are more stringent than necessary to meet numeric targets and attain water quality standards; and
- Complete implementation of the needed bacteria reduction measures to attain numeric targets in as short a time as is practicable.

2.2 Project Area Description

The beaches addressed by this TMDL are located near Half Moon Bay in San Mateo County (Figure 1-1).

2.2.1 Climate

The climate in the Half Moon Bay area is generally mild, with distinct wet and dry seasons. There is significant seasonal variation in monthly rainfall, but most precipitation is recorded from October through April, with almost 80 percent of the precipitation occurring from November through March. The pattern of precipitation changes depending on elevation and topographic setting. The average annual precipitation (1948-2012) near the coast is about 26.3 inches and has ranged from 9.4 inches in 2012 to 52.6 inches in 1983. The summers are dry and mostly clear, and the winters are wet, windy, and partly cloudy. Temperatures are generally moderate year-round with average monthly highs approximately 56 to 67 degrees Fahrenheit, and average monthly lows approximately 43 to 53 degrees Fahrenheit.

2.2.2 Location and Environmental Setting

Pillar Point Harbor

Pillar Point Harbor is a popular recreational area and a vital commercial fishing port located in the unincorporated coastal community of Princeton, just north of the City of Half Moon Bay. The harbor encloses approximately 1.6 miles of shoreline and includes a 280-acre outer harbor, a 45-acre inner harbor housing a working fishing pier, a marina with approximately 400 berths, commercial fishing facilities, floating docks, and shops and restaurants (SMCRCD 2008). Adjoining the marina to the east is the Inner Harbor Beach. Five more beaches (Mavericks Beach, Pillar Point Marsh Beach, Yacht Club Beach, Capistrano Beach and Beach House Beach) are situated within the outer harbor (Figure 2-1). All of the beaches are small, ranging from 100 to just over 300 meters long. The Pillar Point Air Force Station is located on the bluff to the west overlooking the outer harbor and adjacent to Maverick Beach.

Figure 2-1 Aerial view of Pillar Point Harbor with beach locations

Pillar Point Harbor drains approximately 3,920 acres and includes inflows from the Denniston, St. Augustine and Deer Creek watersheds, which comprise 3,920 acres of open space, an airport, and agricultural, commercial and residential areas. Most of the Pillar Point Harbor drainage area is open space or forested land (72 percent), followed by low- and medium-density development (21 percent) and agriculture/pasture (5 percent) land uses. Wetlands occupy a small portion of the watershed (approximately 2 percent).

The flows in the creeks draining to Pillar Point Harbor are relatively low due to seasonal rainfall patterns, small drainage areas and flow diversions. The flow in the largest tributary, Denniston Creek, reached a daily peak of 5.5 cubic feet per second (cfs) in January and February of 2008 and was less than 1 cfs in 9 out of 12 months during 2008 and 2009 (Wuertz et al. 2011). Some salient features of the Pillar Point Harbor drainages include (SMCWPPP 2018):

- The 18-acre Pillar Point Marsh, located on the west side of the harbor, contains a protected salt marsh and conveys runoff from the Half Moon Bay Airport, the Pillar Ridge Mobile Home Park, and several agricultural fields.
- The upper Denniston Creek watershed is mostly open space used as a municipal water supply for the Coastside Water District. A few agricultural fields are scattered throughout the watershed. Lower in the watershed, residential areas of El Granada are drained by an engineered channel to the creek. Commercial businesses, which are also drained by storm drain ditches and an engineered channel, are located near the creek mouth. Dry season flow has been observed within the channel suggesting infiltration of groundwater and/or irrigation return flows. Denniston Creek drains into the harbor at the west edge of Capistrano Beach.
- The Capistrano Catchment is a piped system. The 15-acre catchment is almost entirely impervious and contains commercial businesses such as hotels, shops, restaurants, brew pubs, and large parking lots. Some storm drains in this catchment have a small amount of flow year-round, which appears to be a result of ground water seepage into the pipes and/or irrigation return flows from the commercial businesses. Stormwater runoff from the catchment is discharged to the harbor through Capistrano Beach outfall.
- St. Augustine Creek is also referred to as Montecito Avenue Drainage. The headwaters of St. Augustine Creek are comprised of open space; however, the creek enters a pipe at the upstream boundary of the urban area, less than half a mile from the harbor. The pipe receives stormwater runoff along its length and discharges at the east edge of Capistrano Beach.
- The Deer Creek watershed is larger than that of St. Augustine. It maintains a natural bed and banks throughout most of its length; however, the creek channel is restricted by residential development along its banks. Deer Creek enters a culvert at Highway 1 and discharges to the beach via an outfall just east of the Boat Launch Ramp.

The diverse marine habitats within and seaward of Pillar Point Harbor serve as important feeding grounds for invertebrates, fish, marine mammals, shore birds, and waterfowl. Habitats include rocky nearshore outcroppings, deep and shallow reefs, soft, sandy bottoms, large underwater sand dunes, continental shelf, shoals, ridges, and banks. The offshore transport

of surface waters results in the upwelling of deep, cold, nutrient-rich waters into sunlit surface waters to support a food-rich environment and promote the growth of organisms at all levels of the marine web. More information about the biological resources in Pillar Point Harbor and the coastal zone near Half Moon Bay can be found in the Regional Sediment Management Plan (CSMW 2015).

Venice Beach

Venice Beach is one of the five interconnected beaches comprising the Half Moon Bay State Beach (Figure 2-2). The four-mile-long park of protected beaches was established in 1956 and is managed by the California Department of Parks and Recreation. Together, the five beaches are an immensely popular regional destination, attracting thousands of day trippers per year from the Bay Area, and they are a well-known tourist attraction for all visitors to California. Amenities include a campground, picnic tables, grilling stations, and miles of paved oceanfront trails. The Half Moon Bay Coastal Trail, which extends from Miramar to Poplar Beach runs north-south along the perimeter of the beach. Hikers, runners, and bikers share the paved trail in this area, and a parallel trail is used by horseback riders. Horses are not allowed on the beach.

The approximately 0.8-mile stretch of Venice Beach is abutted by Frenchmans Creek to the north and Pilarcitos Creek to the south. These two creeks drain approximately 33 square miles of watershed, which is predominantly open space with residential and commercial areas in the lower watershed close to the beach. Small farms are scattered along Pilarcitos Creek where it follows Highway 92. These creeks sometimes breach the beach and flow into the ocean, providing a conduit for stormwater runoff from the surrounding watersheds. At other times a small lagoon is formed at the beach outlet of Frenchmans Creek. The intermittent lagoon is confined to the channels and depressions on the beach. The land use in these two watersheds is predominantly open space and forest (87.4 percent), followed by low and medium density development (8.9 percent) and agriculture/pasture (1.7 percent).

Half Moon Bay State Beach is well known for its western snowy plover colony, which resides in an area not accessible to the public, at the mouth of Pilarcitos Creek between Venice and Francis Beach. Because of the significant decline in population, in 1993 these small shorebirds were listed as threatened under the federal Endangered Species Act. Recreational and other human disturbance, loss of habitat to urban development, introduction of beach grass (*Ammophila* spp.), and other non-native species have contributed to a decline in active nesting areas and in the size of the breeding and wintering populations. Although overall increases in plover numbers have been observed, plover population size is still low throughout parts of their historical range of habitat along the coast of California (USFWS 2007).

Figure 2-2 Image of Venice Beach and western snowy plover

2.3 Use of Indicator Bacteria to Assess Health Risks

Excessive amounts of fecal bacteria in surface waters used for recreation put beachgoers at increased risk of pathogen-induced illness (Pandey et al. 2014). Illnesses due to pathogen-contaminated recreational waters include gastrointestinal, respiratory, eye, ear, nose, throat, and skin diseases. Pathogens are carried by storm water runoff as well as other discharges into surface waterbodies. Bacteria TMDLs are designed to reduce sources of waterborne disease-causing organisms to surface waters to reduce public health risk.

The numbers of pathogenic organisms actually present in waters are difficult to identify or isolate, because they are often highly heterogenous in their characteristic or type. The detection and enumeration of all pathogens that pose risks to human health is impractical. Therefore, scientists and public health officials usually monitor bacteria that indicate the presence of pathogens. Not all indicator bacteria are pathogenic, but they are abundant in waste from warm-blooded animals where pathogens are commonly present, and indicator bacteria are easily sampled and measured. Indicator bacteria densities have long served as the surrogate measure of fecal contamination and signal the potential presence of pathogenic organisms that are a health risk. The higher the densities of indicator bacteria, the greater the likelihood of pathogen contamination and, indirectly, the presence and quantity of fecal pathogens in the water (NRC 2014).

Indicator bacteria have long been studied to identify the potential for illness resulting from exposure to contaminated waters, and there are numerous examples which corroborate the use of indicator bacteria as predictors of adverse health outcomes (e.g., Colford et al. 2012; Wade et al. 2010; Wiedenmann et al. 2006; USEPA 2018 and 2009). Commonly used bacterial indicators of fecal contamination include total coliform, fecal coliform, *E. coli*, and *Enterococcus*. Specifically, the U.S. EPA (2012) found *Enterococcus* as the indicator of fecal contamination most highly associated with illness in ocean and estuarine waters.

2.4 Water Quality Standards

Under the authority of the Clean Water Act, the Water Board has established water quality standards for bacteria. Water quality standards consist of the following elements: 1) beneficial uses of the water body; 2) narrative and/or numeric water quality objectives to protect those beneficial uses; and 3) the state of California's antidegradation policy, which requires continued maintenance of existing high-quality waters.

2.4.1 Beneficial Uses Impacted by Bacteria

The Basin Plan designates beneficial uses for water bodies in the Region and the water quality objectives and implementation measures necessary to protect those uses. The designated beneficial uses of the beaches in Pillar Point Harbor and Venice Beach that could be negatively impacted by high levels of fecal pathogens include the following:

- Water Contact Recreation: Uses of water for recreational activities involving body contact with water such that ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing, and uses of natural hot springs.
- Non-contact Water Recreation: Uses of water for recreational activities involving proximity to water, but not normally involving contact with water where water ingestion is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beach combing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

2.4.2 Water Quality Objectives

The Inland Surface Waters, Enclosed Bays and Estuaries Plan and the California Ocean Plan both contain bacteria water quality objectives to protect recreational uses. These objectives are intended to protect human health by reducing the risk of illness associated with exposure to water containing fecal bacteria and incorporate up-to-date research on the most appropriate bacterial indicators.

In 2012, pursuant to Clean Water Act section 304(a), the U.S. EPA developed new bacteria water quality criteria recommendations for protecting primary contact recreation in coastal and non-coastal waters based on *Enterococcus* and *E. coli* respectively. U.S. EPA's studies found that Enterococci are the fecal indicator bacteria most highly correlated with illness in people who recreate in ocean waters (USEPA 2012). In August 2018 State Water Board adopted the U.S. EPA's recommendations for bacteria in the Inland Surface Waters, Enclosed Bays and Estuaries Plan (SWRCB 2018). These updated bacteria objectives are applicable statewide. They are based on U.S. EPA's more conservative protection level of 32 illnesses per 1000 recreators and specify Enteroccoci as the main indicator of pathogens in ocean waters (Table 2-1). Simultaneously with this TMDL project, we are proposing the bacteria WQOs in the Inland Surface Waters, Enclosed Bays and Estuaries Plan be adopted into the Basin Plan (Section 8).

The bacteria objectives in the California Ocean Plan, as revised in 2019, also apply to the beaches in Pillar Point Harbor and Venice Beach. In addition to the Enterococci objectives, the Ocean Plan includes the fecal coliform objective (Table 2-2) based on California-specific epidemiological studies that suggest fecal coliform may be a better indicator of gastrointestinal illness than Enterococci during certain types of exposure and environmental

conditions. While the fecal coliform objective applies to the beaches, no monitoring for fecal coliform has been conducted at the beaches, and thus no record of exceedances exists for comparison going forward. For this reason, we consider the Enterococci objective as the primary indicator of water quality for this TMDL, as discussed in Section 3.

Table 2-1 Enterococci Water Quality Objective to Protect Water Contact Recreation (REC-1) in Ocean Waters

Indicator	GM (cfu/100mL)[a,b]	STV (cfu/100mL)[a]
Enterococci	30	110

GM: geometric mean

STV: statistical threshold value

cfu/100mL: colony forming unit per 100 milliliters

a Estimates of indicator bacteria concentrations are commonly reported as CFU or MPN. CFU refers to "colony forming unit" whereas MPN refers to "most probable number". For the purpose of this report both units are considered to be equivalent. Both measurements represent a well-established means to estimate the number of bacteria in a water sample and are recognized by scientific and regulatory bodies as comparable.

b The waterbody GM shall not be greater than the GM threshold in any six-week interval, calculated weekly. The STV shall not be exceeded by more than 10 percent of the samples collected in a calendar month.

Table 2-2 Existing Fecal Coliform Water Quality Objective for Water Contact Recreation (REC-1) in Ocean Waters

Indicator	30-day GM	SSM
Fecal coliform density	200 per 100 mL	400 per 100 mL

GM: geometric mean calculated based on the five most recent samples

SSM: single sample maximum

2.4.3 Antidegradation

Both the State of California and the federal government have antidegradation policies for water quality. The federal antidegradation policy, found in the Code of Federal Regulations, title 40, section 131.12, requires that state water quality standards include an antidegradation policy consistent with the federal policy. The Basin Plan implements and incorporates by reference both the State and federal antidegradation policies, which are intended to protect beneficial uses and maintain the water quality necessary to sustain them. The State Water Board established California's antidegradation policy through State Water Board Resolution 68-16, "Statement of Policy with Respect to Maintaining High Quality Waters in California," which incorporates the federal antidegradation policy where the federal policy applies. Resolution 68-16 requires that existing water quality be maintained unless degradation is consistent with the maximum benefit to the citizens of California. The proposed TMDL for bacteria is not expected to degrade water quality, but instead to improve water quality by reducing the sources of pathogens and thereby reducing occurrences of bacteria exceedances.

2.5 Impairment Assessment

2.5.1 Overview of 303(d) Listing

In 2002, the beaches included in this project were placed on the CWA Section 303(d) List of Water Quality Limited Segments Requiring TMDLs. The original impairment determination was based on two major factors: 1) data indicating exceedance of numeric criteria and/or 2) closure of beaches by a local agency. The beaches included in this project were listed as impaired primarily because of non-attainment of the water quality objectives for indicator bacteria (total coliform, fecal coliform, and Enterococcus) associated with contact recreation, or because the beaches were consistently posted with health advisories and/or closed. Comprehensive monitoring data collected by the San Mateo County Environmental Health Department from 1997 through 2001 were evaluated to assess compliance with the applicable Basin Plan and Ocean Plan water quality objectives. Percent exceedances were calculated for the maximum, median, and geometric mean objectives and used in the impairment determination. Subsequent evaluation of the Beach Watch data collected in 2005-2010 determined that Pillar Point Harbor and Venice Beach exceeded the geometric mean objective for *Enterococcus*, and those beaches remain impaired, as shown below.

2.5.2 San Mateo County Beach Data 2007 through 2018

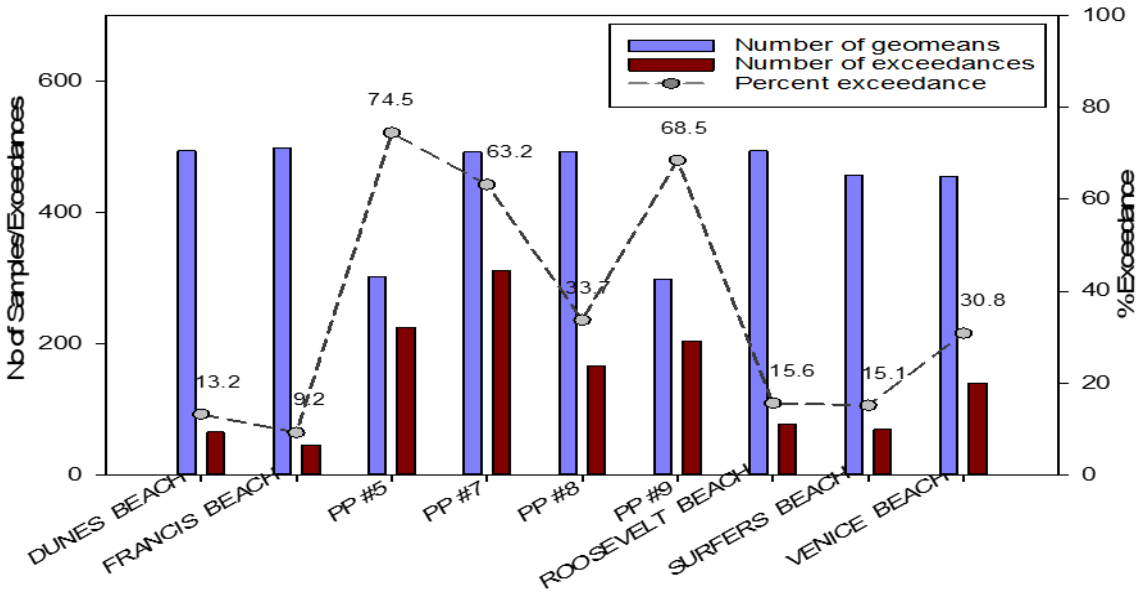
To protect beachgoers from exposure to waterborne disease, California law (Health and Safety Code section 115880 et. seq.) mandates weekly bacterial testing at public beaches with 50,000 or more annual visitors and near storm drains that flow in the summer. The weekly testing includes total coliform, *E. coli* and *Enterococcus*, all of which may indicate presence of fecal contamination. If any one of these indicator organisms exceeds standards established by the State Department of Public Health, the county health officer is required to post warning signs at the beach. In the case of extended exceedances, the officer must decide whether to close that beach. The specific trigger levels for each parameter are slightly different from the new bacteria objectives discussed in Section 2.4.2. They are, for the single-sample maximum and geometric mean respectively, total coliform (10,000 or 1,000), *E. coli* (400 or 200), and *Enterococcus* (104 or 35), all in units of MPN per 100 milliliters.

We evaluated weekly monitoring data collected by San Mateo County over the last decade to confirm which beaches exceed the existing water quality objectives. We assessed *Enterococcus* concentrations at 9 locations (Figure 2-3) from Pillar Point Harbor to Francis Beach using the objective of 30 cfu/100mL, which applies to salt waters and is considered protective of water contact beneficial uses. Following the recommendations in the Bacteria Provisions Report (SWRCB 2018), only the geometric mean values were used to evaluate the impairment. A rolling geometric mean for a minimum of five samples in a six-week period was calculated on a weekly basis. We compared the number of geometric mean values exceeding the water quality objective at each location to a binomial table specific to coastal beaches (see Section 3.3, Listing Policy, SWRCB 2015). Because of the confined nature of Pillar Point Harbor, and the likelihood that all monitored beaches (Figure 2-3) are affected by pathogen sources to the harbor, geometric mean values were grouped together for the purpose of this evaluation. The results show that bacteria levels exceed the *Enterococcus* geometric mean 57% of the time at the Pillar Point Harbor beaches and 31% of the time at Venice Beach (Figure 2-4). These chronic exceedances are consistent with the listing decisions in 2002 and the subsequent evaluation of the data collected from 2005 through 2010. Although there are periodic exceedances of the *Enterococcus* objective at Surfers, Roosevelt, Dunes and Francis beaches, the overall frequency of exceedances is low, so the water contact beneficial use is not impaired at these four beaches according to the criteria of the Listing Policy.

Figure 2-3 San Mateo County Beach Watch monitoring locations

Table 2-3 Summary of Exceedances of *Enterococcus* Geometric Mean Water Quality Objective

Location	Number of Samples 2007-2018	303d Listing Threshold	Number of Exceedances	Percent Exceedance	Impaired (Yes/No)
Pillar Point Harbor	1584	263	906	57	**Yes**
Surfers Beach	457	76	69	15	No
Roosevelt Beach	494	82	77	16	No
Dunes Beach	494	82	65	13	No
Venice Beach	455	76	140	31	**Yes**
Francis Beach	499	83	46	9	No



Monitoring locations PP#5 through PP#9 are shown in Figure 2-3

Figure 2-4 Frequency of water quality exceedances observed at all monitoring locations 2010-1018

In addition to assessing the spatial extent of impairment, we also analyzed the data to determine the timing of exceedances and the seasons in which they were most likely to occur. For simplicity, the wet season (October through April) and dry season (May through September) were defined as the months when rainfall was most or least likely to occur. In other words, the two seasons were not determined according to actual records of rainfall triggering runoff events (see section 2.2.1). The analysis of the wet and dry season data shows similar patterns for all monitoring locations, although the variability and the geometric means are generally higher during the wet season (Figure 2-5, Figure 2-6), indicating that beach waters are especially susceptible to contamination from polluted stormwater runoff and wet weather transport. During rainfall events, wash-off of bacteria accumulated on land surface from natural and anthropogenic sources is considered the main mechanism for transport of bacteria into the nearest water body. Wet weather events also contribute to delivery of bacteria loads from sanitary sewer overflows, faulty sewer lines, or leaking septic systems.

Notably high levels of *Enterococcus* were observed during the exceptionally wet year of 2017 after the prolonged drought from 2014 through 2016. For example, at Francis Beach, which over the last decade (2010-19) experienced the lowest number of exceedances, the geomeans more than doubled in 2017 (max: 97.0 MPN/100mL) compared to the dry years of 2014 through 2016 (maximum 25.4 to 40.8 MPN/100mL). The difference between the concentrations in 2017 and all other dry years was significant ($P<0.001$, t-test).

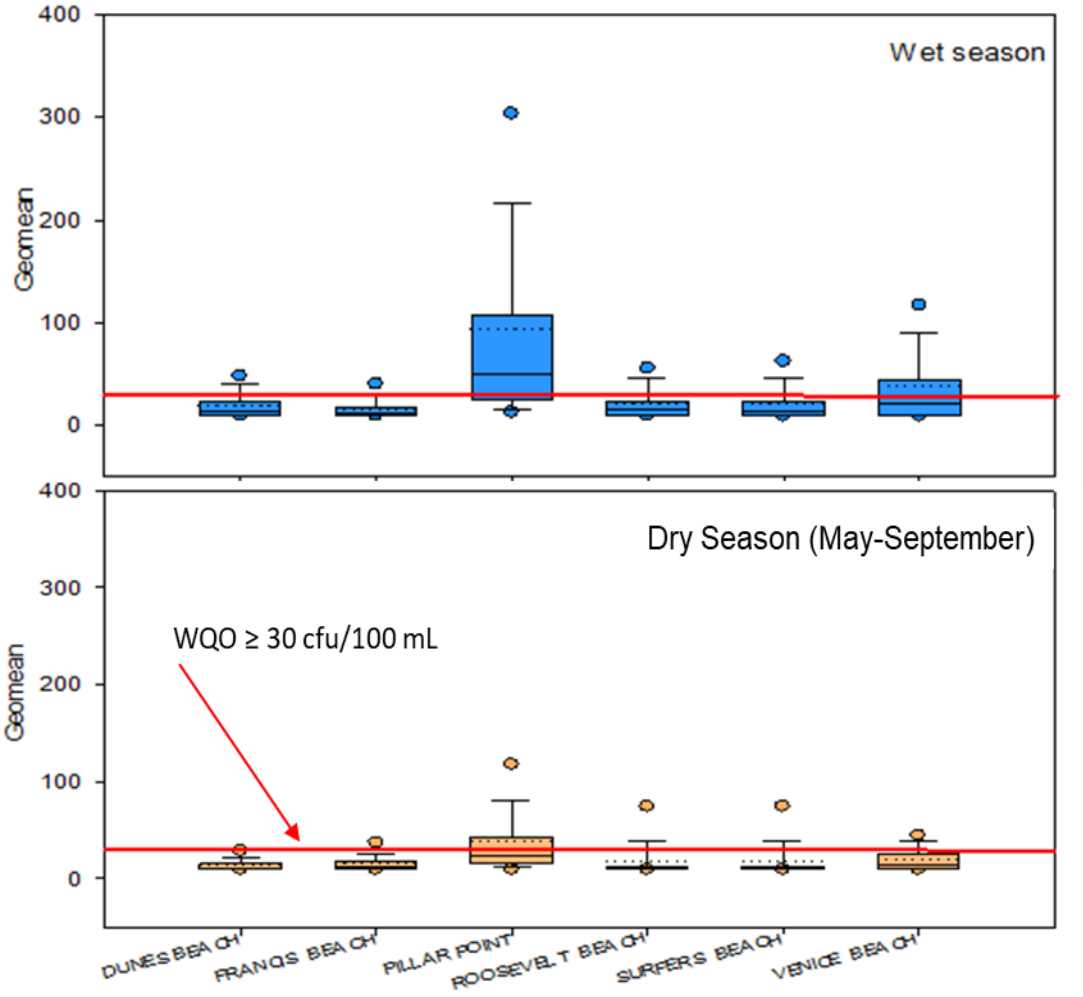


Figure 2-5 Box plots showing geomeans during wet and dry seasons with 5th and 95th percentile, 2007-2018

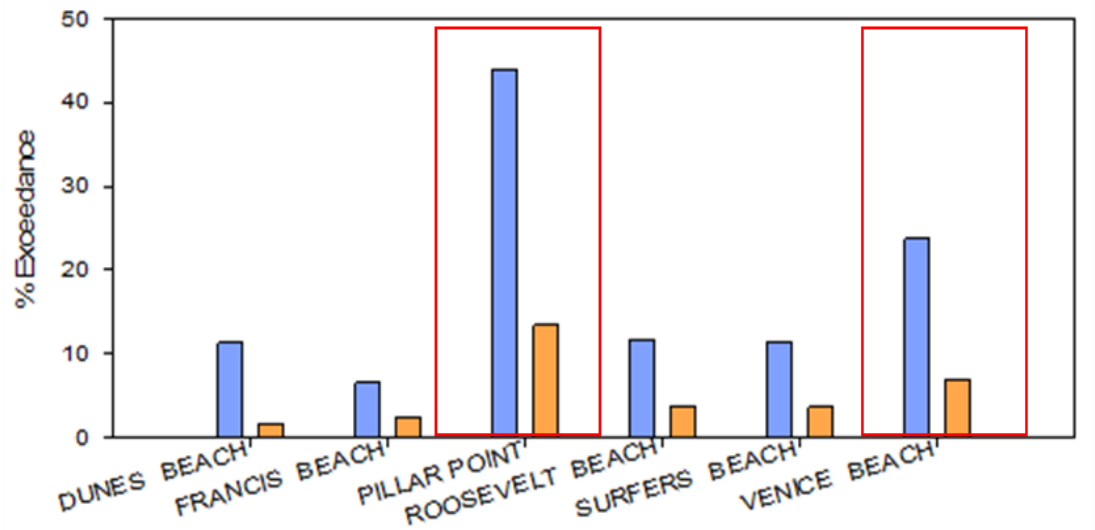


Figure 2-6 Percent exceedance of the Enterococcus water quality objective during wet and dry seasons, 2007-2018

2.5.3 Source Identification and Special Studies

Since 2008, several focused bacteria studies have been conducted in Pillar Point Harbor and the surrounding area (Figure 2-7) to assess and identify the sources of fecal pollution, and to recommend and prioritize actions to improve water quality. Some studies used Microbial Source Tracking (MST) to differentiate between human and nonhuman sources of fecal contamination. MST is a relatively new and developing methodology which relies on genetic analysis to identify strains of bacteria associated with individual animal species (Hardwood et al. 2014). Although significant improvements in MST methods have been made in recent years, at this point no MST method is capable of identifying how specific bacterial sources contribute to water quality impairment in all situations. Still, the studies and MST collection programs to date in Pillar Point Harbor and neighboring watersheds offer further insights into timing, magnitude and pathways of bacterial contamination into the harbor and beyond. The results of the studies to date indicate the following:

- Bacterial contamination was not found to be widespread or ubiquitous. Indicator bacteria concentrations and source markers showed a high level of temporal and site-specific variation.
- A high water exchange ratio has helped remove bacteria and other pollutants from the harbor.
- Fecal contamination from human sources was detected rarely.
- Live-aboard boats within the inner harbor have not been found to be a source of fecal contamination.
- Dog-associated markers were detected frequently and were linked to freshwater creeks draining urban areas.
- Cattle and deer waste was detected at Deer Creek, while at Denniston Creek the predominant source was wildlife.
- Periodic resuspension of sediments and biofilms could lead to temporal increases in bacteria levels.
- Grease, litter and organic matter appear to play a role in bacteria dynamics and can enter the stormwater system via fractured pipes, unknown connections and dumping.

A brief description of the studies and their findings is provided below.

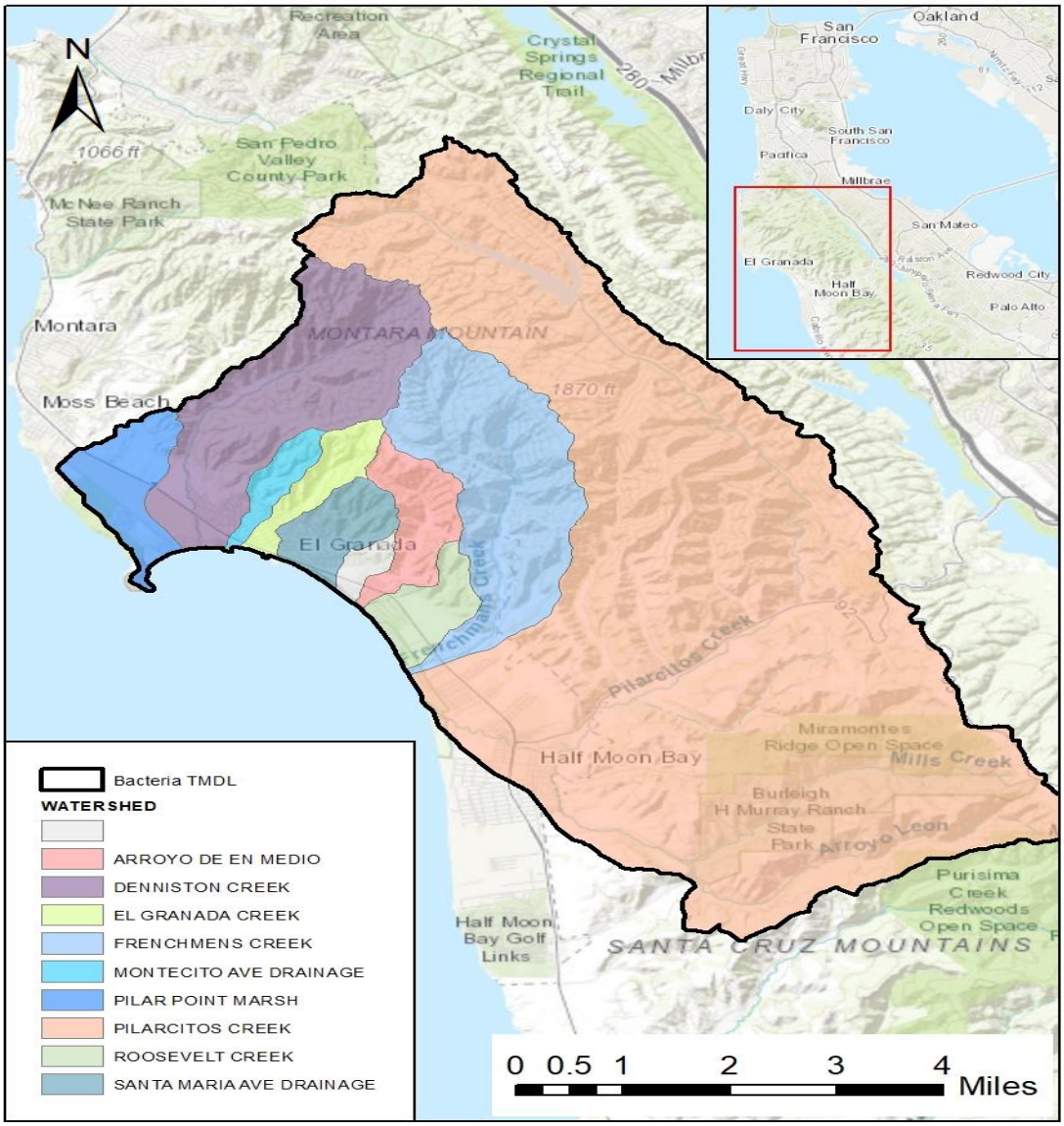


Figure 2-7 Project area location and surroundings

Pillar Point Harbor Circulation Study (2008)

In the San Mateo Resource Conservation District (San Mateo RCD) led effort, Wuertz et al. (2011) conducted a dye study in parallel to bacteria sampling and microbial source tracking to evaluate if hydrologic conditions in the Pillar Point Harbor contributed to worsening fecal contamination. Two fluorescent dyes and four types of fruit drogues[1] were used to conduct a circulation experiment in September 2008. The objective of the project was to observe flow direction, velocity and mass transport in the harbor to assess the capacity for water exchange

[1] Drogues or floats are objects used in hydrological studies to measure surface currents and travel time. Floats may include natural objects such as sticks, oranges, tangerines or manufactured objects such as balls or drogues engineered for this specific purpose.

and, subsequently, infer residence times of pollutants under the late-summer dry season conditions. Water samples for the microbial source tracking target *Bacteroidales* were also collected at the four dye release sites and four control sites.

Although the study did not consider vertical stratification, surface distribution patterns of the dyes indicated the presence of different mixing zones within the harbor. The dye plume released at the northern part of the harbor washed out in five tidal cycles (2.5 days) while the shallow waters of the northwestern side of the harbor took six tidal cycles (3 days) to flush. Under the prevailing wind conditions at the time of the experiment, the movement of water and pollutants was most affected by tidal flows.

Overall, the distribution of dyes and drogues showed a high degree of interchange of waters with the ocean with an approximate exchange coefficient of 0.42, suggesting that the removal of pollutants from the harbor was likely.

Pillar Point Harbor Source Identification Project (2008, 2011, 2012)

The University of California, Davis conducted water quality sampling in Pillar Point Harbor in 2008, 2011 and 2012 to estimate relative contributions of fecal pollution originating from human, cow, dog, horse and bird sources (Kim and Wuertz 2014). Concurrently with the water quality monitoring for microbial source tracking, the San Mateo RCD monitored indicator bacteria, including total coliform, *E. coli* and *Enterococcus*, to evaluate microbial water quality in the area. Researchers collected 514 water samples for indicator bacteria analysis and 225 MST samples from water, sediment, and biofilm matrices for genetic analysis. The MST samples were collected at 10 sites, including freshwater inflows into Pillar Point Harbor, all beaches within the harbor, and locations in proximity to live-aboard boats. In addition, a focused sampling was conducted at and in the vicinity of the Capistrano Beach stormwater outfall, where high concentrations of indicator bacteria have been frequently detected in the past.

The presence of human, cow and dog markers detected at Pillar Point Harbor monitoring locations throughout the study is shown in Table 2-4. Human-associated *Bacteroidales* were not commonly detected at any of the sites. Predictive analysis of live-aboard boat site monitoring data showed that the potential contribution of human feces from live-aboard boats to the water quality was not significant. Somewhat higher levels of bovine-associated *Bacteroidales* [2] were only found at Deer Creek Outlet, and bovine markers were present in both wet and dry season samples. Dog-associated *Bacteroidales* were frequently detected at Capistrano Beach, which receives stormwater from the Capistrano area and St. Augustine Creek, and in Deer Creek samples. Results from upstream and downstream MST monitoring along the waterways draining to Capistrano Outfall Pipe and Deer Creek Outlet indicated that dog feces likely originated in the urban area located between Pillar Point Harbor and the upper watershed.

[2] Bovine-associated markers are intended to detect bacterial contamination from cattle but can include deer, coyote or sheep.

Authors of this study considered wildlife to be the predominant source of fecal pollution at Denniston Creek. There was little evidence of fecal pollution derived from gulls or horses, based on a lack of markers indicative of gull-associated *Catellicoccus* and horse-associated *Bacteroidales*. The universal markers, derived from all warm-blooded animals, were found to be generally higher at sites outside of the harbor than at sites within the inner harbor, which may suggest that live-aboard boats in the outer harbor could potentially contribute to the overall pool of bacteria. High levels of the universal marker were also detected in sediments and biofilm, even when levels in water were not high. This indicates that previously introduced microbial populations can accumulate and persist longer in sediments and biofilm, and that re-suspension of sediments can cause an increase in bacteria levels.

Table 2-4 Summary of Detections of Species-Specific Markers in Pillar Point Harbor Watershed in 2008 and 2011-2012 (*Data from Kim and Wuertz 2014*)

Location	Marker	Dry Season[a]	Wet Season[a]
Capistrano Outfall	Human	1/3	0/17
	Dog	1/3	3/17
	Bovine[b]	0/3	0/17
St. Augustine Creek	Human	0/3	2/15
	Dog	1/3	6/15
	Bovine	0/3	2/15
Capistrano Beach	Human	0/3	3/15
	Dog	1/3	5/15
	Bovine	0/3	0/15
Denniston Creek	Human	1/3	1/17
	Dog	2/3	2/17
	Bovine	0/3	0/3
Deer Creek	Human	1/3	1/11
	Dog	1/3	8/11
	Bovine	3/3	6/11

a Number of detects/total number of samples

b Bovine-associated markers are intended to detect bacterial contamination from cattle but can include deer, coyote or sheep.

James V. Fitzgerald Source Tracking Study (2012)

In 2012, an MST study was collaboratively conducted by San Mateo County, San Francisco Estuary Institute and the University of California, Davis (David and Kim, 2013). The study, funded by a Proposition 84 Grant, was part of the Pollution Reduction Program designed to reduce pollutant loading and protect beneficial uses of Fitzgerald Reserve located just north of Pillar Point Harbor and designated as an Area of Special Biological Significance in the Water Quality Control Plan for Ocean Waters of California. The main goal of the MST study was to provide information about the primary sources of fecal indicator bacteria within the Reserve watershed. This study is of interest because it covers an area abutting the project area and may have similar bacteria sources. The study investigated potential sources of bacteria in five creeks draining to the Pacific Ocean in the vicinity of the Reserve and examined seasonal and land use-related spatial trends. A genetic analysis of host-associated

Bacteroidales was also conducted to determine whether human, bovine[3], dog, and/or horse sources were contributing to fecal contamination. Fifty-eight samples of water, sediment and biofilm were collected for bacteriological and genetic analysis during seven monitoring events from January 2012 through October 2012.

The results of the monitoring showed that bacteria concentrations were elevated during the dry and wet seasons and often exceeded water quality objectives for water contact recreation. The concentrations were generally lower in the dry season and in the less urbanized watersheds. Due to the study design and limited timeframe, consistent spatial trends in bacteria concentrations related to specific land use types could not be detected. Of the four host-specific markers that were analyzed, dog-associated *Bacteroidales* were the most frequently detected host marker in the water, sediments, and biofilms at all sites in the wet season. It was hypothesized that accumulated pet waste from the heavily-used trails adjoining the creeks washed into the creeks during rain events. Horse-associated *Bacteroidales* were found at high concentrations in Dean and San Vicente Creek during rain events in the wet season but were detected less often in the dry season. The results confirmed the presence of fecal contamination from all sources especially during the wet season.

San Mateo County Resource Conservation District Pollution Study (2013 through 2015)

From March 2013 through June 2015 the San Mateo RCD sampled the inner Pillar Point Harbor and the stormwater outfalls to further identify potential sources of bacteria (SMCRCD 2016, Figure 2-8). In the harbor, sites near the live-aboard boats were sampled on a monthly basis, and five consecutive weekly samples were collected twice a year to evaluate wet and dry season water quality. Four stormwater outfalls draining into the harbor were sampled quarterly in 2014 and 2015 during dry and wet weather, including first flush events in both years, to evaluate baseline water quality. Additional outfalls further north of Denniston outfall were also added to the first flush sampling. A total of 16 samples were collected at the Capistrano outfall and included sampling before and after the flushing of the outfall pipe performed by San Mateo County.

The results showed that a majority of the samples collected at dock locations shown in Figure 2-8 had low *Enterococcus* concentrations, below 10 MPN/100mL (66 percent). Concentrations above 104 MPN/100mL were infrequent (17.6 percent) and usually coincided with rainfall events that caused stormwater inflow into the harbor from the upland watershed. The levels of *Enterococcus* in outfall samples consistently exceeded 104 MPN/100mL during dry and wet seasons. Additional monitoring at Capistrano outfall suggested that flushing of the outfall did not have a noticeable impact on bacteria concentrations, however, the sampling may not have been frequent enough to clearly detect changes in water quality.

[3] Bovine-associated markers are intended to detect bacterial contamination from cattle but can include deer, coyote or sheep.

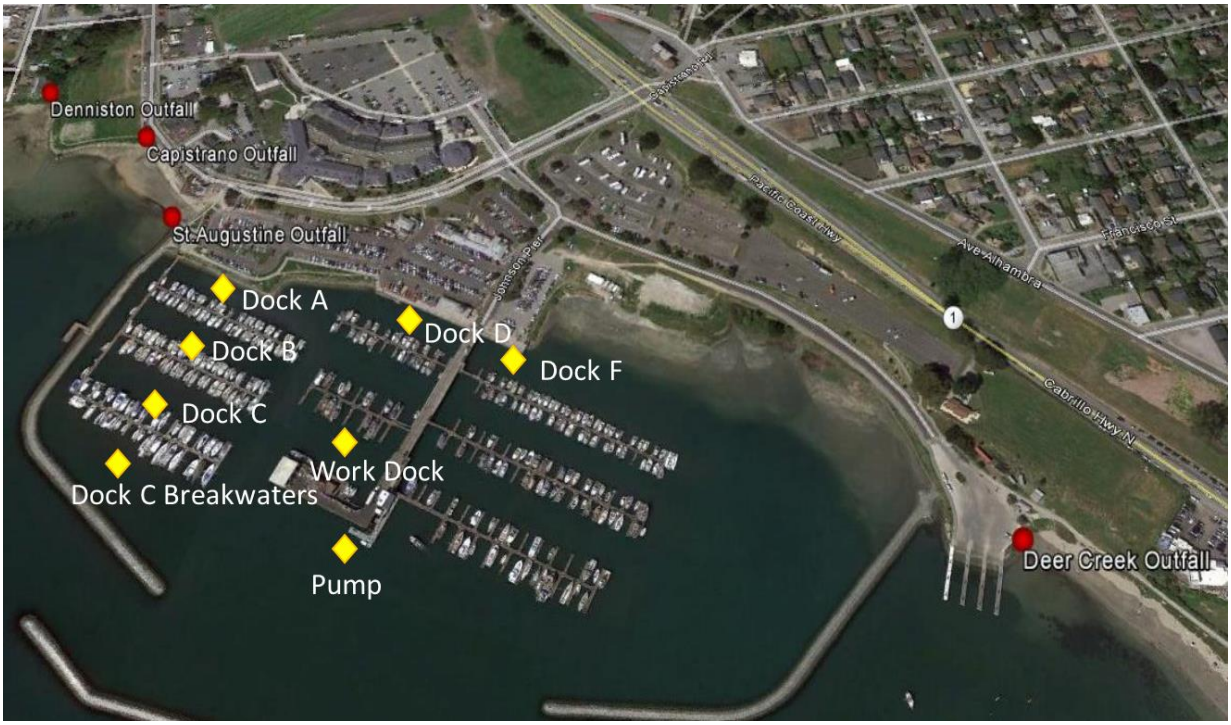


Figure 2-8 Monitoring locations for the Resource Conservation District study

Pillar Point Watershed Pathogen Indicator Stressor/Source Identification (2018 and 2019)

This study (SMCWPPP 2019) was conducted to fulfill the requirements of the Municipal Regional Stormwater Permit. It aimed to identify geographic, seasonal, and species-specific sources of bacteria to Pillar Point Harbor, and to better characterize the magnitude, seasonal variability, and predominant sources of indicator bacteria in the municipality's watershed. Grab samples were collected twice during the wet and dry seasons at 14 stations in five subwatersheds draining to Pillar Point Harbor. The samples were analyzed for *E. coli* and human and dog genetic markers.

Results showed *E. coli* densities often exceeded recommended water quality objectives for freshwaters with water contact recreation beneficial uses (i.e., 320 cfu/100mL). However, bacteria densities were highly variable and did not always follow predictable seasonal patterns across all subwatersheds. No human or dog genetic markers were found in the uppermost locations sampled with predominantly open space and natural land uses. In addition, the upstream areas had measurably lower concentrations of indicator bacteria than the downstream more urbanized locations.

Only in Deer Creek were *E. coli* densities higher in the dry season than in the wet season, while all other creeks draining to Pillar Point Harbor had higher *E. coli* densities in the wet season (SSID 2019). Although the seasonality differed, the magnitude of *E. coli* measured in Deer Creek were somewhat similar to other creeks sampled. Data are insufficient to distinguish whether the dry season *E. coli* densities were caused by cattle or wildlife.

The highest *E. coli* densities were measured at the south sub-catchment of the Capistrano area, which is a highly impervious, piped system. Human markers were detected during one

sampling event in January 2018 in the Capistrano area. Dog markers were more widespread and were detected during wet weather sampling in Denniston Creek, Capistrano and St. Augustine Creek.

E. coli densities measured at the Capistrano catchment outfall were consistently above the water quality objective of 320 cfu/100mL. During storm events, it is likely that bacteria are conveyed through the municipal storm drain system, especially from the south sub-catchment of Capistrano, with contributions from pet waste and a transient, unknown, but evidently not consistent, human source. Wildlife waste and growth of bacteria in biofilms in the lower portions of the stormwater outfalls could also be a contributing source during the dry season.

Other Data Collection Efforts and Monitoring Data

With funding from the Harbor District and Sewer Authority Mid-Coast, the San Mateo RCD collects samples at stormwater outfalls, creeks, and drainages between Montara and Half Moon Bay during the first big rain of the season. Approximately 15 sites are sampled and analyzed for bacteria, metals, nutrients, total suspended solids and physical parameters. This is a program initiated by the Monterey Bay National Marine Sanctuary Foundation in 2000, which has conducted consistent sampling in San Mateo County since 2008. The Foundation writes an Annual Report, and the San Mateo RCD presents results to the community and shares the presentations on their website.

Surfrider collects bacteria samples through its Blue Water Task Force at various locations on the coast including the Capistrano outfall and beach. During 2013, 2014, and 2015, monitoring included sampling of ocean water within the inner harbor breakwater to see if there were bacteria hot spots around the live-aboard boats, and sampling at the Denniston, Capistrano, St. Augustine, and Deer Creek Outfalls. For additional information see the San Mateo RCD's Water Quality program page: http://www.sanmateorcd.org/project/water-quality/ .

3 Numeric Targets

The numeric targets for fecal indicator bacteria for this TMDL are shown in Table 3-1. These targets are the same as U.S. EPA's current recommended water quality criteria (synonymous with water quality objectives) for water contact recreation in ocean and estuarine waters, based on an estimated illness rate of 32 per 1000 water contact recreators. These criteria reflect the latest scientific knowledge and have been adopted by the State Water Board as statewide water quality objectives for water contact recreation (see Section 2.4). These numeric targets are designed to protect the water contact recreation beneficial use, and, therefore, are protective of all types of contact and non-contact recreational uses at the beaches in Pillar Point Harbor and Venice Beach.

Table 3-1 Numeric Targets to Protect Recreation in Pillar Point Harbor and Venice Beach

Indicator	**GM** (cfu/100mL)[a,b]	**STV** (cfu/100mL)[a]
Enterococci	30	110

GM: geometric mean

STV: statistical threshold value

cfu/100mL: colony forming unit per 100 milliliters

a Estimates of fecal indicator bacteria concentrations are commonly reported as CFU or MPN. CFU refers to "colony forming unit" whereas MPN refers to "most probable number". For the purpose of this report both units are considered to be equivalent.

b The waterbody GM shall not be greater than the GM numeric target in any six-week interval, calculated weekly. The STV shall not be exceeded by more than 10 percent of the samples collected in a calendar month.

The main target is expressed and evaluated as the running geometric mean calculated weekly and based on a minimum of five samples collected in a 6-week period. The geometric mean target takes precedence over the statistical threshold value target in determining if the TMDL has been achieved. The numeric targets are the desired condition for Pillar Point Harbor, Venice Beach. Achievement of these conditions will be evaluated in accordance with the 303d Listing Policy (SWRCB 2015).

4 Source Analysis

A TMDL source analysis identifies the amount, timing, and origin of pollutants contributing to water quality impairment. The water quality concern for people using the beach is increased risk of illness resulting from exposure to pathogens, which is directly linked to the level of indicator bacteria in the water. To protect beachgoers from an unreasonable level of risk, we rely on concentration-based loads of indicator bacteria as the wasteload and load allocations This approach is consistent with other bacteria TMDLs in California. Under this approach, the source analysis identifies categories of sources and places where there is a risk of fecal waste discharge, so that a prioritized source control can be developed. Figure 4-1 shows the common sources of fecal contamination.

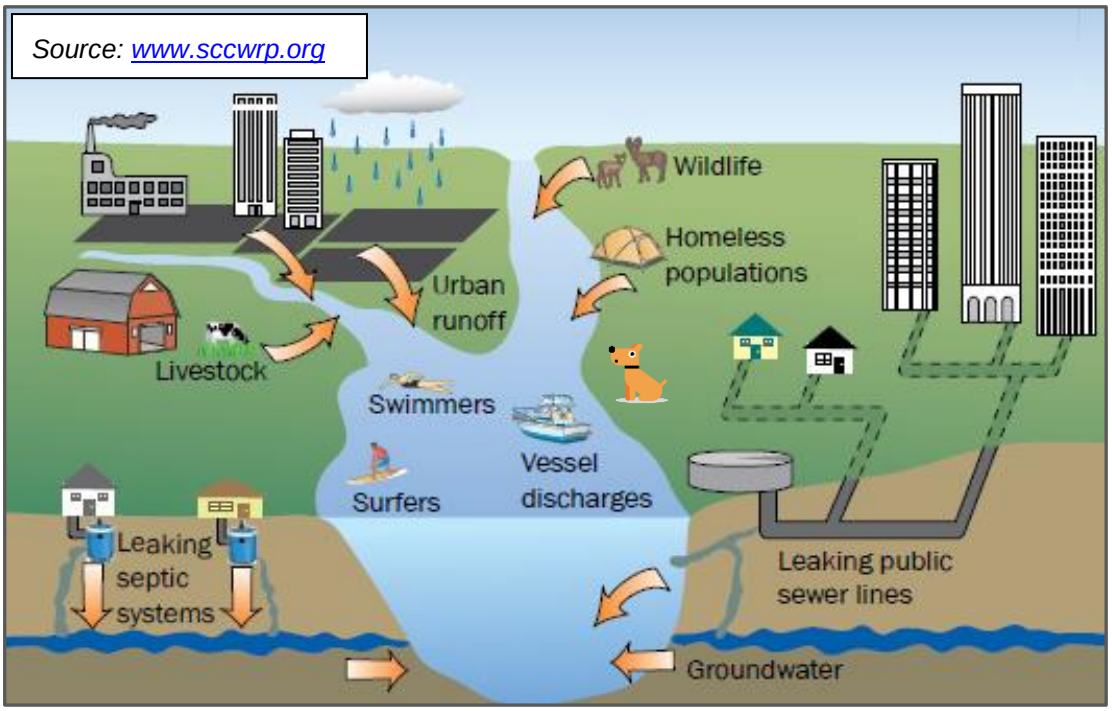


Figure 4-1 Conceptual diagram showing common sources of bacteria

4.1 Controllable Sources of Bacteria to Pillar Point Harbor and Venice Beach

Local monitoring data and microbial tracking studies, land use data, and literature review (e.g., Pandey et al. 2014, UWRRC 2014, Korajkic et al. 2018) were used to identify the sources of bacteria contributing to water quality impairments at Pillar Point Harbor and Venice Beach. Table 4-1 shows the potential sources of fecal contamination and assigns a relative load ranking based on the likelihood of threat each source poses to people who recreate at the beaches. The sources have been categorized as either high or low priority, based on the following factors:

- Potential for polluting water;
- Past waste discharge history, including whether a discharger complies with existing limitations;
- Current regulatory and management status;
- Results of the bacteria monitoring data in the watershed;

- Proximity to the beach or other water body;
- Literature-based and anecdotal evidence of excessive bacteria loads;
- Feasibility of regulation by the Water Board; and
- Prevalence with which they appeared in the MST analyses in the project area and surrounding watersheds.

This relative load ranking and the subsequent priority to take actions to reduce the loads focus on the origin of contamination. Among all sources of bacteria, human waste typically presents the greatest risk of containing viral pathogens, followed by cattle manure, and then gull, chicken and pig feces (Korajkic et al. 2018). Therefore, human waste sources are given the highest priority, followed by sources associated with human activity, and then all other sources, except wildlife, which we consider an uncontrollable source. The following sections discuss each source and explain its categorization as either high or low load and threat. We also discuss which sources could potentially pose the highest risk to people recreating at the beaches in Pillar Point Harbor and Venice Beach, and that are also controllable. These sources may have a direct effect on the level of bacteria at the beach, or there is a transport mechanism for delivering the load of bacteria to the beach. The implementation actions and monitoring requirements described in Section 7 focus on reduction of bacteria loads from these sources as the main means to improve water quality.

Table 4-1 Sources of Bacteria, Load Ranking and Threat Level, Pillar Point Harbor and Venice Beach

Source	Source Activity	Load Ranking
Human waste	Onsite wastewater treatment systems	High
	Sanitary sewer overflows and collection systems	High
	Pillar Point Harbor and Marina Operations	High
	Private sewer laterals and public restrooms	Low
	Municipal wastewater treatment plant	Low
Urban runoff	Municipal stormwater	High
	Runoff from landfills	Low
	Caltrans stormwater runoff	Low
Animal waste	Pet waste	High
	Horse boarding	High
	Livestock grazing	Low
	Wildlife	Uncontrollable/Low

4.1.1 Onsite Wastewater Treatment Systems

Onsite Wastewater Treatment Systems (OWTS), commonly known as septic systems, provide a relatively inexpensive and effective method of wastewater treatment in low-density areas if they are correctly designed and responsibly maintained. They are typically suitable for treating small quantities of sewage waste from a single residence or small business. Conventional OWTS operate by trapping solids in a septic tank and distributing wastewater to

a subsurface leach field. The leach field treats the waste by filtering it through the unsaturated portion of the soil profile, where low moisture and high oxygen levels form favorable conditions to remove pathogens, and where chemical and microbial processes can reduce the concentration of other contaminants (Cooper et al. 2016). Viruses are not effectively filtered in soil because of their small size. Instead, viruses are removed through adsorption to soil particles and by inactivation in the soil. Correctly sited, operated, and maintained OWTS are highly effective in removing bacteria. However, these systems are also prone to failure, and failure rates triple for systems older than 25 years (USEPA 2005). Even a single failing septic system can deliver an extremely large load of bacteria. As a result, OWTS can be significant sources of bacteria when the systems provide inadequate treatment and/or discharge directly to groundwater, or discharge to surface water via overland or groundwater flow.

San Mateo County evaluated the presence and distribution of OWTS in all watersheds in the county to develop its Local Agency Management Program (LAMP), under which the County regulates its OWTS in accordance with the statewide OWTS Policy. (SMC LAMP 2016, Appendix B), County staff conducted GIS analysis to review all land parcels located in the non-sewered areas of the county and determined whether they were developed or vacant land. The number of developed parcels outside of the sewer service area served as a proxy for the current number of OWTS in the county.

Pillar Point Harbor

The County's GIS analysis did not identify any OWTS systems in the non-sewered part of watersheds draining to Pillar Point Harbor. However, within a sewered area, a septic system containing three tanks and a drain field is located at the Half Moon Bay Airport. One septic tank is on the west side of the main airport building, which historically included a small café, and a second tank is in the vicinity of the hangar building, which has a restroom. The Airport also maintains a tank in the plane washdown area.

One more tank exists within the Pillar Point Air Force Radar Station located just north of the harbor. The station is manned by a small team that operates and maintains the site and its equipment in support of space and ballistic missile launches. The records for these septic systems indicate that they are well-designed, permitted and undergo maintenance.

LOAD RANKING: Due to potential risks to human health from waters contaminated with human fecal material, we generally consider septic systems to be a potential significant source of bacteria, and we rank such septic systems among the high priority controllable sources. However, the septic systems in Pillar Point Harbor watershed are few, they are well-maintained and located away from waterbodies, so they are unlikely to pose a significant threat to water quality. Therefore, the load ranking for these systems is low.

Venice Beach

As discussed above, poorly performing OWTS can be a significant source of fecal contamination. San Mateo County's GIS-based analysis (SMC LAMP 2016 Appendix B) of the watershed draining to Venice Beach identified clusters of OWTS in the Frenchmans and Pilarcitos watersheds. Altogether, the analysis identified 21 parcels with OWTS in the middle reaches of Frenchmans and Pilarcitos watersheds (Figure 4-2). In addition, we reviewed the available County records (e.g., permits, repair applications, percolation test results) for 18 properties adjacent to Frenchmans and Pilarcitos creeks. The records indicate that these properties each have one to four septic tanks with up to 2500-gallon capacity, and leach fields

that extend from 30 to 40 meters. These 18 septic systems appear to be located within 100 meters of the creek, and some of them can be as close as 20 meters. Many of these systems were installed more than 50 years ago, although some records indicate that the old redwood tanks have been replaced with concrete tanks in the last 10 to 20 years. The percolation tests performed during tank replacement or installation of a new tank met the standards required for onsite septic systems. Limited information exists on how these septic tanks are maintained and the frequency of pumping. These systems need to be evaluated further to determine whether they meet the current standards of operation or need repairs.

Although there is a relatively small number of OWTS in the watersheds draining to Venice Beach, the septic systems bordering the creek can be a significant source of bacteria when and if discharges of inadequately treated sewage occur and are undetected for prolonged periods of time without above-ground evidence. One property, located within the lower portion of Frenchmans Creek and close to Venice Beach, has a history of complaints about unpermitted septic tanks/pits and unlicensed pumping and distributing of sewage at the property.

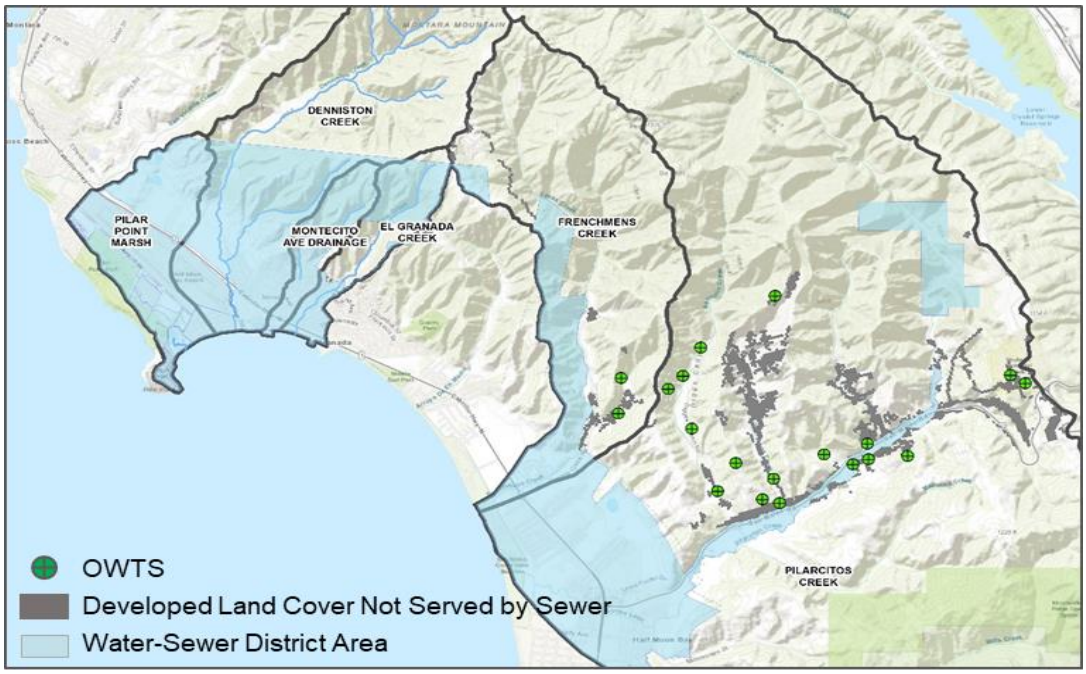


Figure 4-2 Map of OWTS systems in Venice Beach watershed

LOAD RANKING: Eighteen septic systems are located in close proximity to the creeks draining to Venice Beach. The average lifespan of a septic tank and leach fields is approximately 25 years, and a single failing septic system can deliver extremely large load of bacteria. Because of the age, location and infrequent pumping, these systems are prone to failure and should be further evaluated to identify whether they meet the current OWTS requirements. Even a small number of defective systems may cause significant water quality impairment, and thus we rank septic systems as a high priority controllable source.

4.1.2 Sanitary Sewer Overflows and Collection Systems

Three independently maintained sanitary sewer collection systems serve the watersheds connected to Pillar Point Harbor and Venice Beach (Table 4-2). The Sewer Authority

Mid-Coastside (SAM) sanitary sewer collection system includes almost eight miles of sewer pipelines and receives sewage from two other collection systems managed by the Granada Community Services District and the City of Half Moon Bay (Figure 1-1, Figure 4-3). Granada District's sanitary sewer system includes approximately 33 miles of sewer line and approximately 1,500 feet of force main running along Highway 1. The City of Half Moon Bay's sewer system consists of approximately 37 miles of sewer mains, 3,100 laterals, and three lift stations. The three systems combined collect raw sewage from residential, commercial, and industrial properties and transfer it to the SAM wastewater treatment plant for treatment and subsequent discharge.

Table 4-2 Characteristics of the Sewer Collection Systems

Collection System	Length (miles)	Age (years)	Population Served
Sewer Authority Mid-Coastside	7.5	49	25000
Granada Community Services District	35	39	7100
City of Half Moon Bay	36.5	50	13000

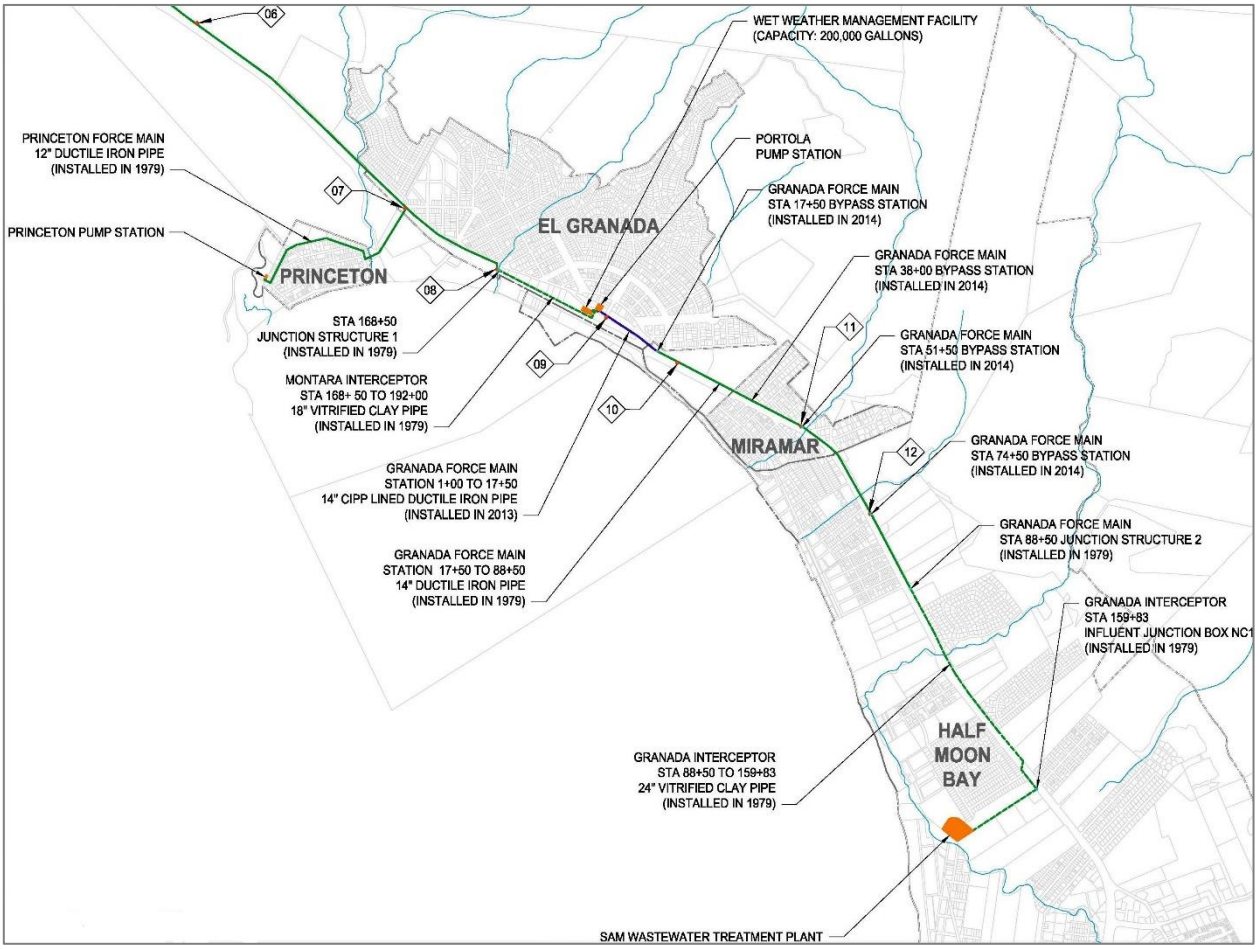


Figure 4-3 Map of sewer collection systems and pump stations

If not sized or maintained properly, collection systems are susceptible to overflows, especially in wet weather. Sanitary sewer overflows (SSOs) often contain high levels of suspended solids, pathogenic organisms, toxic pollutants, nutrients, oil, and grease. SSOs are commonly triggered by plugged pipes or infiltration and inflow. Infiltration refers to the seepage of groundwater into sewer pipes through holes, cracks, joint failures, and faulty connections. Inflow refers to rainwater that enters the sewer system from a variety of sources and is greatest during heavy rainfall when it can cause excessive flows and sewage spills. SSOs can threaten public health, harm aquatic life, and impair recreational uses of surface waters.

In the project watersheds, infiltration and inflow results from aging infrastructure and a lack of capacity. For example, the Granada Community Services District identified infiltration and inflow at locations that need repair in the District's collection system. The pipeline that conveys wastewater from the district to the treatment plant has experienced ongoing capacity issues during wet weather.

SSOs are regulated under the Statewide General Waste Discharge Requirements (WDR) for Sanitary Sewer Systems, State Water Board Order No. 2006-0003. The WDR requires that the operators of sewer collection systems develop and implement sewer system management plans and report and mitigate all SSOs. Table 4-3 shows the SSO rates and the average for other systems in San Mateo County. Based on the 2013 through 2017 data, the SSO rates at the three collection systems were generally on par with the median of the relevant-size collection systems in our region except for the SAM system performance in 2017.

Table 4-3 Summary of Sanitary System Overflows within SAM Collection Systems

Collection System	**SSO Rate** [a]					
Year	**2015**	**2016**	**2017**	**2018**	**2019**	**2015-19**
Sewer Authority Mid-Coastside (SAM)[b]	0	26.7	53.3	0	13.3	93.3
Granada Community Services District[c]	4.3	12.8	2.9	0	0	20.0
Half Moon Bay Sanitary District[c]	16.4	5.5	13.7	0	2.7	35.6
San Mateo County median for small systems (< 10 miles)	19.8	31.6	23.3	30.3	60.6	165.6
San Mateo County median for systems 10 to 100 miles	10.2	9.5	13.4	9.0	11.1	53.2

a SSO rate is expressed as number of SSOs per year per 100 miles of collection system

b Small collection system (less than 10 miles)

c Collection system of 10 to 100 miles

In 2017 a force main pipeline conveying wastewater from the Portola Pump station to the wastewater treatment plant failed, releasing approximately 357,000 gallons of untreated sewage into an unnamed creek just south of Pillar Point Harbor, which then discharged to the Pacific Ocean. Only about four percent of the release was recovered and returned to the collection system. In 2018, the Regional Water Board reached a $600,000 settlement with SAM to resolve permit violations, including discharges of untreated waste to the Pacific Ocean in 2017 and SSOs totaling more than 150,000 gallons (Order No. R2-2018-1012.) The

Regional Water Board reached separate settlements with the Montara Sewer District and the City of Half Moon Bay to resolve violations of the SSO WDRs due to SSOs discharging approximately 30,000 gallons of untreated waste to surface waters in the area, including Pilarcitos Creek. (R2-2018-1022 [Montara] and R2-2018-1020 [Half Moon Bay].)

The collection systems are susceptible to failures predominantly during wet weather, and SAM, together with the Granada District and the City of Half Moon Bay have made improvements by replacing damaged pipes and other infrastructure. The Granada District has proposed mitigation measures that include better mapping of the District's collection system followed by field verification and upgrades. SAM initiated a wet weather expansion project in 2018 to alleviate wet weather SSOs. This project, when completed, will increase the temporary storage capacity during storms, which in turn would prevent untreated sewage discharges to surface waters. This additional storage capacity in the collection system would also allow the wastewater plant to better regulate influent flow, which will result in more effective wastewater treatment and, subsequently, reduce impact on the receiving water quality (K. Prathivadi, Sewer Authority Mid-Coastside, *pers. comm*).

In its Existing Conditions Report (HMB 2014) the City of Half Moon Bay evaluated the adequacy of existing sanitary sewer services for its General Plan Update. Although the system is generally able to handle existing flows, the report identified capacity issues that caused surcharge in some manholes during heavy rain periods. The City has initiated a sewer system study to identify existing system deficiencies and prioritize improvements necessary to accommodate peak period flows and completed tv/video inspection of the 37 miles of sewer mains to help identify problem areas.

LOAD RANKING: Due to potential risks to human health from waters contaminated with human fecal material, sanitary sewers are ranked as a high priority source. In recent years, the volume of any single SSO incident was usually less than 1000 gallons; however, chronic minor leakage of sewer lines is often difficult to detect and can result in sustained impairment of adjacent surface waters through bacterial loading. In 2017, the largest recorded spill resulted in direct discharge to the Pacific Ocean. Because of aging infrastructure, the SSOs from the sanitary sewer collection systems are a potentially significant source of bacteria that could adversely affect the water quality at both Pillar Point Harbor and Venice Beach.

4.1.3 Pillar Point Harbor and Marina Operations

The beaches around Pillar Point Harbor are frequently posted for exceeding bacteria water quality objectives by the County's Environmental Health Department. The postings signify that beach goers may become ill if they engage in water contact activities in the posted area. Capistrano Beach and Beach House Beach (see beach locations on Figure 2-1), the closest to the marina, are the most frequently posted during dry and wet weather conditions. During the drought year of 2014, Beach House Beach was posted for 53 days in total and Capistrano Beach for 46 days. The number of postings was somewhat lower in 2018 with only 21 and 22 posted days, respectively. Venice Beach, which is not influenced by Pillar Point Harbor operations, was posted for 13 days during both years.

Pillar Point Harbor contains a 371-slip marina for recreational boaters (Figure 4-4, Table 4-4). Activities at the marina have the potential to generate bacteria loading, which can be exacerbated by local hydrologic conditions and freshwater inflows. Direct waste disposal from boats is the most concerning potential source of bacteria, although activities such as boat deck and slip washing can wash bird feces off the docks and into receiving waters. If boats do

not use pump-out facilities to manage their septic and holding tanks, they may discharge into marina waters, which could then contribute loading of bacteria to the beaches. The pump-out facility at the marina has been evaluated and found to have sufficient capacity to serve all stationary and transient boats in Pillar Point Harbor (CDBW 2004). The Harbor District also offers mobile pumping service free of charge to the live-aboard boats and takes a proactive approach to prevent illicit discharges of waste from boats in the inner harbor. On entry to the harbor, all boats' holding tanks are inspected and sealed, and dye tablets are inserted to identify illicit or accidental discharges.

Table 4-4 Pillar Point Harbor Marina Information

Number of slips	Number of boats requiring pump-out	Number of transient boats	Number of live-aboards	Vessels with portable toilets	Pump-out station present? [a]	Onshore restroom
371	223	500	37	74	yes	No

a A pump-out station is an apparatus that removes the sewage from a boat's sewage holding tank and discharges the sewage to a wastewater collection system.

Figure 4-4 Marina in Pillar Point Harbor

Aerial images show a sizable number of boats (30 to 50) docking in the outer harbor. These boats do not undergo inspection or sealing of their holding tanks, and they are not typically observed to use the pump out facilities in the harbor. It is currently unknown whether these boats discharge their waste into the outer harbor, but a survey by the Department of Boating and Waterways (CDBW 2011) indicates a high likelihood of discharging untreated sewage from recreational boats. More than 40 percent of respondents to the survey perceived illicit

discharges from boats as "*frequent"*, while more than 20 percent said it occurred "*once in a while".*

In addition to recreational and live-aboard boats, Pillar Point Harbor generates waste from commercial fishing operations, runoff from piers and the related structures, docks, roads, trailer parking, parking lots, boat maintenance and fueling facilities. All these activities can increase bacteria loading into the harbor. In 2014, an engineering assessment of marina facilities was conducted to evaluate the overall condition of the harbor buildings and infrastructure, identify known deficiencies, and prioritized items in need of maintenance or replacement (Marina Facility Condition Survey 2014). Two public restrooms and shower facilities in the western portion of the marina were determined to be in fair condition. The restroom near the boat ramp was determined to be in poor condition as it was showing severe staining in some areas from leaking plumbing fixtures. The report concluded that the boat ramp restroom needed an upgrade and that the underground utilities and the parking lot storm drain system, which were over 50 years old, were due to be inspected, and that the sewage pump that serves the entire harbor should be replaced.

Stormwater runoff from the Harbor's commercial area is another source of bacteria loading. Outdoor washing of restaurant kitchen floor mats, poor maintenance of or non-enclosed garbage bins, and sidewalk flushing can transport bacteria to the Harbor.

Over the past few years, the Harbor District together with the San Mateo RCD inspected, mapped and cleaned stormwater lines on the Harbor District property. An illicit wash water connection to the St Augustine storm drain was rectified in 2018, which is expected to reduce bacteria concentrations flowing untreated to the harbor. However, inspection by closed circuit television and other techniques identified that the St. Augustine drain remains clogged with fats, oil and grease, and sediment; and is scheduled to be cleaned in the near future. These examples suggest that more frequent surveys of pipes and stormwater facilities are important to prevent future contamination. Regular cleanup of drainpipes will prevent trash and sediment buildup, which, in turn, helps deter nuisance wildlife.

LOAD RANKING: Recreational and fishing boats, pumpout facilities, runoff from the commercial area, and public restrooms in Pillar Point Harbor are potential sources of human fecal contamination and as such we rank the marina and its amenities as controllable high priority sources. Beaches enclosed within Pillar Point Harbor are particularly susceptible to bacterial contamination due to the fact that many amenities, stormwater outfalls and urban infrastructure are located close to the water. Potential sources of bacteria include illicit storm drain connections; improper disposal of materials; overflows from clogged, cracked or damaged pipes; stormwater runoff; and wildlife fecal sources. Given the high rate of exceedances of bacteria water quality objectives observed even during dry weather, and the level of recreational and commercial boat traffic, the harbor with its activities is a likely significant source of bacterial contamination.

4.1.4 Private Sewer Laterals and Public Restrooms

Private sewer laterals are the portion of the sewer collection system connecting individual and private properties to the public sewer system. They are owned and maintained by the property owner. If not maintained properly, private sewer laterals can leak and discharge untreated sewage and can be a potential source of pathogens to a nearby water body.

The overall length of private laterals in the project area is relatively small, given the low population density in these watersheds. While discharges from private sewer laterals are not directly regulated by the Water Board, information about spill incidents are recorded in CIWQS database when reported. The private overflow incident map shows only two incidents during the last 10 years (CIWQS 2020). Both times the volume of sewage spill was small, occurred during maintenance activities, and was completely recovered before the spill could enter the nearest drain. However, where publicly-owned portions of the sewer collection system have been shown to be in good repair and sewer-related sources of bacteria persist, it may be necessary to investigate to determine whether private sewer laterals might be a source of bacteria. Private lateral assessment and replacement programs may be required under Phase 2 implementation requirements and/or as part of the TMDL adaptive implementation if beach water quality continues to exceed targets after sewer system overflows and other major sources of bacteria have been minimized.

Like private sewer laterals, unmaintained laterals from public restrooms can potentially discharge untreated human waste into surface waters. There are several public restroom facilities in Pillar Point Harbor and Venice Beach. Since a relatively high number of people use these facilities, a faulty lateral could be a significant source of bacteria.

Venice Beach has two sets of public restrooms and outdoor showers for washing off sand. Sweetwood Park, situated between Dunes and Venice beaches, has a group camping site that can accommodate 50 and a public restroom. The Department of Parks and Recreation owns and maintains two public restroom structures. Both were built in 1990 and are connected to the sanitary sewer via a lift station. The lift station was recently inspected, and new pumps were installed in 2018. The facilities are maintained daily and are in good condition (J. Bentley, Dept. of Parks and Recreation, *pers. comm*). Therefore, they are not considered a likely source of bacteria to Venice Beach.

LOAD RANKING: Both Pillar Point Harbor and Venice Beach have similar density of homes in their watersheds and are thus expected to have similar impacts from private sewer laterals. Available records indicate the number of known private sewer lateral overflow incidents within the last decade is low, and no evidence has been found of leaks or discharges from private laterals. Because monitoring data currently indicate low concentrations of human-associated *Bacteroidales*, we rank private sewer lateral overflows and public restrooms as a low priority bacteria source at this time. Should future monitoring identify private laterals to be a likely source of bacteria, the ranking may be adjusted during adaptive TMDL implementation.

4.1.5 Municipal Wastewater Treatment Plant

Sewer Authority Mid-Coastside (SAM) operates a wastewater treatment plant located south of Venice Beach, at 1000 North Cabrillo Highway in Half Moon Bay (Figure 4-5). The plant discharges treated effluent to the Pacific Ocean through a discharge pipe and a submerged, multi-port diffuser, approximately 1,900 feet offshore.

The plant receives wastewater from three separate collection systems, City of Half Moon Bay, the Granada Community Services District, and the Montara Water and Sanitary District, and provides secondary treatment of domestic wastewater to a population of approximately 25,000. The City of Half Moon Bay and the Granada District are located just upstream from Pillar Point Harbor and Venice Beach (Figure 4-3). The plant receives an average dry weather flow of approximately 1.5 million gallons per day (mgd) and has capacity to treat on average four mgd during dry weather flows. A peak wet weather capacity is 15 mgd.

The NPDES Permit No. CA0038598 limits the level of bacteria in the effluent and requires weekly effluent monitoring. Under routine circumstances, the discharge is not a source of pathogens because it is disinfected, which results in low concentrations of indicator bacteria (*Enterococcus*) measured in treated effluent. A review of available discharge monitoring data showed no exceedances of the *Enterococcus* effluent limitation of geometric mean of 30 MPN/100 mL between 2014 and 2019 (CIWQS 2020). The SAM treatment plant did not violate any effluent limitations for the past six years and we do not consider the plant to impair the beaches in Pillar Point Harbor and Venice Beach. The existing regulatory requirements and actions undertaken at the facility to ensure adequate effluent treatment and disinfection are sufficient to protect water contact recreation beneficial uses in the receiving waters.

Figure 4-5 Municipal Sewage Treatment Plant in Half Moon Bay

LOAD RANKING: The SAM municipal wastewater treatment facility effluent bacteria concentrations are well below numeric targets. The facility is currently meeting its waste load allocations, as demonstrated by the past five years of self-monitoring reports that consistently show low densities of *Enterococcus* in the treated effluent. The wastewater treatment facility does not significantly contribute to pathogen loading, and we rank it among the controllable low priority sources.

4.1.6 Municipal Stormwater

Elevated bacteria levels in direct stormwater runoff and watershed runoff conveyed through stormwater drains are well documented (e.g., Tiefenthaler et al. 2011, UWRRC 2014). In California, the highest mean densities of bacteria are observed from December through March (Schiff and Kinney 2001). During wet weather events, wash-off of bacteria from various land uses is considered the primary transport mechanism of bacteria to the nearest waterbody or beach. The individual sources of bacteria are numerous and dispersed, and often bacteria inputs cannot be traced to a particular location in the drainage area. Dry season bacteria contributions can be two orders of magnitude lower than wet season contributions for typical indicator bacteria such as *E. coli* or *Enterococcus*. Despite seasonal

differences in concentration, exceedances of bacteria water quality objectives are nevertheless observed in stormwater runoff in the dry season. However, the overall level of exceedances during the summer months is much lower than during the winter months (Figure 2-6).

Pillar Point Harbor

Frequent exceedances of *Enterococcus* objectives have been detected at all monitoring locations in Pillar Point Harbor during wet and dry weather over the past 10 years. All samples collected from the stormwater outfalls discharging into inner harbor show high indicator bacteria concentrations, which indicates that bacteria sources from the surrounding urban areas and the watershed contribute to the increased risk of fecal contamination at the beaches (SMCRCD 2016). A correlation between elevated bacteria levels and the presence of a storm outfall was observed in other studies (e.g., Stein et al. 2007, Tiefenthaler et al. 2011). The concentrations of indicator bacteria measured within the municipal separate storm sewer system (MS4) are often an order of magnitude higher than the concentrations upstream of the MS4 (SMCWPPP 2019).

Adjacent to the harbor is the Capistrano area, which is a waterfront tourist destination that is popular year-round. The 15-acre catchment is almost entirely impervious and contains hotels, shops, restaurants, brew pubs, and large parking lots. Many of the businesses have storm drain inlets that connect to the underground MS4.The entire area is drained by the MS4 network, which discharges directly to Capistrano Beach via a 24-inch reinforced concrete pipe. This outfall flows year-round and can be inundated by water and sediment during high tides (SMCWPPP 2019). A single homeless tent was observed next to the outfall during field visits in 2019, and Harbor staff stated they have not observed more homeless persons near the harbor.

In the past decade, the Capistrano catchment has been a focus of attention of numerous data collection efforts and studies to determine the reasons for the persistent high level of exceedances of bacterial water quality objectives. The geomean concentrations at Capistrano Beach (PP#5 monitoring location), which is next to the outfall, experienced more than 87 percent exceedances during the 2012 through 2018 wet seasons. In the same area, low levels of human markers were also detected. In addition, the highest bacteria counts measured at the outfall seem to coincide with the observations of grease in the water, presumably from the local restaurants (K. Mangold, *pers. comm*). The build-up of fats, oils, and grease can cause blockages of drains and pipes which can lead to breaks and attract wildlife. Urban runoff delivers pathogens to the beaches from illicit storm drain connections, pets (dogs and cats) and other domestic animals, trash, wildlife, failing septic systems, and in some cases human waste from homeless individuals. Regular cleanup of drainpipes will prevent trash and sediment buildup, which, in turn, helps deter nuisance wildlife. Either directly or indirectly, urban runoff is considered to be a significant source of bacteria to the beach.

LOAD RANKING: Data indicate that stormwater is a significant, widespread pathogen source in the watersheds, and we rank municipal stormwater runoff as a controllable high priority source of bacteria to Pillar Point Harbor. About 20 percent of the area draining to Pillar Point Harbor is occupied by residential or commercial development, and all urbanized areas are located in close proximity to the beaches.

Venice Beach

Venice Beach receives runoff from two large watersheds Pilarcitos Creek and Frenchmans Creek. Before emptying into the beach, each creek receives municipal stormwater from the City of Half Moon Bay. The City operates and maintains a stormwater drainage system consisting of storm drains, municipal separate storm sewers, drainage ditches and swales. Pilarcitos Creek, which flows to the Pacific Ocean in the southern portion of Venice Beach, receives stormwater runoff from Pilarcitos and Kehoe ditch sub-drainage areas. The combined area of these sub-drainages is approximately 990 acres. The two sub-drainages have almost 6.5 miles of large diameter storm drainpipes (DPW 2016), and together, they form the largest drainage area in Half Moon Bay, covering almost 40 percent of the City. The Frenchmans drainage area is comparatively small, at approximately 69 acres and includes 0.7 miles of pipes.

While the upper parts of the watersheds are predominantly open space, with some horse boarding facilities and agricultural enterprises, such as floriculture and vegetable crops, the lower parts of the drainage area closest to the beach are dominated by residential and urban land uses. While Half Moon Bay is a small coastal town with a population of approximately 13,000, it attracts more than 2.5 million visitors every year, which exerts additional pressure on the stormwater system. Sources of fecal waste that have the potential to enter stormwater collection systems typically include SSOs, illicit discharges to storm sewer systems, failing OWTS, urban wildlife, domestic pets, and livestock; however, runoff from loading docks, dumpsters, food service and refuse areas may also contribute bacteria loads. In addition, discharges associated with homelessness, including human waste and trash, could add to load of bacteria in stormwater, which can cause potentially significant impacts to human health. A small number of homeless people were occasionally observed along lower Pilarcitos Creek next to the local Safeway shopping area at the intersection of Highway 92 and Highway 1.

To alleviate stormwater pollution the City of Half Moon Bay performs maintenance activities (e.g., cleaning, sediment removal, vegetation management, bank stabilization) in selected storm drainages; it does not conduct routine maintenance on any part of Frenchmans or Pilarcitos creeks (HMB 2014).

San Mateo County has conducted limited bacteria monitoring in two creeks draining to Venice Beach. Results for the lower reaches of the creeks, just above the beach, revealed densities of *E. coli* in excess of statistical threshold value of 320 cfu/100 mL, the bacteria objective for freshwater. The concentrations of *E. coli* measured in Frenchmans and Pilarcitos creeks below the developed and sewered areas show persistent exceedances of the water quality objectives.

Storm drains not only provide a conveyance system for bacteria and other pollutants but could also become an auxiliary source of bacteria. Sediment deposition, overgrowth of vegetation, and accumulation of litter in the storm drains together with dark and wet environment with steady nutrient concentrations provide conditions favorable for biofilm forming and re-growth of bacteria (Roberts 2012). Storm drains therefore have the potential to act as reservoirs of indicator bacteria and biofilm formation.

LOAD RANKING: Data indicate that stormwater is a significant, widespread pathogen source in the watersheds, and we rank municipal stormwater runoff as a controllable high priority source of bacteria to Venice Beach. Samples collected in the lower reaches of Frenchmans

and Pilarcitos creeks, below the developed and sewered areas of Half Moon Bay, show consistently elevated densities of *E. coli* exceeding the water quality objectives.

4.1.7 Runoff from Landfill

Ox Mountain Sanitary Landfill (landfill) is located approximately a mile inland from Venice Beach. The landfill began operating in 1976 and receives sludge, residential, commercial, construction, and agricultural wastes, including nonhazardous solid wastes transported from transfer stations within San Mateo County and wastes hauled directly to the site by the general public. The Water Board regulates the landfill through WDRs (Order No. R2-2018-0049) and an NPDES permit (Order No. R2-2018-0048). In 2017, the landfill expanded its design capacity from 49 to 60.5 million cubic yards. The entire landfill property occupies an excess of 2,700 acres, but only 191 acres are currently utilized for refuse disposal operations, as authorized by the landfill's most recent Solid Waste Facility Permit (permit). The waste disposal areas of the landfill are situated in the Corinda Los Trancos Canyon, a drainage tributary to Corinda Los Trancos Creek, which drains to Pilarcitos Creek, which flows westward into the Pacific Ocean near Venice Beach. Runoff from the landfill flows into a sedimentation basin where it is either reused at the landfill for dust control, evaporated, or released into Corinda Los Trancos Creek downstream of the landfill in accordance with the permit. Landfills of this type may generate several types of wastewater, including leachate, landfill gas condensate, truck and equipment wash water, stormwater, and polluted groundwater. Some of the waste (e.g., sludge, animal bodies and ashes) may contain some levels of bacteria. In addition, there are two septic tanks located within the landfill boundary.

At the time of this report preparation, there was no evidence to suggest that leachate or runoff from the facility is causing or contributing to the impairment at the beach, and the landfill conforms to the waste discharge requirements. However, its location next to the creek and leakage or runoff from the facility could present a potential source of bacteria to Pilarcitos Creek. Anecdotal information indicates that seagulls can be attracted to the area by easy pickings from the landfill, so seagulls could also deposit waste in close proximity to the creek. Landfill operators have implemented comprehensive measures to deter birds from the facility by installing sonic bird scaring devices and using live predator birds to patrol the area (staff at Groundwater Division, *pers. comm*). The *E. coli* densities measured in Pilarcitos Creek downstream from the landfill after rainfall in March 2020 were low, and the landfill facility complies with existing permits and regulations.

LOAD RANKING: At present, there is no evidence to suggest that the load contribution from the landfill is significant, and it is ranked as a low priority controllable source.

4.1.8 Caltrans Stormwater Runoff

Discharges from roadways may contain elevated bacteria levels due to the presence or proximity to the bacteria-generating sources, such as homeless encampments, restroom facilities, litter, and garbage bins. Homeless encampments, albeit small and of a temporary nature, are known to occur along Highway 1 and in the proximity to Caltrans' infrastructure.

The discharges from Caltrans facilities, including Highway 1, park and ride facilities, and maintenance yards will combine with other runoff discharging to Pillar Point Harbor and Venice Beach, and could potentially add to the bacteria load to the beaches. Overall, only a short length of Highway 101 is in the project area, and the road is well maintained.

LOAD RANKING: Caltrans' properties have a small footprint within the project area, with few homeless encampments and few significant trash issues. Both Pillar Point Harbor and Venice Beach are expected to have similar Caltrans stormwater runoff impacts, and we rank this as a controllable low priority source for both beaches.

4.1.9 Pet Waste

Pets, especially dogs, can be a major source of fecal indicator bacteria. Dogs can be a significant source of fecal waste based on their population density, high defecation rate, and pathogen infection rates (Schueler 2000). Specifically, dog waste can contain bacteria and parasites, such as *E. coli*, *Salmonella, Giardia*, and tape worms, which can cause infectious diseases in humans, wildlife, and other dogs. A study in urbanized Baltimore catchments concluded that dog feces were the single greatest source contributing fecal coliform and fecal streptococcus bacteria (Schueler 2000). At a beach in Miami, dog feces were found to have the highest concentrations of Enterococci bacteria, followed by birds and shrimp (Wright et al. 2009). A comparison of the microbial loads showed that one dog fecal event was equivalent to 6,940 bird fecal events.

When pet owners do not pick up pet waste, it can be transported to the beach by stormwater runoff. Data show that stormwater contains high levels of bacteria, and pets are a common contributor. Because storm drains do not connect to treatment facilities, untreated animal feces often end up in surface waters or at the outfalls to the beaches.

Pillar Point Harbor

Dog genetic markers have been detected in the samples collected in the municipal stormwater drainages above Pillar Point Harbor. The dog waste bin stations are available in the harbor, however, given the number of visitors, including those with pets, in Pillar Point Harbor and at local beaches, we assume that pet waste is a source of bacteria and needs to be addressed at the beaches. The watersheds draining to Pillar Point Harbor and Venice Beach are also likely to be sources of pet waste.

LOAD RANKING: Stormwater runoff is the main mechanism for transporting pet waste to the beaches. Given the fact that dogs are allowed on the beaches in Pillar Point Harbor and are observed in abundance near the beaches and in the watersheds, dogs could be a large contributing source of Enterococci. Thus, pet waste is ranked as a controllable high priority source of bacteria to Pillar Point Harbor.

Venice Beach

Dogs are not allowed on Venice Beach, but they are permitted in the campground, in the day-use picnic areas, and on the Coastal Trail where the dog waste bin stations are available for visitors. Pets are commonly seen in these areas near Venice Beach, and to date there has not been a Venice Beach-specific campaign to remind the residents and beachgoers to pick up pet waste.

LOAD RANKING: Because pets are frequently present on trails and park areas near the beach, we rank pet waste as a controllable high priority source to Venice Beach.

4.1.10 Horse Boarding and Livestock Grazing

Livestock manure, if not properly managed, can be a significant source of bacterial contamination. Bacteria loads can be introduced directly to the receiving waters where livestock wade in streams or indirectly through stormwater runoff.

Pillar Point Harbor

A source identification study conducted in 2012 considered cattle grazing a potential bacteria source in the upstream reach of Deer Creek. No additional evidence that cattle are a significant source of pollution has been found, and if the cattle operations still occur, they seemed to be confined to a small area located far away from the beaches. As discussed in 2.5.3, an MST study conducted over ten years ago detected bovine markers at Deer Creek's outlet to the harbor and in two upstream locations during the sampling in 2008-2012. These markers could be indicative of cattle or deer or both. Overall, bacteria densities found at the interface of the rural and residential area along Deer Creek were moderately elevated but substantially lower than densities in the municipal separate storm sewer system drainages or the Deer Creek outfall at the bottom of the watershed.

The upper reaches of the watersheds draining to Pillar Point Harbor are mostly undeveloped open space, and much of these reaches are within the protected Golden Gate National Recreation Area (GGNRA) known as the Rancho Corral de Tierra. While there are no grazing operations in the Rancho Corral de Tierra within the watershed draining to Pillar Point Harbor, horse riding is known to occur on GGNRA trails. However, we have no evidence to suggest that horse waste from these remotely located trails is a significant source of pollution to the beaches. We do not consider these horse trails to be a substantial source at this time.

LOAD RANKING: There are no horse boarding facilities and there is little evidence of cattle grazing in the watershed, so we consider horse and cattle to be low-priority controllable sources of bacterial loading to Pillar Point Harbor. Should future monitoring, land use changes, or analyses identify horse boarding or grazing to be a source of bacteria, the ranking may be adjusted during adaptive TMDL implementation.

Venice Beach

There are five identified commercial horse-boarding/training facilities located in the Venice Beach watershed (Table 4-5) and potentially other smaller horse establishments. Horse waste can contain pathogens and other pollutants and can contaminate waterways and beaches through direct deposit or via runoff after rain events. An average horse produces about 45 pounds of manure and urine each day (USEPA 2001). The horse boarding/training establishments are considered confined animal facilities (CAF) under the Water Board's Confined Animal Facilities order. CAFs are livestock operations where animals are confined and fed in an area that has a roof or is devoid of vegetation, generating solid and liquid manure wastes that are collected and disposed of on land or offsite. In the watershed draining to Venice Beach, the primary type of CAF is horse boarding facilities.

The facilities listed in the table below are covered under the confined animal permit issued by the San Mateo County Planning and Building Department. Under the County ordinance the permittees are required to provide information on the method and frequency of collecting, processing, storing and disposing of manure produced on the site, but only limited records exist on how the waste is handled. These commercial horse-boarding facilities are not enrolled in the Water Board's Confined Animal Facilities General Waste Discharge

Requirements Order (Order No. R2-2003-0093), so we have very little information about their manure management and general operations.

In addition, hobby and petting farms are located along Highway 92, which connects the Bay Area with Half Moon Bay. These hobby farms sometimes house a small number of other livestock. A small number of goats (less than ten) or alpacas could be observed in the upper watershed and far away from the local creeks. The same control measures used to manage horse waste at these facilities can also be used to address waste from these other livestock.

Sea Horse Ranch is located next to Venice Beach and offers guided horse rides on Kelly Beach and the surrounding area. Horses are not permitted on Venice Beach, but they are common on the Coastal Trail, which runs parallel to the beaches and crosses the creeks. Horse waste was observed along the paths where the guided tours take place, and on nearby Kelly Beach. Horse waste has the potential to contaminate Venice Beach either through direct deposit at creek crossings or indirect input via stormwater runoff.

Table 4-5 Horse Facilities near Venice Beach

Name	Main Activity	Number of horses	Location
Canyon Ck Equestrian Center	Training and boarding	15	Pilarcitos Creek
Ciara West Equestrian	Training and boarding	60	Arroyo Leon
Maloney's Horses and Ponies	Horseback riding and boarding	15	Frenchmans Ck
Sea Horse Ranch	Sports and recreation, (horseback riding)	20	Frenchmans Ck
Branscomb Farms LLC	Breeding, training, and research	60	Frenchmans Ck

LOAD RANKING: Horse facilities offering commercial animal boarding and training are classified as confined animal facilities. These facilities have been found to be a significant source of pathogens in the nearby watershed of San Vincente Creek and in other watersheds throughout our region. Given the facilities' locations, often in proximity to Frenchmans and Pilarcitos creeks, and the number of animals they could house, we consider horse waste a high priority controllable source of bacterial pollution. There is no known livestock grazing in Frenchmans or Pilarcitos creek watersheds, so livestock grazing is not considered a source of bacteria to Venice Beach.

4.2 Uncontrollable Sources - Wildlife

Wildlife are considered an uncontrollable source of bacteria. Most warm-blooded animals can carry pathogen indicator bacteria as well as a wide range of actual human pathogens (USEPA 2001). Thus, direct deposition of waste from birds and wildlife to land and water surface could be a significant source of bacteria during both wet and dry conditions. Studies have shown that birds can potentially contribute significant loads of bacteria to coastal waters (e.g., Kirschner et al. 2004, Grant et al. 2001). During an extensive 9-month study in six shallow saline habitats Kirschner et al. (2004) found that wild bird abundance and feces production were significantly correlated to *Enterococcus* densities in water.

In the Half Moon Bay area, coastal lagoons and beaches are frequented by large populations of sea birds. In particular, sandy beaches provide foraging, resting, and nesting habitat for

birds, including the threatened western snowy plover. Birds can contribute feces directly to the water surface or to the low-lying areas that become submerged during high tides. Such bacteria loads can be transported to the beaches during tidal fluctuations or during wet weather flows. No accurate information as to the magnitude and geographic distribution of this waste source is available. Because of the great variety, complex distribution and dispersal patterns, and fluctuating populations of birds and wildlife, it is difficult to assess their exact contribution to bacteria levels in Pillar Point Harbor and Venice Beach.

Pillar Point Harbor

For Pillar Point Harbor, limited information is available on fecal contamination by seagulls. Kim and Wuertz (2014) tested 25 samples from the Pillar Point Harbor area for the presence of seagull contamination. Although many gulls and sea birds were observed at several beaches in the harbor during sampling, the results were inconclusive.

Additionally, stormwater drains and creeks provide conveyances for bacteria generated by nuisance wildlife to the beaches. The wildlife may include rodents (rats, raccoons, squirrels), deer, coyotes and feral cats that are attracted to available food sources and other favorable conditions. No accurate information as to the magnitude and geographic dispersion of this waste source is available; however, raccoons and skunks were observed in the municipal separate storm sewer system drainages to Pillar Point Harbor (SMCWPPP 2019).

In urban areas, wildlife that are attracted to or influenced by human activity, such as wildlife that feed on litter or at dumpsters, could be a substantial source of bacteria that is somewhat controllable. To the extent possible, food and water sources for such wildlife should be minimized to reduce the bacteria loading from this source.

Venice Beach

Venice Beach is a popular destination for bird and wildlife watching. Birds are abundant in the area including migratory and resident water-associated birds such as western snowy plovers, California and glaucous-winged gulls, brown pelicans, and sanderlings. A restricted snowy plover area is located just south of the beach. Unlike Pillar Point Harbor, Venice Beach attracts migratory and permanent populations of shore birds nearly year-round, and there is anecdotal evidence that Venice Beach attracts many more birds than surrounding beaches. This suggests that natural sources (birds) could contribute a substantial load of bacteria at Venice Beach in a localized manner. A small lagoon is formed regularly at the beach outlet of Frenchmans Creek, which is heavily used by birds (Figure 4-6). Intermittent formation of the lagoon is confined to the channels and depressions on the beach. South of Venice Beach, the outlet of Pilarcitos Creek often drifts northward towards Frenchmans Creek. In recent decades, the northward displacement at the outlet has become a regular occurrence. Shallow, warm waters in the lagoon and freshwater inflow from the creeks are likely to provide conditions favored by birds. Since water exchange is restricted due to the formation of a foredune ridge, bacteria from birds would not be flushed out and the lagoon could be a significant source of bacteria.

Figure 4-6 Flocks of birds congregating at Venice Beach

At Frenchmans Creek, the riparian area attracts red-tailed hawks, barn owls, red-winged blackbirds and American kestrels. Coyote bush is home to white-crowned sparrows, and jackrabbits and brush rabbits. Flocks of seagulls are also common at or near the beach.

LOAD RANKING: The Pillar Point Harbor and Venice Beach watersheds provide habitat for resting and foraging for many bird species, and upper portions of the watersheds remain undeveloped, providing habitat for wildlife. Thus, wildlife is a potential source of bacteria to the beaches. The TMDL does not call for actions to control wildlife because these sources are not controllable. Instead, during the first five years after TMDL effective date, actions to control human-caused sources of bacteria are called for. If these control measures do not result in attainment of bacteria water quality objectives at the beaches, the Water Board will work with implementing parties to conduct studies to quantify the contribution of bacteria from wildlife; results of these studies may lead to adjustment of the TMDL.

5 Total Maximum Daily Load and Allocations

U.S. EPA's protocol for developing pathogen TMDLs (USEPA 2001) defines a total maximum daily load as the allowable loading of a specific pollutant that a water body can receive without exceeding water quality standards. A TMDL is the sum of the individual wasteload allocations (for point sources) and load allocations (for nonpoint sources) for a given water body. The total amount of pollutant contributed must not exceed water quality standards for the water body. In addition, the TMDL must include a margin of safety, either implicit or explicit, which accounts for uncertainty in the relationship between pollutant loads and the quality of the receiving water body.

For many pollutants, a flow-based TMDL, expressed on a mass per time basis, is an accurate and effective way to express the amount of the pollutant that can safely be present in a water body. However, for pathogen indicators, it is the number of organisms in a given volume of water (i.e., their density), and not their mass, that is indicative of their impact on water quality. Density-based TMDLs make more sense for bacteria impairments because the public health risks associated with recreating in contaminated waters increase with organism concentration, and bacteria are not readily controlled on a mass basis. Density-based TMDLs are permissible, as the federal regulations allow TMDLs to "be expressed in terms of mass per time, toxicity, or other appropriate measure." (40 CFR § 130.2(i).) U.S. EPA guidance recommends establishing density-based TMDLs for pollutants that are not readily controllable on a mass basis. As explained below, bacteria are not readily controllable on a mass basis and density is a more appropriate measure where, as at Pillar Point Harbor and Venice Beach, bacteria sources are diffuse throughout the watersheds and discharged intermittently runoff under a variety of flow conditions.

Establishment of a density-based TMDL eliminates the need to conduct a potentially error-prone analysis to translate loads into expected concentrations, as would be required under a mass-based TMDL. Bacteria decay over time and space, are not persistent, and do not bioaccumulate in receiving waters. A flow-based TMDL expressed as mass per time where the sources are diffuse and predominantly associated with stormwater runoff can be problematic to implement because high-concentration, low-flow discharges could comply with the TMDL, whereas inconsequential low concentration, high flow discharges would not comply. In reality, however, high-concentration, low-flow wastes pose more of a health risk, and may be indicative of an acute problem, such as an OWTS failure or a leaking sewer pipe, that could be relatively easy to remedy. In addition, a flow-based TMDL would require calculation of acceptable loads based on acceptable bacterial concentrations and expected flows, and then back-calculation of expected concentrations under various load reduction scenarios. Since the beaches in Pillar Point Harbor and Venice Beach are tidal and freshwater inflows are highly variable, intermittent and difficult to measure, such an analysis would inevitably involve a great deal of uncertainty, with no increased water quality benefit.

Therefore, we propose a density-based TMDL expressed in terms of indicator bacteria concentrations. Unlike mass-based load and wasteload allocations, concentration-based allocations do not add up to equal the TMDL. Rather, to achieve the density-based TMDL, each source must meet the concentration-based allocation.

Establishing a density-based TMDL equivalent to water quality objectives and expressed in terms of count/100mL of fecal indicator organisms is most useful because:

- The concentration of bacteria in a discharge and/or in the receiving waters is the technically relevant criteria for assessing the impact of discharges, water quality, and public-health risk;
- The units are consistent with how compliance with ambient water quality objectives; are expressed and determined; by contrast, mass-based units would require an error-prone set of calculations to determine compliance;
- Monitoring of diffuse and spatially-commingled discharges from individual small sources in the watersheds would not only be infeasible, it will not yield useful information about source attribution and compliance determination; and
- Compliance with density-based bacteria TMDLs is easier to measure and track than a flow-based TMDL, and progress toward implementation is easier to convey to the public.

5.1 TMDL for Pillar Point Harbor and Venice Beach

The bacteria TMDL is equivalent to the numeric targets for water contact recreation beneficial use presented in Section 3, and is expressed as the total density of *Enterococcus* indicator bacteria (Table 5-1). This TMDL represents the total density of *Enterococcus* that can be discharged from all sources while not causing an exceedance of the applicable water quality objectives (Table 2-1, Table 2-2). The daily load expression of this TMDL is equivalent to the STV of 110 cfu/100mL. This TMDL will be applicable year-round.

Table 5-1 Total Maximum Daily Load for *Enterococcus* in Pillar Point Harbor and Venice Beach

Geometric mean[a]	<30 cfu[b]/100mL
Statistical Threshold Value	<110 cfu/100mL

cfu/100mL: colony forming units per 100 milliliters

a The waterbody geometric mean shall not be greater than the geometric mean threshold in any six-week interval, calculated weekly. The maximum daily load is 110 cfu/100 mL (i.e., equivalent to the STV).

b cfu per 100 milliliters of sample is equivalent to most probable number per 100 milliliters of sample.

5.2 Load and Wasteload Allocations

A load allocation is defined as the portion of the receiving water's pollutant loading capacity allocated to nonpoint sources of pollutants to that receiving water, and a wasteload allocation is the portion allocated to point sources of pollutants to that receiving water. Together, load and wasteload allocations are referred to as "allocations." Density-based allocations are proposed for this TMDL. The daily load and wasteload allocations are equal to the statistical threshold value (STV) or zero where bacteria discharges are prohibited.

Table 5-2 presents the density-based indicator bacteria load and wasteload allocations proposed for Pillar Point Harbor and Venice Beach and their watersheds. The attainment of these allocations will ensure protection of the water quality and applicable beneficial uses at the beaches. These allocations will apply year-round because the beaches in Pillar Point

Harbor and Venice Beach receive significant public use, and year-round monitoring is conducted by the San Mateo County Health Department.

The load allocations for sanitary sewer collection systems, OWTS, vessels, marinas and harbor amenities (restrooms) are set to zero for the following reasons:

- Sources of human waste pose the greatest threat to the public health;
- The zero load allocation is consistent with the existing Basin Plan prohibition of release of untreated sewage (Prohibition #15, Table 4-1, Basin Plan);
- When operated properly and lawfully, sanitary sewer collection systems, OWTS, vessel marinas and restrooms should not discharge any human waste to waters; and
- Human waste discharges from these sources are not authorized and are fully controllable and preventable.

All entities that discharge indicator bacteria or have jurisdiction over such discharges are responsible for meeting the allocations. Discharging entities will not be held responsible for uncontrollable discharges originating from wildlife. Implementing parties shall demonstrate achievement of allocations in the receiving water bodies (i.e., at the beach shoreline water quality monitoring stations).

Table 5-2 Load and Wasteload[a] Allocations for Pillar Point Harbor and Venice Beach

Pollutant Source	**Allocation Type**	***Enterococcus* (cfu/100 mL)**
Sewer Authority Mid-Coastside Wastewater Treatment Plant (NPDES Permit No.CA0038598)	WLA	Geometric mean[b] < 30 STV[c] = 110
Sanitary Sewer Collection System[d] (Sewer Authority Mid-Coastside, Granada Community Services District, Half Moon Bay Sanitary District)	WLA	0
Municipal Stormwater Runoff (MS4)[d, e] (NPDES Permit No. CAS000004)	WLA	Geometric mean[b] < 30 STV [c] = 110
Caltrans Stormwater Runoff [d] (NPDES Permit No. CAS000003)	WLA	Geometric mean[b] < 30 STV[c] = 110
Ox Mountain Landfill [d]	WLA	Geometric mean[b] < 30 STV[c] = 110
Onsite Wastewater Treatment Systems (e.g., septic systems) [d]	LA	0
Marina vessels and Harbor amenities	LA	0

Pollutant Source	Allocation Type	*Enterococcus* (cfu/100 mL)
Operations in Pillar Point Harbor (on Pillar Point Harbor property)	LA	Geometric mean[b] < 30 STV[c] = 110
Confined Animal Facilities[d] (e.g., horse facilities)	LA	Geometric mean[b] < 30 STV[c] = 110
Grazing Lands/Operations[d] (e.g., horse/cattle)	LA	Geometric mean[b] < 30 STV[c] = 110
Wildlife[f]	LA	Geometric mean[b] < 30 STV[c] = 110

cfu/100 mL: Colony forming unit per 100 milliliters of sample

WLA: Wasteload allocation

LA: Load allocation

STV: Statistical threshold value

a. All allocations apply year-round and will be measured at the beach shoreline water quality monitoring stations, except for WLA for the Wastewater Treatment Plant and Ox Mountain Landfill, which shall be measured at the discharge point(s) specified in wastewater discharge permit order CA0038598 and CA0029947, respectively.
b. The water body geometric mean shall not be greater than the applicable geometric mean magnitude in any six-week interval, calculated weekly.
c. The *Enterococcus* density shall not be greater than 110 cfu/100 mL
d. Facilities discharging to freshwater creeks draining to Pillar Point Harbor and Venice Beach will use *E. coli* concentrations to demonstrate they meet the allocations. The density of *E. coli* shall not be greater than 320 cfu/100 mL.
e. WLA for discharges from municipal stormwater runoff via the municipal separate storm sewer system includes contributions from pet waste, trash, and homeless encampments.
f. Wildlife is an uncontrollable source of bacteria and its contribution is considered natural background. No management measures will be required for wildlife sources.

5.3 Margin of Safety

TMDLs are required to include a margin of safety to account for data uncertainty, critical conditions, and lack of knowledge. The TMDL for Pillar Point Harbor and Venice Beach includes multiple implicit margins of safety because: 1) the U.S. EPA have already considered uncertainties and safety measures in the process of establishing the water quality criteria; 2) the TMDL targets are equivalent to the statewide bacteria objectives, which are designed to prevent the lower of the two acceptable illness rates identified by U.S. EPA (2012) (i.e., 32 gastrointestinal illnesses per 1,000 recreational users versus 36); and 3) the daily maximum load is set to the statistical threshold value. Therefore, no additional or explicit margin of safety is needed for this TMDL.

While it is controllable water quality conditions (referred to as actions, conditions, or circumstances resulting from human activities in Basin Plan, Chapter 3.1) that must conform to water quality objectives, receiving water quality will contain discharge from both controllable and natural sources. At some beaches, it is possible that non-controllable natural sources contribute indicator bacteria at levels exceeding water quality objectives. Monitoring

data will help to indicate whether the allocations from controllable sources have been met, and, as a result, exceedances have been eliminated. Once implementing parties have taken action to control the controllable sources of bacteria, they and Water Board staff will review bacteria data to determine if the TMDL should be adjusted to include a load allocation for wildlife sources.

5.4 Seasonality and Critical conditions

While indicator bacteria densities can be greater during the winter wet season due to factors such as stormwater runoff, they can be high at any time of year. As mentioned above, exceedances of the *Enterococcus* objective during the dry season are common at the beaches in Pillar Point Harbor and Venice Beach (Figure 2-6). Recreational uses at the beaches near Half Moon Bay occur all year round. Seasonality and variability in the data are accounted for and addressed using allocations equivalent to the water contact recreation water quality objective which ensures the loading capacity of the water body be met under all flow and seasonal conditions.

Critical conditions occur when the prescribed load allocations result in achieving the water quality standards by a narrow margin. The conditions are considered critical because any unknown environmental factors, such as high or low flows or temperatures could result in not achieving the water quality standards. Therefore, critical conditions are particularly important with load-based allocations and TMDLs. However, this TMDL is a density-based TMDL. As such, the numeric targets and allocations are the concentrations equivalent to the water quality objectives. Therefore, there exists no uncertainty as to whether the allocations and TMDLs will result in achieving water quality objectives.

6 Linkage Between the Targets and Pollutant Sources

The technical analysis of pollutant loading from watersheds, and the waterbody response to this loading is referred to as the linkage analysis. For the Pillar Point and Venice Beaches TMDL the concepts of the linkage analysis are the same or similar to the other San Francisco Bay Region bacteria TMDLs:

- Fecal waste from warm-blooded animals, including people, can contain pathogens;
- Indicator bacteria are present in fecal waste from warm-blooded animals and are routinely used as a monitoring surrogate for fecal pathogens. Thus, it is appropriate to use indicator bacteria as a surrogate to measure pathogen impairment of beneficial uses;
- The proposed pollutant load and wasteload allocations are based on the numeric targets for indicator bacteria for water contact recreation;
- The numeric targets are based on the Basin Plan and U.S. EPA's bacterial water quality objectives for water contact recreation waters, which are specifically designed to protect human health by reducing the risk of illness associated with exposure to water containing fecal bacteria; and
- The numeric targets take into account the more conservative estimated illness rate of 32 per 1,000 primary contact recreators recommended by U.S. EPA and adopted for use throughout California.

Therefore, achievement of the proposed pollutant load and wasteload allocations will ensure the protection of the water quality and water contact beneficial use of Pillar Point and Venice Beach.

7 Implementation and Monitoring

This section describes the actions necessary to attain the water contact recreation water quality objectives for indicator bacteria at the beaches in Pillar Point Harbor and Venice Beach. The purpose of the Implementation Plan is to describe the steps necessary to reduce bacteria loads from anthropogenic and controllable sources to achieve the TMDL. The Implementation Plan identifies actions expected to reduce bacteria loading, parties responsible for taking these actions, mechanisms by which the Water Board will assure these actions are taken, and monitoring and reporting requirements that will indicate progress toward attaining the TMDL. The Plan also describes the timeline and key milestones for achieving the implementation actions.

The strategy outlined in this Implementation Plan relies on existing efforts to achieve the implementation actions, such as inspections and repairs of sewerage system piping, compliance with existing WDRs and NPDES permits, public education, Harbor maintenance activities, and similar actions. It is expected that this approach will maximize benefits, minimize any duplication of labor, and facilitate quick implementation. To this end, work completed in the past five years and ongoing efforts to implement actions to reduce bacteria loads into the beaches will be considered as progress toward attaining the TMDL.

7.1 Legal Authorities

The Water Board has the responsibility and authority for water quality control and planning under the Water Code. The Water Board regulates point and nonpoint sources of pollution. The National Pollutant Discharge Elimination System (NPDES) program permits point sources of pollution that discharge into waters of the United States. Nonpoint sources of pollution are addressed in California's Policy for Implementation and Enforcement of the Nonpoint Source Program (NPS Policy) (SWRCB 2004), which requires regulation of current and proposed nonpoint source discharges under Waste Discharge Requirements (WDRs), conditional waivers of WDRs, Basin Plan discharge prohibitions, or some combination of these tools. The Water Code gives the Water Board authority to issue WDRs for both point and nonpoint sources of contamination.

7.2 Implementation Actions

This section outlines the actions to reduce bacteria loads for all sources shown in the Source Analysis (Section 4). The implementation actions focus on the known, controllable anthropogenic bacteria sources common to coastal beaches and describe the most effective implementation measures and best management practices (BMPs) for controlling discharges from each of these sources. The steps described in this Staff Report and in The California Microbial Source Identification Manual (Griffith 2013) should be used to guide adaptive implementation of the TMDL.

7.2.1 Sewer Authority Mid-Coastside Wastewater Treatment Plant

The Sewer Authority Mid-Coastside (SAM) operates the Mid-Coastside Wastewater Treatment Plant. Wastewater discharges from this plant are not likely to contribute to bacterial contamination because the treated effluent is disinfected to levels well below the applicable water quality objectives. The NPDES Permit No. CA0038598 limits the level of bacteria in the effluent and requires weekly effluent monitoring to ensure protection of water contact recreation beneficial uses. The effluent limits stablished in the permit are based on the Ocean Plan water quality objectives, specifically the 30-day geometric mean *Enterococcus* density,

which is not to exceed 35 MPN per 100 mL, and the single sample maximum *Enterococcus* density, which is not to exceed 104 MPN per 100 mL. The Ocean Plan objectives are applicable water quality objectives and they are almost identical with the water quality objectives and numeric targets in the TMDL, 30 and 110 MPN per 100 mL, respectively. After taking into account mixing and dilution, the bacteria effluent limits are as follows: the 30-day geometric mean *Enterococcus* bacteria density shall not exceed 2,800 MPN per 100 mL and no single sample shall exceed 8,300 MPN/100 mL.

A review of the available discharge monitoring data from 2014 through 2018 showed no exceedances of the *Enterococcus* effluent limitations and the *Enterococcus* densities in effluent samples were below the geometric mean of 30 MPN/100 mL (CIWQS 2019). The SAM treatment plant did not violate any effluent limitations for the past six years, and we do not consider the offshore deep-water discharge to impair the beaches in Pillar Point Harbor and Venice Beach.

The existing regulatory requirements and actions undertaken at the facility to ensure adequate effluent treatment and disinfection are sufficient to protect water contact recreation beneficial uses in the receiving waters, and we do not expect that any additional abatement measures are necessary. To demonstrate compliance with the TMDL wasteload allocations, SAM shall comply with existing requirements set in the NPDES permit.

7.2.2 Sanitary Sewer Collection Systems

The wasteload allocation for sanitary sewer collection systems operated by SAM, City of Half Moon Bay, Granada Community Services District and CA Parks and Recreation will be implemented through the requirements and provisions of the Statewide General WDRs for Sanitary Sewer Systems, State Water Board Order No. 2006-0003 DWQ. All public entities that own or operate sanitary sewer systems greater than one mile in length and that collect and/or convey untreated or partially treated wastewater to a publicly owned treatment facility in the State of California are required to apply for coverage under the WDRs and comply with its requirements. In addition, implementation of actions to eliminate sanitary sewer system leaks is supported by the Basin Plan's prohibition of discharges of raw sewage or any waste failing to meet waste discharge requirements to any waters of the Basin (Water Board 2018).

Sewer collection system authorities are responsible for finding and repairing leaks and overflows of sanitary waste, regardless of the existence of an applicable TMDL. In particular, the WDRs contain provisions for SSO prevention and reduction measures, including the following requirements:

- Develop and implement sanitary sewer system management plans (SSMPs);
- Prohibit any SSO that results in a discharge of untreated or partially treated wastewater to waters of the United States, or creates a nuisance as defined in California Water Code Section 13050(m);
- Take all feasible steps to eliminate SSOs and to properly manage, operate, and maintain all parts of the collection system; and
- Develop and implement a monitoring and reporting plan.

To achieve the numeric targets at the beaches in Pillar Point Harbor and Venice Beach, authorities must review and amend their SSMPs, or other Plans required by applicable

permits or orders, as needed to prioritize the investigation and repair of faulty sewer pipes, pumps, and other infrastructure according to their proximity to the beach, the magnitude of leak or overflow risk, and similar considerations. Inspectors for the sewer collection system and the municipal stormwater entities need to pay particular attention to cross-connections between sewer and storm water piping and take action to eliminate them, using effective methods to identify and quantify sources of bacteria, such as those described in by the Urban Water Resources Council (UWRRC 2014).

The Water Board will require these actions through amended or reissued NPDES permits and Water Code sections 13267 and 13383, as necessary. Details and timelines of the implementation actions for Phase 1 and Phase 2 implementation are found in Table 7-1and Table 7-2, respectively. If wasteload allocation are not met within five years of the TMDL effective date, the implementing parties will be required to implement appropriate Phase 2 actions within their jurisdiction.

Table 7-1 Phase 1 Implementation Actions and Schedule for Sanitary Sewer Collection Systems

Phase 1 Implementation Actions	Implementing Parties	Schedule
Comply with Statewide General Waste Discharge Requirements for sanitary sewer systems	SAM (City of Half Moon Bay, Granada Community Services District)	Ongoing
Submit an enhanced Sewer System Management Plan, acceptable to the Executive Officer, that prioritizes sewer system inspections and repairs in areas within ½ mile of beach or otherwise connected to the beach. Include a diagram of prioritized infrastructure, a time schedule for implementing short- and long-term plans, and, as necessary, a schedule for developing the funds needed for the capital improvement plan.	SAM (City of Half Moon Bay, Granada Community Services District)	Within six months of the effective date of the TMDL
Complete inspections identified in the enhanced Sewer System Management Plan and schedule repair of identified leaking or damaged infrastructure as expeditiously as feasible.	SAM (City of Half Moon Bay, Granada Community Services District)	Within five years of the effective date of the TMDL
Determine effectiveness of sewer system repairs by assessing beach monitoring data to determine if targets are met at the beaches.	SAM (City of Half Moon Bay, Granada Community Services District)	Within five years of the effective date of the TMDL

Phase 1 Implementation Actions	Implementing Parties	Schedule
Inspect laterals and all other components connecting facilities at Venice Beach to the sanitary sewer system. Repair all leaks.	CA Parks and Recreation	Within one year of the effective date Within three years of the effective date of the TMDL
Submit annual status reports until all system components are inspected and repaired.	SAM (City of Half Moon Bay, Granada Community Services District) CA Parks and Recreation	Annually, first report due one year from the effective date of the TMDL

SAM - Sewer Authority Mid-Coastside

Table 7-2 Phase 2 Implementation Actions and Schedule for Sanitary Sewer Collection Systems

Phase 2 Implementation Actions	Implementing Parties	Schedule
If load allocations are not met, submit an enhanced Sewer System Management Plan, acceptable to the Executive Officer that prioritizes sewer system inspections and repairs in areas further than ½ mile from the beach. Include a diagram of prioritized infrastructure, a time schedule for implementing short- and long-term actions, and, as necessary, a schedule for developing the funds needed for the capital improvement plan. Also submit an assessment of the potential source-control benefits of lateral replacement program options, with a conceptual work plan for the optimal option.	SAM (City of Half Moon Bay, Granada Community Services District)	Within six years of the effective date of the TMDL
Complete inspections and repairs identified in Phase 2.	SAM (City of Half Moon Bay, Granada Community Services District)	Within 10 years of the effective date of the TMDL

Phase 2 Implementation Actions	Implementing Parties	Schedule
Submit to the Water Board annual status reports describing actions taken.	SAM (City of Half Moon Bay, Granada Community Services District) CA Parks and Recreation	Annually

SAM - Sewer Authority Mid-Coastside

7.2.3 Ox Mountain Sanitary Landfill

The wasteload allocation will be achieved through the existing NPDES permits, and actions listed in Table 7-3. The Water Board will not include numeric limits based on the wasteload allocation provided the discharger submits water quality monitoring data that demonstrates the landfill does not contribute to exceeding *E. coli* concentrations in Corinda Los Trancos Creek.

The landfill facility at Ox Mountain is operated by Browning Ferris Industries. The landfill operates under the Waste Discharge Requirements order R2-2018-0049 which regulates landfill operations and includes requirements for groundwater, surface water, subdrain, and leachate monitoring to minimize impacts to water quality.

In addition, NPDES Permit No. CA0029947 regulates discharge from the on-site groundwater treatment system and sedimentation basin to Corinda Los Trancos Creek. Browning Ferris Industries manages this groundwater collection and treatment system that collects naturally occurring groundwater contaminated by pollutants from a closed, unlined part of the landfill. The leachate and groundwater are treated and disinfected to remove bacteria. Stormwater runoff from the landfill flows into a sedimentation basin where it is either reused at the landfill for dust control, evaporated, or released into Corinda Los Trancos Creek downstream of the landfill.

The landfill's stormwater discharges are regulated under the statewide General Permit for Storm Water Discharges Associated with Industrial Activities (Stormwater General Permit) (Permit No. CAS000001 as of July 1, 2015).

The existing permit requirements and regulations will be sufficient to achieve the numeric targets at the beaches in Pillar Point Harbor and Venice Beach, and to protect receiving waters of Corinda Los Trancos and Pilarcitos Creek. However, the treated groundwater and stormwater discharged to the Creek is not routinely monitored. To ensure bacteria concentrations in receiving waters are protective of water contact recreation, Browning Ferris Industries will demonstrate compliance with the wasteload allocation using the bacteriological results of the receiving water samples collected quarterly at RSW-001, RSW-002 and RSW-003 (NPDES permit No. CA0029947). The Statistical Threshold Value (STV) for *E. coli* bacteria shall not exceed 320 MPN/ 100 mL in the receiving water samples. This value denotes the applicable water quality objective for freshwaters.

Table 7-3 Implementation Actions and Schedule for Ox Mountain Landfill

Implementation Actions	Implementing Parties	Schedule
Comply with NPDES permit No. CA0029947 and General Permit for Industrial Stormwater No. CAS000001	Browning-Ferris Industries	Ongoing
Monitor bacteria in receiving waters at locations RSW-001, RSW-002, and RSW-003 specified in NPDES permit No. CA0029947, and submit a report of the data to Water Board	Browning-Ferris Industries	Quarterly

7.2.4 Marina Vessels, Amenities and Operations in Pillar Point Harbor

The Basin Plan Discharge Prohibition 15 (Basin Plan Table 4-1) prohibits any discharge of human waste, including raw sewage or inadequately treated waste, to the ocean waters from this source. Section 117515 of the Health and Safety Code prohibits dumping of sewage into marinas and yacht harbors from any vessel tied to a dock, slip, or wharf that has toilet facilities available for persons on such vessels. Further, the Water Board has the authority to require all vessel terminals be equipped with adequate sewage disposal facilities (Harbors and Navigation Code sections 775 through 786).

To reduce bacteria loads related to vessels, the San Mateo County Harbor District (the District) is required to evaluate and ensure the adequacy and proper performance of sewage collection and disposal systems from vessels and restroom facilities within Pillar Point Harbor. Further, the District is responsible for enhancing education and enforcing “no dumping” and cleanout rules. Pursuant to Harbors and Navigation Code sections 775 et seq. and Water Code section 13267, the Water Board will require the District to comply with the implementation actions listed in Table 7-4 and Table 7-5 applicable to vessel marinas and harbor amenities.

If discharges from boats and facilities in Pillar Point Harbor are shown to be a significant source of bacteria contributing to exceedances of water quality objectives, the Water Board may enforce the waste discharge prohibitions in the Basin Plan to ensure that illegal discharges do not occur. This may involve issuing waste discharge requirements to the marina and harbor operators requiring implementation of BMPs (e.g., public education and outreach, and/or requiring dye testing in all boat sewage holding tanks, including those in outer harbor) to eliminate illegal discharges of sewage, in addition to water quality monitoring and reporting.

Table 7-4 Phase 1 Implementation Actions and Schedule for Vessels and Amenities in Pillar Point Harbor

Phase 1 Implementation Actions	Implementing Parties	Schedule
Begin or enhance “no dumping” education efforts to vessel owners	San Mateo County Harbor District	Within six months of the effective date of the TMDL
Submit a plan and implementation schedule, acceptable to the Executive Officer, listing steps to: 1) Evaluate effectiveness and proper performance of sewage collection systems (sewage dump stations, sewage pumpout stations, sewer lines, etc.) for the harbor marina and harbor amenities; 2) Inspect sewer and stormwater laterals and all other components connecting facilities at Pillar Point Harbor to the sanitary sewer system; 3) Prioritize sewer system repairs and public restrooms repairs in the harbor; 4) Establish and implement a protocol to enhance efforts to identify and correct illicit sewage dumping from boats in inner and outer harbor; and 5) Begin or enhance existing actions to control runoff from loading docks, dumpsters, food service and refuse areas.	San Mateo County Harbor District	Within six months of the effective date of the TMDL
Complete implementation of the above plan	San Mateo County Harbor District	Within five years of the effective date of the TMDL
Submit to the Water Board annual status reports describing implementation actions taken	San Mateo County Harbor District	Annually, beginning on the second year after the effective date of the TMDL

Table 7-5 Phase 2 Implementation Actions and Schedule for Vessels and Amenities in Pillar Point Harbor

Phase 2 Implementation Actions	Implementing Parties	Schedule
If the above Phase 1 actions are insufficient to meet the load allocations within five years of the TMDL effective date, submit an enhanced plan, acceptable to the Executive Officer, describing actions being implemented and additional actions that will be implemented to reduce discharges of bacteria to the beaches. The plan shall include an implementation schedule and milestones for compliance.	San Mateo County Harbor District	Within five years of the effective date of the TMDL
Complete implementation of the enhanced (Phase 2) actions.	San Mateo County Harbor District	Within 10 years of the effective date of the TMDL
Submit to the Water Board an annual report on the status of the implementation activities. The report shall cover all the actions implemented in the previous year as well as a checklist, timeline, and discussion of the actions scheduled for implementation during the upcoming year	San Mateo County Harbor District	Annually, beginning the second year after the effective date of the TMDL

7.2.5 Municipal Stormwater Runoff

The wasteload allocation for stormwater runoff will be implemented through the requirements of the Municipal Regional Stormwater NPDES permit (MRP). The implementation actions to reduce bacteria loads in runoff are given in Table 7-6 and Table 7-7. The City of Half Moon Bay and San Mateo County are responsible for implementing these actions within their respective jurisdictions.

The federal Clean Water Act requires municipalities to obtain NPDES permits for discharges of municipal runoff from their Municipal Separate Storm Sewer Systems (MS4s). For the City of Half Moon Bay and San Mateo County, MS4 requirements have been adopted in the MRP Order No. R2-2015-004, as amended by Order No. R2-2019-0004. This permit requires each permittee to adopt and enforce ordinances and policies; implement control measures or BMPs to prevent or reduce pollutants in stormwater; and fund its own capital, operation, and maintenance actions necessary to implement such control measures or BMPs. Bacteria-related MRP requirements address stormwater and non-stormwater pollution associated with sewage, wash water, discharges of pet waste, illicit connections to storm drains, and trash. In addition, MRP Provision C.1 requires each permittee, when its discharges may be causing or contributing to exceedance of water quality standards, to notify the Water Board of controls or BMPs it will implement to prevent or reduce this discharge.

These existing permit requirements compel the City of Half Moon Bay and San Mateo County to identify and control bacteria inputs in stormwater discharges and dry weather flows. Table 7-6 and Table 7-7 further clarify the actions and timeframes to reduce bacteria and achieve the TMDL numeric targets at the beaches. The Water Board is currently in the process of drafting requirements and proposing reissuance of the MRP. When this permit is reissued, it may include the actions and timeframes in Table 7-6 and Table 7-7. The Water Board will not include numeric limits based on the wasteload allocation in the MRP provided the permittees demonstrate that they have fully implemented technically feasible, effective, and cost-efficient BMPs to control all controllable sources of bacteria to, and discharges from, their storm drain systems.

To meet the stormwater TMDL wasteload allocation the permittees will need to implement or enhance all the mandatory minimum BMPs listed in Table 7-6 (Phase 1 BMPs). If wasteload allocations are not met within five years of the TMDL effective date, then permittees need to select and implement appropriate Phase 2 BMPs within their jurisdictions.

Numerous structural and nonstructural BMPs exist to address bacteria discharges in urban runoff. Below are examples of BMPs that can reduce bacteria loads. Some useful resources for BMP selection include: U.S. EPA website, which lists a menu of BMPs for stormwater representative of the types of practices that help MS4s meet permitting requirements[4], international stormwater database[5] and the UWRRC Report (2014).[6]

Structural BMPs

Structural stormwater controls are designed to remove pollutants through chemical, physical, and biological processes, including filtration and infiltration. Structural BMPs that have been found to work particularly well for bacteria include vegetative buffers and sand filters. Dense vegetative buffers can be used to impede the flow of runoff into stormwater conveyance systems. Buffers facilitate bacteria removal by retaining runoff long enough for the bacteria to die, filtration of bacteria-laden water by vegetation, and infiltration of the bacteria into soil, where survival is limited. Sand filters are a storm water treatment practice designed to remove sediment and pollutants from runoff from pavement and impervious areas after a rain or a storm event; they are also effective at removing bacteria, which sorb to sand particles and are thus removed from stormwater flows. The Stormwater Best Management Practices Database[5] indicates that sand filters are effective in removing from 30 to 80 percent of the bacteria in urban runoff. Sand filters are very adaptable to their surroundings and tend to have a low failure rate.

Other BMPs relying on stormwater infiltration contribute to bacteria control by reducing the volume of potentially contaminated runoff from houses, streets, parking lots, and agriculture, and mitigating peak flows (CASQA 2003). Such infiltration systems include porous concrete, pervious asphalt, grass pavers, gravel pavers, pervious crushed stone, retention grading that

[4] https://www.epa.gov/npdes/national-menu-best-management-practices-bmps-stormwater#edu

[5] http://bmpdatabase.org/bmpstat.html

[6] http://www.asce-pgh.org/Resources/EWRI/Pathogens%20Paper%20August%202014.pdf

allows rainwater to collect on-site until it can percolate into the ground, and most other infiltration-based systems. Local infiltration systems can also entail disconnecting downspouts from the storm drain and directing downspout flows to infiltrative areas, cisterns or subsoil drains where soil conditions and terrain allow infiltration.

Rainwater capture systems, including rain barrels, cisterns, and other containers used to hold rainwater for reuse or recharge, are usually designed to capture runoff for reuse, but they also provide an added benefit of controlling bacteria from wildlife. Shergill and Pitt (2004) found that roofs with birds and squirrels in the overhead tree canopy had higher bacteria levels than those without animal activity, indicating that rooftops can be a source of bacteria loading during wet weather events. In such cases, disconnecting roof downspouts to collect runoff or redirect it to pervious areas is expected to reduce both runoff volumes and bacteria loads.

Proper maintenance of BMPs to capture runoff and bacteria is important to ensure that they operate efficiently, and to help remove secondary reservoirs of bacteria which can be re-suspended and released during storm events.

Nonstructural BMPs

Nonstructural BMPs, such as outreach and pollution prevention programs, and site design guidelines mandating better stormwater controls are practical first steps for addressing water quality priorities because of their relatively low costs.

Nonstructural strategies are defined as those actions and activities that are intended to reduce stormwater pollution and that do not involve construction or implementation of a physical structure to filter or treat stormwater. Examples of nonstructural strategies include: maintenance of BMPs; street sweeping; administrative policies; creation and enforcement of municipal ordinances; education and outreach programs; rebate and other incentive programs; and cooperation and collaboration with regional partners. Another nonstructural strategy to reduce bacteria loads and other pollutants is cleaning of drain systems to remove accumulated trash, sediment, organic matter and animal waste. This can be effective because dark and humid conditions in drains and catch basins can lead to the persistence or regrowth of bacteria.

Control of Waste from Pets

For beaches, disposal of pet waste is a particularly important part of reducing bacteria. Pets, particularly dogs, are the primary focus, but horse boarding facilities and trails need to be considered as well. Pet waste management involves using a combination of pet waste collection programs, pet awareness and education, signs, and pet waste control ordinances to alert residents how to properly dispose pet droppings. Allowing natural riparian buffers to grow alongside streams to dissuade pet access also could be effective. In areas with significantly elevated bacteria levels, allocation of resources to park and open space rangers to enforce pet waste disposal controls and leash laws may be needed.

The effectiveness of pet waste control programs in reducing bacteria sources is not yet well documented. However, the degree of behavior change resulting from pet waste outreach campaigns has been measured. A report on the Dog Waste Management Plan for Dog Beach and Ocean Beach in San Francisco found that public compliance with the “scoop the poop” policy was highly dependent on awareness of the policy and availability of waste disposal bags and trash cans (Weston 2004). Quantitative studies report a 9 percent improvement in the number of pet owners who claim to regularly pick up waste (UWRRC 2014) and show a

37 percent reduction in the total amount of pet waste in city parks where pet waste stations and disposal bags were installed (UWRRC 2014). Because pet waste management is focused on individual pet owners, achieving reductions of pet waste depends on the participation and cooperation of all pet owners, and pet waste management programs must be enforced. With increased public awareness and knowledge of storm water regulations, proper disposal of pet wastes can lead to a significant reduction of bacteria discharged into storm water and direct deposition on beaches and trails.

Table 7-6 Phase 1 Implementation Actions and Schedule for Municipal Stormwater Runoff

Phase 1 Implementation Actions	Implementing Parties	Schedule
Comply with bacteria pollution prevention requirements in NPDES permit No. CAS 612008	City of Half Moon Bay and San Mateo County	Ongoing
Submit an Initial Report to the Water Board describing actions to prevent or reduce discharges of bacteria to storm sewer systems. The report shall also include timeline and/or frequency of implementation activities for all the actions listed below, as appropriate.	City of Half Moon Bay and San Mateo County	Within three months of the effective date of the TMDL
Effectively prohibit and prevent potential illicit discharges into the storm sewer system from: *Illicit sanitary sewer connections*. Ensure at least 20 percent of the stormwater system is evaluated and addressed for illicit connections each year. If this work has already been performed, submit the results of that evaluation and corresponding repairs in the Initial Report. *Homeless population*. Implement an effective approach to prevent bacteria in runoff from areas inhabited by homeless people as needed, based on the size and duration of homeless encampments. *Pet waste.* Address potential pet waste discharges into the storm sewer system through the following actions: Continue developing and implementing a visual inspection program to identify high pet waste accumulation areas and develop a cleanup plan for these areas, including specific actions before winter rains;	City of Half Moon Bay and San Mateo County	Complete within five years of the effective date of the TMDL

Phase 1 Implementation Actions	Implementing Parties	Schedule
Install new or additional dog waste cleanup signs, waste bag dispensers, and trash bins in high dog waste accumulation areas; Evaluate and improve, as needed, the service frequency of dog waste bins; and Develop and implement a comprehensive pet waste public outreach and education campaign. *Loading docks and dumpsters.* Enhance inspection and enforcement of best management practices within ½ miles to the beach to control pollutants in runoff from loading docks, dumpsters, food service and refuse areas.		
Actively deploy best management practices to capture polluted runoff and reduce trash and sediment buildup (e.g., cleanout stormwater pipes, install trash capture devices and frequently remove trash, divert runoff from the beaches).	City of Half Moon Bay and San Mateo County	Complete within five years of the effective date of the TMDL

Table 7-7 Phase 2 Implementation Actions and Schedule for Municipal Stormwater Runoff

Phase 2 Implementation Actions	Implementing Parties	Schedule
If the above Phase 1 actions are insufficient to meet the wasteload allocations within five years of the TMDL effective date, submit an enhanced plan, acceptable to the Executive Officer, describing actions being implemented and additional actions that will be implemented to reduce discharges of bacteria to the beaches or creeks draining to the beaches; a list of possible Phase 2 actions is given below. The plan shall include an implementation schedule and milestones for compliance.	City of Half Moon Bay and San Mateo County	Within five years of the effective date of the TMDL
Implement the actions listed below or document why they are not appropriate: Inspect existing or future local parks, dog parks, and outdoor pet kennel facilities to ensure compliance with applicable codes and ordinances,	City of Half Moon Bay and San Mateo County	Within six years of the effective date of the TMDL

Phase 2 Implementation Actions	Implementing Parties	Schedule
and take corrective or enforcement actions as needed; Divert runoff to the sanitary sewer system; Develop and enforce pet or domestic animals waste disposal ordinances; Execute better enforcement of existing litter ordinances; Execute better enforcement of leash ordinances; Execute better enforcement of ordinances for commercial, industrial, and multi-family garbage control, including requirements to cover trash enclosures; and Develop and enforce guidelines for portable toilets and recreational vehicle dumping.		
Complete implementation of the enhanced (Phase 2) stormwater actions.	City of Half Moon Bay, San Mateo County	Within 10 years of the effective date of the TMDL
Submit to the Water Board an annual report on the status of the implementation activities. The report shall cover all the actions implemented in the previous year as well as a checklist, timeline, and discussion of the actions scheduled for implementation during the upcoming year	City of Half Moon Bay, San Mateo County	Annually, beginning the second year after the effective date of the TMDL

7.2.6 Caltrans Stormwater Runoff

The California Department of Transportation (Caltrans) is regulated under General Storm Water Permit (NPDES Permit No. CAS000003) and Waste Discharge Requirements Order No. 2012-0011-DWQ (as amended by Order 2014-0077-DWQ), which includes TMDL-specific permit implementation requirements. The statewide permit regulates stormwater and non-stormwater discharges from Caltrans's properties and facilities and discharges associated with operation and maintenance of the state highway system. It requires Caltrans to control sources of bacteria to attain waste load allocations consistent with the established bacteria TMDLs. Caltrans is required to install structural and nonstructural controls utilizing BMPs to prevent dry weather and wet weather discharges of bacteria, trash, sediment and other pollutants. As discussed in Section 4.3.4, stormwater discharges from Caltrans' roads to Pillar Point Harbor and Venice Beach are likely to be small and the existing efforts and regulations are sufficient to meet its wasteload allocation.

Homeless encampments, albeit small and of temporary nature, are known to occur in Half Moon Bay along Highway 1 and in the proximity to Caltrans' infrastructure. Caltrans will

collaborate with other agencies to identify and prioritize areas where homeless encampments pose threat to water quality and to develop solutions to address homelessness.

7.2.7 Onsite Wastewater Treatment Systems

The load allocation for OWTS will be implemented in accordance with the statewide OWTS Policy (2012) which regulates *Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems*. Implementation of actions to eliminate OWTS waste discharges is also supported by Prohibition 15 of the Basin Plan, which prohibits discharges of raw sewage or any waste failing to meet waste discharge requirements to any waters of the Basin.

The OWTS Policy establishes a statewide, risk-based, tiered approach to regulation and management of existing and new or replacement OWTS and sets the level of performance and protection expected from OWTS. The tiers of the requirements are based on potential threat to water quality. Existing, new, and replacement OWTS within the TMDL area are designated as Tier 3, and as such, must comply with the applicable TMDL implementation program.

Individual OWTS within the project area are regulated by the San Mateo County Health Department following the requirements set in the County Local Agency Management Program (LAMP). The LAMP is a management program which comprises policies, requirements and procedures used to regulate and oversee the use of OWTS in San Mateo County. County staff review permit applications and project plans for new OWTS and OWTS repairs and upgrades, and issue permits as necessary in accordance with local county ordinances. To ensure compliance with local regulations and technical standards for OWTS, local agency staff conduct inspections at the time of OWTS construction and in response to complaints and reports of OWTS failures. Table 7-8 shows the implementation actions necessary for achieving the load allocations by the owners and operators of OWTS.

Table 7-8 Implementation Actions and Schedule for OWTS

Implementation Actions	Implementing Parties	Schedule
Comply with local codes and ordinances pertaining to OWTS.	Owners and operators of existing, new, and replacement OWTS	Upon effective date of the TMDL and Ongoing
Maintain OWTS in good working condition, including inspecting the OWTS and pumping of solids as necessary, or as required by local ordinances.	Owners and operators of existing, new, and replacement OWTS	Ongoing
Notify the local agency if OWTS has failed, effluent is pooling, wastewater is discharging to the ground surface, or wastewater is backed up into plumbing fixtures.	Owners and operators of existing, new, and replacement OWTS	Immediately upon discovery

Implementation Actions	Implementing Parties	Schedule
Obtain the required basic operational inspection report and submit the results and any other required information to the Water Board and local agency.	Owners and operators of existing, new, and replacement OWTS	Within three years of the TMDL effective date, and every ten years, thereafter
Obtain an appropriate local agency permit for the repair or replacement of an OWTS deemed by the local agency to need corrective action and complete all appropriate OWTS repairs or replacement.	Owners and operators of existing, new, and replacement OWTS	Timeline will be specified by the local agency. To be completed within 12 years from the TMDL effective date
Implement the OWTS Policy and any approved Local Agency Management Program.	San Mateo County	Ongoing
Ensure corrective actions for all OWTS that are failing or in need of major repairs are completed.	San Mateo County	Ongoing
Track and report the compliance status of identified failing systems and results of all other implementation activities to the Water Board.	San Mateo County	Annually

7.2.8 Horse Boarding Facilities

Owners and/or operators of lands containing domestic animals (including horses, farm animals and pets) are responsible for controlling animal waste to prevent potential water quality impacts.

Within the project area, equestrian facilities offering commercial animal boarding and training will be regulated under the Water Board's General Waste Discharge Requirements Order for Confined Animal Facilities, Order No. R2-2016-0031 (CAF Order), as may be amended (Table 7-9). The CAF Order applies to CAFs in watersheds with bacteria impairment, and thus to the watersheds draining to Pillar Point Harbor and Venice Beach. Thus, once this TMDL is adopted, the Water Board will notify owners or operators of existing CAFs within the watershed to obtain coverage and comply with the Order's requirements.

The management measures required by the CAF Order include the following waste discharge prohibitions:

- The collection, treatment, storage, discharge, or disposal of waste at the facility shall not cause a condition of nuisance, contamination, or pollution of surface water or groundwater as defined in Water Code section 13050;
- The discharge of waste from a CAF, which causes or contributes to an exceedance of any applicable water quality objective in the Basin Plan, or any applicable State or

federal water quality criteria, or violates any applicable State or federal policies or regulations, is prohibited;

- The direct and indirect discharge of waste, including stormwater contacting wastes, from the animal production or housing area to any surface waters, or tributary thereof, is prohibited; and
- The application of manure or process water to a land application area in a manner that results in the discharge of waste to surface water is prohibited.

The CAF Order provisions for the type of confined animal facility operations in the watersheds draining to Pillar Point Harbor and Venice Beach will require property owners or operators to develop and implement site-specific waste management plans (Ranch Plan) and Monitoring and Reporting Programs. The purpose of a Ranch Plan is to ensure that the CAF is designed, constructed, operated, and maintained in a manner such that wastes, nutrients, and contaminants generated by the facility do not adversely impact surface water and groundwater quality. The Ranch Plan must evaluate existing facilities and pollutant sources or problems, if any, and describe how these sources will be controlled utilizing BMPs, depending on the type and size of the confined animal facility. For example, to contain manure and prevent its contact with water, a small-scale facility could move animals away from surface water, remove manure before, after, and during a rain event, and/or install wattles in high-risk areas. A large-scale facility may practice seasonal rotation to remove animals from areas without drainage, install roof gutters or swales, and conduct daily inspections of retention ponds and pumps. The plan must detail how the facility owner or operator maintains compliance with the CAF Order discharge prohibitions and discharge specifications for all confined areas, pastures, and waste/compost application areas.

Additionally, CAF owners and operators must commit to regular monitoring, sampling, and record-keeping requirements in their Monitoring and Reporting Program. The monitoring component of the CAF Order allows the Water Board to evaluate compliance with the terms and conditions of the Order. If sampling data indicate that pollutant concentrations are above the established benchmarks, the CAF owners or operators must take immediate actions to identify causes of pollution and correct the problem.

Table 7-9 Implementation Actions and Schedule for CAFs

Implementation Actions	Implementing Parties	Schedule
Obtain coverage and comply with the General Waste Discharge Requirements Order No. R2-2016-0031 for Confined Animal Facilities (CAF), as may be amended or revised (CAF Order)	Owners or operators of CAFs	Obtain coverage within one year of effective date; Comply with Order requirements per timeline specified in the CAF Order
Develop a ranch water quality plan and implement BMPs and other actions specified in the CAF Order	Owners or operators of CAFs	According to schedule in the CAF Order

Implementation Actions	Implementing Parties	Schedule
Review and compile County records of all facilities with a confined animal permit within the TMDL project area, and submit information to the Water Board	San Mateo County	Within three months of the effective date of the TMDL

7.3 Existing Implementation Efforts

In recent years, numerous efforts have been undertaken by the San Mateo Resource Conservation District (San Mateo RCD), San Mateo County (County), the Harbor District, Surfrider, Sewer Authority Mid-Coastside, and other entities to identify and reduce bacteria sources in Pillar Point Harbor and Venice Beach. These efforts include stormwater and sewer infrastructure improvements as well as outreach and education. We appreciate these proactive steps and would expect these efforts to continue as part of the TMDL implementation, which should lead to noticeable reductions in the occurrences of high bacteria loads and improvement of water quality. As stated at the beginning of Chapter 7, proactive measures are considered part of TMDL implementation, and future efforts will build upon these measures.

7.3.1 Stormwater and Sewer Infrastructure Improvements

All stormwater lines on the Harbor District property except the St. Augustine stormwater line were videoed via closed circuit television (CCTV) and cleaned. The St. Augustine stormwater line remains clogged with fats, oils, and grease, and sediment. SAM had planned to clean and CCTV the outfall pipe in the summer of 2020. The primary source of fats, oils, and grease to the system was identified and corrected by sealing off a misplaced wash water connection to the stormwater system. In September 2018, the Harbor District also repaired failing/broken stormwater pipes in the north parking lot. Future stormwater system repairs in the south parking lot are being considered.

All County stormwater lines in the Capistrano catchment and in the lower Denniston watershed (west of HWY 1) were videoed via CCTV, cleaned, and remapped in recent years. The County is planning to line the Capistrano system and, at the time of the Report preparation, was reaching out to contractors regarding the scope of work, cost, and scheduling. The sanitary sewer lines on Capistrano Road and the north parking lot area of the Harbor District property were dye tested, and the dye was not observed in the stormwater systems or the ocean, which suggests that the sewer collection system does not intersect with the stormwater pipes.

Storm drain stickers were added to all storm drains on the Harbor District property and on the County storm drain system. Private properties in the Capistrano watershed have also recently spray painted ‘No Dumping’ on some of the storm drain inlets. To help prevent stormwater pollution at the beaches the County performs catch basin cleaning once per year and sweeps streets in El Granada and Princeton twice a month (SMRCD, *pers. comm*).

7.3.2 Outreach and Education

In 2017 the County launched an online pet waste pledge targeted at dog owners throughout the County. The goal of the pledge is to increase awareness about the connections between dog waste disposal and water quality and to encourage residents to dispose of dog waste in an environmentally safe way. Residents of unincorporated San Mateo County who complete the online pledge, if desired, are sent a dog bag dispenser free of charge. Postcard mailers and mass email campaigns are also conducted to remind residents that pet waste is a pollutant, and to pick up pet waste especially before rains are expected.

The County, San Mateo RCD, Harbor District and Surfrider actively use social media and community events such as Snapshot Day, Dream Machines, and Half Moon Bay Pumpkin Festival to distribute educational materials about stormwater, pollution, conservation and sewer management. Brochures and flyers provide information to residents and visitors.

In partnership with the County, Sea Hugger conducts monthly beach cleanups at Dunes and other beaches using a sand sifting trommel machine to recover microplastic nurdles (pellets) from beach sand. Also, in August 2019 a trash skimmer called Seabin was installed in the harbor. This is a floating device designed to collect floating rubbish and microplastics.

7.4 Adaptive Implementation

Periodically, the Water Board staff will evaluate information from the implementation actions, water quality monitoring results, and scientific literature, and assess progress toward attaining TMDL targets and load allocations. The Water Board staff will also determine if additional implementation actions would be beneficial to achieve the water quality objectives. The Water Board may choose to adapt the TMDL and Implementation Plan, as needed, to incorporate new and relevant information such that effective and efficient measures can be taken to achieve the allocations.

7.5 Water Quality Monitoring

San Mateo County Health Department conducts weekly bacteria beach monitoring in Pillar Point Harbor and Venice Beach. Throughout the implementation of this TMDL, data from the beach monitoring program will be used to assess attainment of the TMDL numeric targets for each beach. The compliance points for these assessments will be at or near the existing beach water quality monitoring stations (Figure 2-3). In addition, as described in Section 2.5.3, the San Mateo RCD and Surfrider, with help from the public, collect data to characterize and identify bacteria sources in Pillar Point Harbor and in the creeks draining to the harbor and coastal beaches. We will incorporate this auxiliary information to improve our understanding of the spatial and temporal variability of bacteria densities at the beaches.

If the TMDL target is not achieved after five years, i.e., following implementation of Phase 1 actions, the implementing parties may delay Phase 2 implementation for up to four years if they conduct or cause to be conducted enhanced bacteria source identification studies. Implementing parties (San Mateo County and Harbor District, City of Half Moon Bay, Sewer Authority Mid-Coastside, Granada Community Services District and CA Parks and Recreation) will be required to contribute to this effort as appropriate and may choose to begin special studies during Phase 1. For example, monitoring catchments within the watershed may help identify and characterize indicator bacteria loadings from different land uses and locations or may be used to evaluate the effectiveness of bacteria control actions. Enhanced monitoring may answer questions, such as:

- Could bacteria sources be reduced by placing enhanced urban runoff BMPs in certain locations?
- Could bacteria sources be reduced by focusing sewer system investigations and repairs in certain locations?
- Could re-growth of bacteria in stormwater outfalls contribute to exceedances at the beaches?
- Are natural sources of bacteria contributing to a significant degree to the impairment at the beaches?

The Water Board will support data collection and analysis to further quantify the extent of fecal contamination in Pillar Point Harbor and Venice Beach, and to determine the origin of the contamination. The Water Board will collaborate with implementing parties to investigate any remaining information gaps, including the contribution of natural sources of bacteria to the impairment.

Monitoring data will be reported to the Water Board and entered into the State Water Board's "Beach Watch" database as appropriate. On an annual basis, the Water Board will review the water quality reports for Pillar Point Harbor and Venice Beach to evaluate whether TMDL targets are attained.

8 Minor Edits to Basin Plan Chapters 3, 4 and 5

We propose to update the Basin Plan to reflect the new statewide bacteria water quality objectives for protecting water contact recreation in coastal and non-coastal waters. On August 7, 2018, the State Water Resources Control Board adopted water quality objectives for fecal bacteria (Resolution No. 2018-0038). They were approved by the Office of Administrative Law on February 4, 2019 and became effective upon United States Environmental Protection Agency approval on March 22, 2019. The objectives and implementation options are now included in the Water Quality Control Plan for the Inland Surface Waters, Enclosed Bays, and Estuaries of California (ISWEBE Plan), and thus already apply in the San Francisco Bay Region. The updated objectives supersede numeric water quality bacteria objectives for the water contact recreation beneficial use in the water quality control plans established by the Regional Water Quality Control Boards. This action to delete the previous numeric bacteria objectives and to replace them with the new statewide criteria, though editorial, will ensure that the Basin Plan contains the correct bacteria water quality objectives and reflects current state law.

The new objectives apply to ocean, estuarine, and fresh waters and protect the water contact recreation beneficial use based on a risk protection level of 32 illnesses per 1,000 recreators. Resolution 2018-0038 establishes Enterococci as the sole indicator for saline inland surface waters, enclosed bays, and estuaries and *Escherichia coli* (*E. coli*) as the sole indicator of pathogens in freshwater.

These proposed updates do not affect or change any State or regional policy, program, or implementation plan. To incorporate these objectives, we propose to make changes to Chapters 3 and 4 of the Basin Plan to include new bacteria water quality criteria for protecting water contact recreation, and to clarify or correct narrative passages and specific tables of the Basin Plan affected by these changes. The specific changes are shown in underline-strikeout in the Basin Plan amendment. The proposed revisions to Chapters 3 and 4, with rationale, are described below.

In addition to the proposed update to Chapters 3 and 4, we propose one small editorial correction on page 5-4 in Chapter 5. This Chapter lists plans and policies that guide Regional Water Board actions or clarify the Water Board's intent. In 2017 the State Board revised the enforcement policy. We propose changes on page 5-4 to reflect the adopted Resolution and to provide a link to the 2017 Water Quality Enforcement Policy.

8.1 Revisions to Section 3.3.1

We revised the text in Section 3.3.1 and updated Table 3-1 to include new water quality objectives to protect water contact recreation in accordance with the ISWEBE Plan. Footnote *f* of Table 3-1 was revised to remove outdated information, and footnote *g* was edited to reflect the source of the objectives and describe how and where they apply. We deleted Table 3-2 because the U.S. EPA bacteriological criteria no longer apply. Footnote *h* was added to explain how the attainment of the new objectives is assessed under the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List.

8.2 Revisions to Section 4.5.5.1

We revised Section 4.5.5.1 to correct the description of the content of Table 4-2a by removing references to outdated information. We also revised Table 4-2a to add effluent limitations for *E. coli,* correct the effluent limitations for Enterococci, and revise the effluent limitations for

total coliform to only apply to shallow water discharges in the vicinity of shellfish harvesting and to reflect the total coliform objectives in Table 3-1. The revised effluent limitations for *E. coli* and Enterococci reflect the new water quality objectives. The revisions to total coliform effluent limitations were made because the new water quality objectives for water contact recreation are expressed as *Enterococcus* and *E. coli* and not as total coliform. The daily maximum and the seven-sample median total coliform bacteria effluent limitations were revised to be protective of shellfish harvesting only. The footnotes to Table 4-2a were also revised as follows:

- Footnote *a* was revised to explain the applicability of *E. coli* and *Enterococcus* objectives, and to clarify the geometric mean and statistical threshold calculations.
- Footnotes *b* and *c* were modified to clarify the use of the total coliform organisms in waterbodies with the shellfish harvesting beneficial use. Total coliform will be used for effluent limitations for the intermittent and shallow water discharges in the vicinity of shellfish harvesting. The values for the daily maximum and the seven-sample median are derived from the water quality objectives for total coliform bacteria in Table 3-1.
- Footnote *d* specifies the effluent limitations for discharges from the City of San Francisco's combined sewer system, which were originally in Footnote *b*. We made the applicable text into a standalone footnote and edited the text to provide clarity on how the limitations apply and to explain the limitations for non-sewage discharges.
- Footnote *e* was deleted. The referenced thresholds and/or indicators could not be used for establishing the effluent limitations because the basis for them no longer exist.

Finally, all footnotes to Table 4-2a were renumbered to provide clarity and for better alignment with other tables in the Basin Plan. A clarification regarding the interchangeable use of units of CFU and MPN was also provided. Estimates of fecal indicator bacteria concentrations are commonly reported as CFU or MPN. CFU refers to "colony forming unit" whereas MPN refers to "most probable number". Both units are considered to be equivalent.

8.3 Revisions to Section 5

We revised the outdated reference to the Water Quality Enforcement Policy on page 5-4 of the Basin Plan.

9 Regulatory Analysis

The proposed Basin Plan amendment establishes a bacteria TMDL for the beaches in Pillar Point Harbor and Venice Beach near Half Moon Bay. This section includes the analyses required by law for the adoption of the proposed Basin Plan amendment. It provides an overview of the Project's compliance with California Water Code requirements; peer review requirements of Health and Safety Code §57004; federal and state antidegradation policies; and with California Environmental Quality Act (CEQA).

The discussion of economic considerations is provided in accordance with Public Resources Code section 21159 (a)(3)(c), which requires the environmental analysis to take into account a reasonable range of environmental, economic, and technical factors, population and geographic areas, and specific sites. Thus, the environmental analysis identifies the environmental impacts of the reasonably foreseeable methods of compliance and considers the economic factors for those methods. The discussion of economic considerations also fulfills the requirements of Water Code section 13141, which provides that prior to implementation of any agricultural water quality control program, an estimate of the total cost of such a program, together with an identification of potential sources of financing, shall be indicated in the Basin Plan.

9.1 California Environmental Quality Act Environmental Analysis

The Water Board is the lead agency responsible for evaluating the potential environmental impacts of Basin Plan amendments. Staff prepared the required environmental documentation, which includes an Environmental Checklist and a written report (this Staff Report) that disclose any potentially significant environmental impacts of the Basin Plan amendment. This Staff Report, including the CEQA Checklist and analyses, constitute a substitute environmental document. A scoping meeting was held on December 4, 2019, to satisfy CEQA's recommendation to engage the public and interested stakeholders in consultation about the scope of the environmental analysis.

The State Water Board's regulations require a substitute environmental document to include: 1) a brief project description; 2) identification of any significant or potentially significant adverse impacts of the proposed project; 3) analysis of reasonable alternatives to the project and mitigation measures to avoid or reduce any significant or potentially significant adverse environmental impacts; and 4) analysis of the reasonably foreseeable methods of compliance (Cal. Code Regs., title 23, § 3777, subd. (b)).

The environmental impact analysis evaluates the reasonably foreseeable environmental impacts of the implementation measures identified in the Implementation Plan.

Overall, these analyses indicate that the project will benefit the environment. It is not expected to have significant adverse impacts on the environment and will not cause immediate, large scale expenditures by the parties required to implement it. The Implementation Plan of the TMDL, for the most part, is built on management measures required by existing regulations to control, reduce, or eliminate waste discharges from: sanitary sewer collection systems, onsite wastewater treatment systems, some confined animal facilities (i.e., horse facilities), vessel marinas, and municipal stormwater runoff. Although the precise implementation actions parties will use to achieve the objectives are not known at this time, the Environmental Checklist evaluates potential impacts from measures that are readily implementable, low-

impact, and effective. The proposed implementation actions are considered to be consistent with industry standards.

9.1.1 Project Description and Objectives

The project is a Basin Plan amendment to establish a Total Maximum Daily Load (TMDL) for bacteria in Pillar Point Harbor and Venice Beach and an Implementation Plan to implement the TMDL, as described in this Staff Report. The primary purpose of the project is to restore and protect the recreational beneficial uses at the beaches in Pillar Point Harbor and Venice Beach. The project includes numeric targets equivalent to the applicable water quality objectives to protect these recreational uses. The TMDL assigns load and wasteload allocations to dischargers that, over time, are expected to result in attainment of the targets. The TMDL Implementation Plan relies on existing regulatory programs and requires management measures to control, reduce, or eliminate bacteria discharges from these sources. These implementation actions are summarized in Table 7-1 through Table 7-9.

The objectives of the proposed TMDL and Implementation Plan are consistent with the mission of the Water Board and the requirements of the federal Clean Water Act (CWA) and California's Water Code. These objectives are:

- To comply with the CWA requirement to adopt TMDLs for section 303(d)-listed water bodies;
- To protect existing beneficial uses in Pillar Point Harbor and Venice Beach affected by high indicator bacteria levels (i.e., contact and non-contact water recreational uses);
- To set numeric targets to attain relevant water quality standards;
- To avoid imposing regulatory requirements that are more stringent than necessary to meet the numeric targets and attain water quality standards; and
- To attain relevant water quality standards, by completing implementation of needed bacteria reduction measures in as short a time as practical.

9.1.2 Baseline Conditions

To satisfy CEQA's recommendation to engage the public and interested parties in early consultation about the scope of the environmental analysis, Board staff held a CEQA scoping meeting on December 4, 2019, at the San Mateo County Library in Half Moon Bay to receive input into the environmental analysis. We did not receive substantive CEQA comments. The environmental analysis commenced at that time and the impact analysis below is evaluated according to these baseline environmental conditions.

The water quality regulatory framework and the existing Water Board orders and other local, regional, and statewide regulations that were in effect in December 2019 will result in many actions that reduce bacteria loading. These actions would occur with or without the TMDL in accordance with the following existing regulations and orders. Ongoing actions under existing permits are part of the baseline.

State and Regional Water Board Orders and Discharge Prohibitions:

- State Water Board Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (Order No. 2006-0003-DWQ as revised by Order No. 2008-0002-EXEC);
- Basin Plan Discharge Prohibition No. 15 (Table 4.1), which states: "It shall be prohibited to discharge raw sewage or any waste failing to meet waste discharge requirements to any waters of the Basin;"
- Water Board NPDES permit for wastewater discharges by the Sewer Authority Mid-Coastside Wastewater Treatment Plant (Permit No. CA0038598);
- Water Board Waste Discharge Requirements and the NPDES Permit for Ox Mountain Sanitary Landfill (Permit No. CA0029947);
- Water Board Municipal Regional Stormwater Permit (NPDES No. CAS612008);
- State Water Board Stormwater Permit for State of California Department of Transportation (NPDES No. CAS000003);
- The Water Board's General WDR Orders for Confined Animal Facilities (Order No. R2-2016-0031) and waiver of WDR Orders for existing Confined Animal Facilities (Order No. R2-2015-0031); and
- State Water Board's Water Quality Control Policy for Siting, Design, Operation, and Maintenance of Onsite Wastewater Treatment Systems (OWTS Policy, Order No. 2012-0032).

9.1.3 Reasonably Foreseeable Methods of Compliance

The TMDL Implementation Plan (Section 7) identifies the tasks and the schedule necessary to achieve compliance with the numeric targets, which are equivalent to the water quality objectives. The candidate implementation measures that are proposed in the TMDL are consistent with existing local, regional, and statewide regulations and are identified in Table 9-1. The potential environmental impacts of these measures are evaluated in the environmental analysis (checklist and explanations below).

The actions listed in Table 9-1 provide a reasonable range of measures that may be implemented to achieve compliance with the TMDL. Responsible parties and individual property owners will choose management practices necessary and effective to reduce bacteria loads in their discharges. Since many of the implementation projects have yet to be proposed, it is not possible to know the location, proposed activities, or construction specifications at this time, so the environmental analysis considers these impacts on a general level. Some projects proposed to implement the TMDL would require additional permitting and/or would undergo additional environmental analysis. Projects that would involve construction affecting an area of one acre or more would be required to obtain coverage under the statewide General Construction Stormwater Permit. Any construction projects within the project area would have to comply with local building, grading, and other requirements of the municipal code. Any construction activities undertaken in the unincorporated areas of San Mateo County would comply with the county's applicable regulations.

Table 9-1 Implementation Plan Actions Evaluated in the CEQA Analysis

Source	Implementation Actions	Compliance Measures
Sanitary Sewer Collection Systems	Continue to comply with Statewide General Waste Discharge Requirements Order for sanitary sewer systems (which aims to prevent sanitary sewer overflows). Develop and implement an updated sewer system management plan that prioritizes sewer system inspections and repairs within ¼ mile from the beach or otherwise connected to the beach.	Activities that would bring parties into compliance include: Actions to inspect and clean existing sewer lines Actions to repair and replace existing leaky sewer lines Actions to control tree roots to prevent them from damaging the sewer lines Actions to improve spill response and spill clean up
Onsite Wastewater Treatment Systems (OWTS)	Comply with State Water Board's OWTS Policy Comply with the LAMP requirements and prioritize OWTS evaluation/inspections to ensure proper functioning and compliance of all OWTS identified in need of repairs	Activities that would bring parties into compliance include: Actions to inspect existing OWTS Actions to maintain and repair or replace existing OWTS, as needed
Vessels and Harbor Amenities Marina	Develop and implement a plan to: Evaluate and ensure adequacy and proper performance of sewage collection systems for vessel marinas and harbor amenities Continue to enforce rules pertaining to dumping if vessels become a source of bacteria to a beach	Activities that would bring parties into compliance include: Enhancement of education and enforcement of "no dumping" rules Actions to repair or replace existing restrooms

Source	Implementation Actions	Compliance Measures
Municipal Stormwater Runoff	Continue to comply with the Municipal Regional Stormwater Permit requirements to identify and implement measures, as needed, to reduce bacteria in stormwater runoff and dry weather flows to achieve wasteload allocations.	Activities that would bring parties into compliance include: Detection and elimination of illicit stormdrain discharges Additional storm drain cleaning Increased maintenance of structural BMPs Construction of new BMPs to detain, divert and treat urban runoff Installation of additional pet waste receptacles and signage at the beaches Education and outreach campaign for better pet waste management
Horse Facilities (CAFs)	For horse facilities: obtain coverage under and comply or continue to comply with the Water Board's General Waste Discharge Requirements for Confined Animal Facilities	Activities that would bring parties into compliance include: Measures to limit animal access to beaches and creeks Measures to divert clean runoff from manure areas (e.g., roofs, gutters, berms, minor grading of previously disturbed lands) Measures to manage polluted runoff on-site (e.g., vegetated strips, berms) Measures to manage manure (e.g., collection, onsite composting process, off-site use or disposal).

9.1.4 Environmental Checklist

The Environmental Checklist and discussion that follows is based on questions provided in Appendix G of the CEQA Guidelines, which focus on impacts to various environmental resources, such as air quality, cultural resources, land use, traffic, etc. The Environmental Checklist focuses on the implementation activities described in Table 9-1. Some of the TMDL Implementation Plan actions solely involve planning or assessment, public outreach and education, and water quality monitoring. These activities are not evaluated in this analysis because they do not cause a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment.

ENVIRONMENTAL CHECKLIST

1. Project Title:	Basin Plan Amendment to Establish Total Maximum Daily Load (TMDL) for Bacteria in Pillar Point Harbor and Venice Beach
2. Lead Agency Name and Address:	California Regional Water Quality Control Board San Francisco Bay Region 1515 Clay Street, Suite 1400 Oakland, CA 94612
3. Contact Person and Phone:	Barbara Baginska, (510) 622-2474
4. Project Location:	San Mateo County
5. Project Sponsor's Name & Address:	California Regional Water Quality Control Board San Francisco Bay Region 1515 Clay Street, Suite 1400 Oakland, CA 94612
6. General Plan Designation:	Not Applicable
7. Zoning:	Not Applicable

8. Description of Project:

The project is a Basin Plan amendment to establish a bacteria TMDL and implementation plan for Pillar Point Harbor and Venice Beach.

9. Surrounding Land Uses and Setting:

The proposed Basin Plan amendment would affect the beaches in Pillar Point Harbor and Venice Beach, as described in Section 2 of the Staff Report. Pillar Point Harbor is located in the unincorporated coastal community of Princeton, north of the City of Half Moon Bay. Venice Beach stretches between Venice Boulevard and Beach Avenue, which intersect with Cabrillo Highway halfway between the City of Half Moon Bay to the south and Pillar Point Harbor to the north. Implementation will involve the beaches and the upland areas that drain to the Harbor and Venice Beach. Pillar Point Harbor drains approximately 6 square miles and includes inflows from Denniston, St. Augustine and Deer creeks watersheds, which comprise large open space areas in the upper reaches (74 percent), and include mixed-use areas with commercial, airport, residential (21 percent) and agricultural areas (5 percent) at the lower reaches. Venice Beach receives inflow from Frenchmans Creek and Pilarcitos Creek which together drain approximately 30 square miles of watershed. The land use is predominantly open space and forest (87.4 percent), followed by low and medium density development (8.9 percent) and agriculture/pasture (1.7 percent).

10. Other public agencies whose approval is required:

The State Water Board, the California Office of Administrative Law, and the U.S. EPA must approve the Basin Plan amendment following adoption by the Water Board.

11. Have California Native American tribes traditionally and culturally affiliated with the project area requested consultation pursuant to Public Resources Code section 21080.3.1? If so, has consultation begun?

On July 1, 2019, we reviewed the list of California Native American tribes who requested consultations under the AB 52. We found no Native American tribes traditionally and culturally affiliated with the project area who have requested consultations.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

We have determined that the project would not have any significant adverse impacts on the environment; hence, there are no physical, biological, social and/or economic factors that might be affected by the proposed project, except for less than significant impacts identified below.

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

	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
I. AESTHETICS: Except as provided in Public Resources Code Section 21099, 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) In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

a) Any physical changes to the aesthetic environment because of the Bacteria TMDL would be small in scale. None of the reasonably foreseeable compliance methods identified in Table 9-1 are expected to have an adverse impact on a scenic vista. No actions or projects associated with implementation of the TMDL would result in tall or massive structures that could obstruct views from, or of scenic vistas.

b) Reasonably foreseeable methods of compliance identified in Table 9-1 do not require building of structures that would damage natural or human made resources to the extent that it would impede the scenic quality of the area or scenic resources associated with state scenic highways, and therefore will not result in adverse aesthetic impacts to state scenic highways or scenic resources.

c) Actions to implement the TMDL would not substantially affect or degrade the existing visual character or quality of any site or its surroundings because physical changes to the aesthetic environment would be small in scale. The implementation actions will not conflict with the applicable zoning or regulations governing scenic quality.

d) Actions and projects that could result from the TMDL would not include new lighting or installation of large structures that could generate reflected sunlight or glare, and therefore do not result in adverse light and glare impacts.

II. AGRICULTURE AND FOREST RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, 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 the forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board. Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared	☐	☐	☐	☒

pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?				
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)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
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 non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

a-e) The TMDL would mainly affect urban or developed land in the area that drains to Pillar Point Harbor and Venice Beach and would not convert land designated as Prime, Unique, or Farmland of Statewide Importance by the California Resources Agency. The TMDL would not affect existing agricultural zoning or any aspects of Williamson Act contract nor would it result in the conversion of farmland to non-agricultural uses or loss of forest land. Therefore, no impacts would result.

III. AIR QUALITY: Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) 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?	☐	☐	☒	☐
c) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	☐	☐	☒	☐

a) None of the reasonably foreseeable methods of compliance will result in any conflicts with or obstruction to the implementation of the applicable air quality plans. The TMDL would not cause any significant changes in population or employment, it is not expected to generate ongoing traffic-related emissions or require construction of any permanent emissions sources. For these reasons, no permanent change in air emissions would occur, and no air quality impacts would result.

b) Implementation of stormwater BMPs and repair and replacement of sewer system components could result in temporary construction-related emissions. However, these emissions would not violate any air quality standard. Nor would these projects involve the construction of any permanent emissions sources or generate ongoing traffic-related emissions. Construction and minor earthmoving resulting from implementation actions in the proposed TMDL would be short-term and would likely be small-scale. Standard dust control construction management practices should mitigate inhalable particulate matter from soil disturbance activities such as grading and excavation. If specific construction projects were proposed to comply with the TMDL, such projects would comply with the Bay Area Air Quality Management District's requirements and implement readily available measures to prevent adverse impacts, such as watering active construction areas, covering trucks hauling soil, and applying water or

soil stabilizers on unpaved areas. Therefore, the TMDL would not violate any air quality standard or contribute substantially to any air quality violation. Temporary construction-related air quality impacts would be less than significant. Because the TMDL would not involve the construction of any permanent emissions sources, it would not result in a cumulatively considerable net increase of any pollutant for which the project region is in non-attainment of air quality standards. Overall, less than significant air quality impact would result.

c) Because the TMDL would not require the construction of any permanent emissions sources but rather involves short-term and discrete construction activities, it would not expose sensitive receptors to substantial pollutant concentrations. No air quality impact would result..

d) The Bacteria TMDL would include actions to manage manure at horse facilities so that animal waste does not enter the beaches. Manure management activities could include the collection, storage and transport of manure which could result in odor. However, because manure stockpiling would be limited to areas of low-density population, possible odors would not affect substantial numbers of people and impacts would be less than significant.

IV. BIOLOGICAL RESOURCES: Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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 state or federally-protected wetlands (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 wildlife 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) There are Federal and State listed endangered and threatened animals which are known to be present in the vicinity of the project area. Such species could potentially be temporarily impacted by measures implemented to comply with the proposed project. However, actions proposed by the TMDL are likely to be small in scale and/or located in Pillar Point Harbor or other developed areas. Furthermore, actions to reduce bacteria discharges to the Harbor and Beach will in many cases have the effect of reducing other pollutants, such as nutrients, which will help to improve water quality and aquatic habitats. Therefore, no adverse impacts on any species identified as a candidate, sensitive, or special status species would result, and the overall impact will be less than significant.

b) Presence of sensitive species and habitat must be assessed on a project by project basis. Implementation compliance measures that involve repair of sewage systems or minor construction are

not expected to have a significant impact on sensitive natural communities because they would mostly be located in already disturbed areas away from creeks and riparian habitats. Therefore, the TMDL would not have a substantial adverse effect, either directly or through habitat modifications to sensitive natural communities. In addition, in fulfilling its regulatory program responsibilities in connection with work that may occur near waters of the state, the Regional Water Board includes requirements to avoid and minimize impacts on riparian ecosystems or other sensitive natural communities. Such requirements include but are not limited to pre-construction surveys; construction buffers and setbacks; restrictions on construction during sensitive periods of time; employment of on-site biologists to oversee work; and avoidance of construction in known sensitive habitat areas or relocation and restoration of sensitive habitats, but only if avoidance is impossible.

c) The TMDL does not include construction of new fill in riparian or wetland areas. Implementation actions are likely to occur in existing roadways and facilities and as such they would result in less than significant adverse impacts on wetlands.

d) Reasonably foreseeable compliance methods will not interfere with migratory fish or wildlife because structural compliance methods are not required within stream beds. Also, reasonably foreseeable compliance methods are not anticipated to be spatially large-scale, contiguous, or numerous enough to block fish or wildlife migration or use of wildlife nursery sites.

e-f) The TMDL does not conflict with any local policies or ordinances protecting biological resources, such as trees. Projects to comply with the TMDL would not require tree removal in riparian zones or other sensitive habitats and would not result in the physical alteration of natural environment such that there would be any adverse effects on federally-or State-listed species. The proposed actions would not conflict with any Habitat Conservation Plans, Natural Community Conservation Programs, or Midcoast Local Coastal Program and other local policies designed to protect biological resources. Based on the range of avoidance and minimization measures available, the impacts to Biological Resources from compliance measures to address fecal indicator bacteria impairment are less than significant.

V. CULTURAL RESOURCES: Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historical resource pursuant to in §15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?	☐	☐	☐	☒
c) Disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☐	☒

a-c) This proposed TMDL is not expected to have an impact on cultural resources, because implementation actions would not require construction in areas with known cultural resources, changes to, or demolition of historic structures. Likely TMDL implementation actions by municipalities to control bacteria loads, such as creation of green infrastructure or placement of stormwater treatment structures, would include only minor construction in existing roadways and stormwater facilities and would not require changes to historic buildings or structures.

VI. ENERGY: Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☐	☒

b) Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☐	☐	☒

a) Any minor amounts of electricity or natural gas that may be consumed as a result of the TMDL project construction or repairs would be temporary and negligible and would not have an adverse effect; therefore, no impacts would occur.

b) Energy conservation measures protocols would be used to ensure energy would not be used in a wasteful manner or conflict with adopted energy conservation plans, policies or regulations.

VII. GEOLOGY AND SOILS: Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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 on 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 and 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 soil, 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 alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒
f) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒

a) Implementation of the TMDL would not require construction of habitable structures or addition of new population; therefore, it would not result in any human safety risks related to fault rupture, seismic ground-shaking, ground failure, or landslides.

b) Action to comply with the TMDL may result in minor construction and earthmoving such as to repair faulty septic systems. Such activities are not likely to result in substantial soil erosion or loss of topsoil because they are small in scale.

c) Actions to comply with the TMDL would generally be located in existing disturbed areas such as marinas, streets, backyards, and horse facilities. While these areas may contain localized areas that are prone to instability, the type of construction that would be required under the TMDL, such as

replacement of pipes and facility upgrades, would be small in scale and would be very unlikely to trigger land instability. No adverse impacts to local geologic conditions, including on- or off-site landslides, lateral spreading, subsidence, liquefaction, or collapse are expected to occur as a result of this project.

d) Construction of buildings (as defined in the Uniform Building Code) or any habitable structures to implement the TMDL is not reasonably foreseeable. Minor grading could occur in areas with expansive soils but this activity would not create a substantial risk to life or property. Therefore, the TMDL would not result in impacts related to expansive soils or risks to life or property.

e) While the TMDL requires evaluation, inspection, and repair or replacement of existing faulty septic systems, some may require construction of new septic systems. Affected soils will be capable of supporting the use of new septic tanks or alternative wastewater disposal systems. Further, any such project must undergo site specific soil testing to ensure it is capable of supporting the use of septic tanks or alternative wastewater disposal systems. Therefore, no impacts from new septic tanks or alternative wastewater disposal systems would result from the project.

f) The implementation actions will be limited by both volume and geographic location and will not occur in areas where known unique paleontological resources or geological features are present. There would be no impacts.

VIII. GREENHOUSE GAS EMISSIONS: Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☒	☐
b) Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☒

a) Implementation of compliance measures at the project level could result in a temporary/intermittent increase in greenhouse gases related to exhaust from equipment and vehicles used during construction, repair, or manure management at small horse facilities. However, these emissions will be limited and short in duration, and would result in less than significant impacts overall.

b) All structural or nonstructural implementation measures would need to be implemented in a manner consistent with plans, policies or regulations to reduce greenhouse gas emissions. The proposed project would not conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the greenhouse gas emissions and no impact would occur.

IX. HAZARDS AND HAZARDOUS MATERIALS: Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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 one-quarter 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 Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
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 result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
g) Expose people or structures to a significant risk of loss, injury or death involving wildland fires?	☐	☐	☐	☒

a) Implementation of TMDL is not expected to involve the routine transport, use, or disposal of hazardous materials. Therefore, no impacts from the use, transport or disposal of hazardous materials would result.

b) Actions to implement the TMDL, such as repair of pipelines, and cleaning of stormwater outfalls are not expected to result in upset or accident conditions involving the release of hazardous materials. Sewage is not considered a hazardous material. Laws and regulations restrict handling and disposal of sewage during repair and replacement of holding tanks and sewer pipes. Small amounts of cement, grease or solvents may be used for repairs or minor construction. These materials would be handled in accordance with relevant laws and regulations, which would minimize hazards to the public or the environment, and the potential for accidents or upsets. Therefore, hazardous waste transport and disposal would not create any significant public or environmental hazard or environmental impact.

c) As indicated in response to item VIII b), above, actions to implement the TMDL would not be associated with emission of hazardous materials or handling of significant quantities of hazardous or acutely hazardous materials or substances. Therefore, no impact from hazardous materials would occur within one-quarter mile of an existing or proposed school.

d) There are no sites located within the project area identified on the hazardous waste and substance material sites compiled pursuant to Government Code Section 65962.5 (Cortese List). Further, all minor construction and earth moving activities will take place in either rural or farmland areas or within shallow ditches in municipal utilities right of ways. Therefore, minor construction that may be undertaken to implement the TMDL would have no impact to hazardous waste sites.

e) The TMDL does not include actions that would result in a safety hazard for people residing or working within two miles of the Half Moon Bay Airport or vicinity.

f) Hazardous waste management activities resulting from the TMDL would not interfere with any emergency response plans or emergency evacuation plans, and no impacts would result from the project.

g) The TMDL would not affect the potential for wildland fires. Therefore, no impacts from wildfires would result.

X. HYDROLOGY AND WATER QUALITY: Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Violate any water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	☐	☐	☒
b) Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☐	☒
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or through the addition of impervious surfaces, in a manner which would:	☐	☐	☐	☒
(i) result in substantial erosion or siltation on- or off-site;	☐	☐	☐	☒
(ii) substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;	☐	☐	☐	☒
(iii) 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; or	☐	☐	☐	☒
(iv) impede or redirect flood flows?	☐	☐	☐	☒
d) In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☐	☒
e) Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☐	☒

a) TMDL implementation actions listed in Table 9-1 would not result in violations of water quality standards or waste discharge requirements. This project is intended to improve water quality at the beaches and to attain applicable water quality standards.

b-c) The candidate implementation actions would not affect groundwater supplies, substantially alter the existing drainage pattern, contribute additional runoff or interfere with the conveyance of urban storm water. Instead, actions to control bacteria loading will likely reduce the volume of stormwater, and of inflow and infiltration into stormwater and sewer collection systems, which will help to reduce flooding. The TMDL would not deplete groundwater supplies or interfere with groundwater recharge. No adverse impacts to groundwater would result. Actions to comply with the TMDL would not include large scale grading, construction on unpaved areas, vegetation removal, or stream course alteration and would not result in substantial erosion or siltation, either on- or off-site. The bacteria TMDL would not increase the rate or amount of runoff or exceed the capacity of stormwater drainage systems and no adverse impacts to channels would occur.

d) Bacteria TMDL-related activities are intended to reduce bacteria at the beaches and improve water quality. No releases of bacteria would result, therefore, no adverse water quality impacts would occur.

e) The TMDL implementation actions are part of the water quality control plan to reduce bacteria loads to the beaches. No conflict would occur.

XI. LAND USE AND PLANNING: Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Physically divide an established community?	☐	☐	☐	☒
b) Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☒	☐

a) Implementation actions of the TMDL would include small-scale repairs and construction and would not result in physical dividing of any established community.

b) The Bacteria TMDL is consistent with existing Local Coastal Program policies and goals and would not conflict with any land use plan, policy, or regulation. Many actions to comply with TMDL requirements would be either subject to regional or local agency review (e.g., replacement of septic systems) and therefore would not conflict with local land use plans or policies, and only less than significant impacts are expected.

XII. MINERAL RESOURCES: Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in the loss of availability of a known mineral resource that would be of 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?	☐	☐	☐	☒

a-b) The TMDL project is located in an area generally zoned for aggregate mineral resources, however, none of the reasonably foreseeable structural or non-structural compliance measures would be located in the areas where aggregate materials might be are extracted. Furthermore, the compliance measures should not preclude the mining of mineral resources in the future.

XIII. NOISE: Would the project result in:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☒	☐
b) Generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) For a project located within the vicinity of a private airstrip or 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?	☐	☐	☐	☒

a) Earthmoving and construction could temporarily generate noise. Projects that local agencies propose to comply with the TMDL would be required to comply with the local noise and nuisance standards and limited to the allocated construction hours from 7 am to 6 pm. Any increased noise levels would be temporary, and would cause less than significant impacts.

b) To comply with the TMDL, specific projects could involve minor construction and the use of some heavy equipment, including pump trucks, which could result in temporary ground-borne vibration or noise. These activities would typically last no more than a few days and would be carried out in compliance with local standards. Therefore, the TMDL would not result in substantial noise, and noise impacts would be less-than-significant.

c) There are no private airstrips in the vicinity of the project area. This condition precludes the possibility of the project creating aviation safety hazards for people residing or working in the area. The TMDL would not have the potential to create aviation safety hazards for people residing or working within two miles from the public airport and no additional impacts from airport noise exposure would result.

XIV. POPULATION AND HOUSING: Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Induce substantial unplanned 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 people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

a-b) The TMDL will not have any impact on housing and will not affect the population of the project area. It would not displace any existing housing or any people who would need replacement housing, and no adverse housing impacts would occur. It would not displace permanent residents or create a need for construction of replacement housing.

XV. PUBLIC SERVICES: a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

a) The TMDL would not affect any governmental facilities or service ratios, response times, or other performance objectives for any public services, including fire protection, police protection, schools, or parks.

XVI. RECREATION: Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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 which might have an adverse physical effect on the environment?	☐	☐	☐	☒

a) Projects to implement the TMDL could include minor excavation and grading to repair or replace sewer pipes; and installation of additional pet waste receptacles at the beaches and open space. Eventual compliance with bacteria targets might have the effect of encouraging more people to use the beaches at Pillar Point Harbor and Venice Beach. However, these beaches are already quite popular and heavily used, so incremental additional use of the beaches is not expected to cause physical deterioration of recreational facilities. No recreational facilities would need to be constructed or expanded and no recreational impacts would occur.

b) The TMDL would not result in the need for construction or expansion of recreational facilities that could have an adverse effect on the environment.

XVII. TRANSPORTATION: Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Conflict with a program plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle and pedestrian facilities?	☐	☐	☐	☒
b) Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	☐	☐	☐	☒
c) Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
d) Result in inadequate emergency access?	☐	☐	☐	☒

a-d) Because the TMDL would not increase population or provide employment, it would not generate any ongoing motor vehicle trips and would not affect level of service standards established by the county congestion management agency. Therefore, the TMDL would not result in permanent, substantial increases in traffic above existing conditions. Nor would the proposed action change any policy, plan, or program.

XVIII. TRIBAL CULTURAL RESOURCES:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
a) Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☐	☒
b) A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☐	☒

a-b) Implementation of the bacteria TMDL will not affect sites listed on the state or federal register of historic places. Any improvements to water quality conditions will take place at locations that that will have no effect on tribal cultural resources. Pursuant to Public Resources Code section 21080.3.1, commonly referred to as AB 52, the Water Board checked whether any of the California Native American tribes requested a consultation in a project area and found no Native American tribes traditionally and culturally affiliated with the Half Moon Bay area who have requested the consultations. In addition, in an unlikely event that the ground disturbances uncover previously undiscovered or documented resources, California law protects Native American burials, skeletal remains, and associated grave goods regardless of the antiquity and provides for the sensitive treatment and disposition of those remains. (Health & Safety Code, section 7050.5; Public Resource Code, section 5097.9 et seq).

XIX. UTILITIES AND SERVICE SYSTEMS: Would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Require or result in the relocation or construction of new or expanded water, wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental impacts?	☐	☐	☐	☒
b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	☐	☐	☒	☐
c) 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?	☐	☐	☒	☐
d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☐	☐	☐	☒

e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☐	☐	☐	☒

a) The project will not impose requirements to relocate or construct new wastewater treatment or storm water drainage, electric power, natural gas, or telecommunications facilities. The TMDL could result in improvements to or expansion of the sewage collection system and/or wastewater treatment facilities to reduce sanitary sewer overflows or inflow and infiltration. Such activities would consist of relatively small construction projects that would be of short duration and would be implemented under existing permits. The TMDL implementation actions could also result in improvements to urban stormwater runoff systems, landfill discharges, and management of runoff from horse facilities to reduce bacteria discharges to Pillar Point Harbor and Venice Beach. These activities would also consist of small constructions and minor earth moving and would be of short duration. All actions will be implemented to improve water quality which will benefit the entire community and will result in only temporary less than significant impacts.

b) Because the TMDL would not increase population or provide employment, it would not require ongoing additional water supply or entitlements.

c) Because the TMDL addresses a pollution problem linked to the wastewater conveyance system, not the treatment plant itself, compliance would not require any increased wastewater treatment capacity or construction.

d) TMDL implementation would not affect municipal solid waste generation or landfill capacities. No impacts would occur.

e) TMDL implementation would not affect federal, state, and local statues related to solid waste.

XX. WILDFIRE: If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
b) Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?	☐	☐	☐	☒
c) Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☐	☒
d) Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☐	☒

a-c) The implementation of the Bacteria TMDL would not impair any adopted emergency response plan or evacuation plan and would not exacerbate wildfire risks. There will be no construction of roads, fuel breaks, power lines or other facilities or the road for transportation to the facilities. Therefore, the project would not result in alteration of the landscape or the surrounding areas that may start a wildfire.

d) The TMDL would not require construction of any structures downslope or downstream of potential flooding or land slide areas. Therefore, the impacts would not occur.

XXI. MANDATORY FINDINGS OF SIGNIFICANCE	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
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, substantially 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 which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

a) The TMDL would not degrade the quality of the environment. The proposed project is intended to restore and enhance water quality and to benefit the future of recreational uses in Pillar Point Harbor and Venice Beach.

b) As discussed above, the TMDL could pose some less-than-significant adverse environmental impacts related to minor sewage system repair, replacement, and re-construction, and other small construction projects, such as stormwater management. These impacts from repair and construction activities would be individually limited and of short-term duration. When viewed with other projects with related impacts, the effects would not be cumulatively considerable. Therefore, these future projects would not lead to cumulatively considerable significant impacts. Moreover, the TMDL's monitoring provisions and the Water Board's adaptive management approach to implementation provide additional safeguards and guarantees that future implementation actions will be carried out in ways that enhance, and do not degrade, the quality of the environment at the beaches.

c) The goal of the proposed TMDL and associated actions is to improve long term water quality by providing a program designed to protect and restore beneficial uses at the beaches in the TMDL project area. The TMDL will not adversely affect people, either directly or indirectly. To the contrary, achievement of water quality objectives is expected to reduce risk of gastrointestinal illness compared to current conditions, and to enhance aesthetic attributes and recreational opportunities at the beaches.

9.1.5 Potential Cumulative Impacts

This section provides an analysis of the significant cumulative impacts of the proposed Basin Plan amendment (CEQA Guidelines §15130). Cumulative impacts refer to "two or more individual effects which, when considered together, are considerable or which compound or increase other environmental impacts."

The cumulative impact that results from several related projects is the change in the environment which results from the incremental impact of the project combined with the impacts from other related past, present, and probable future projects.

As shown in the Environmental Checklist, the TMDL would not result in significant adverse impacts to the environment individually or cumulatively. This analysis considers past, present, and reasonably foreseeable future projects that could have similar environmental impacts, to determine that no significant cumulative impacts would occur. These include projects that would involve reduction of human waste discharges from various sewage handling systems, management of waste from confined animal facilities, and changes to urban stormwater infrastructure. This cumulative analysis considers projects in the area covered by the proposed Basin Plan amendment.

Any future Water Board regulations or enforcement actions would improve overall water quality in Pillar Point Harbor and Venice Beach and could include implementation actions that would further reduce bacteria at the beaches.

The cumulative impact of the TMDL with these other projects would be beneficial to the environment and would not result in cumulatively significant adverse environmental impacts. Our review of other planned, proposed, and ongoing projects reveals none that would lead to significant environmental impacts.

9.2 Consideration of Alternatives

As explained in this report, the proposed project would not result in any significant adverse impacts on the environment and would not cause any reasonably foreseeable indirect physical changes. Therefore, based on the requirements of Cal. Code Regs., title 23, § 3777(e) and Cal. Code Regs., title 14, § 15252(a)(2)(B), no alternatives or mitigation measures are proposed.

An evaluation of the alternatives is required under CEQA Section 15252(a)(2)(A) to avoid or reduce any significant or potentially significant effects on the environment.

9.3 Economic Considerations

The objective of this analysis is to estimate the costs of various implementation measures for bacteria reduction needed to improve water quality in Pillar Point Harbor and Venice Beach. The Implementation Plan calls for reductions in the load of bacteria from sanitary sewer systems, urban runoff, harbor vessels, amenities and operations, and confined animal facilities. The implementation actions that may be used to control each potential bacteria source as described in Chapter 7 include treatment technologies and management practices most likely to be implemented to achieve compliance with load allocations, waste load allocations, and numeric targets.

This analysis examines the potential costs of implementing the reasonably foreseeable compliance measures without considering whether compliance measures are currently part of the existing regulatory baseline. The discussion of economic considerations or costs associated with various measures described in the Implementation Plan is limited to those actions that are currently technically feasible and likely to be implemented by dischargers, taking into account economic and technical factors. The TMDL is not prescriptive in terms of the specific actions that dischargers will have to undertake to comply with the TMDL. Rather, implementing parties are allowed to independently select actions that will allow them to meet their load and wasteload allocations, based on their own considerations of need, budget, feasibility, or other criteria. Therefore, anticipating costs with precision is challenging. Cost estimates are complicated further because some implementation actions are currently part of the baseline condition as they are already required by other regulatory measures (e.g.,

NPDES or Stormwater permits) or are anticipated regardless of this TMDL. While the below text discusses the cost of various control measures aimed at improving water quality, it does not discuss the effects (costs) of *not* improving water quality, such as impacts to public health.

In addition, there are multiple additional benefits associated with the implementation of these measures. For example, many of the structural and nonstructural BMPs to address bacteria loading would also reduce the loading of other contaminants, which could assist in protecting other beneficial uses of the beaches.

For CEQA purposes, the economic and social impacts of the proposed implementation measures are considered to determine if they will cause or contribute to an adverse environmental impact. This analysis does not assess whether the costs of the measures themselves are significant or will cause an economic hardship. Although the Regional Water Board is required to consider economics, it is not obligated to consider the balance of costs and benefits associated with implementation of the TMDL.

The Implementation Plan does not require additional controls for the municipal wastewater treatment plant, the sanitary landfill or Caltrans stormwater other than what is already required in the existing NPDES permits and waste discharge requirements (WDRs) for these facilities, and in the existing Basin Plan WDRs. There will be some costs to CAF owners and operators associated with enrollment in the CAF WDR and implementation of permit requirements, such as development of a Ranch Plan and compliance with monitoring requirements.

9.3.1 Potential Costs for Sanitary Sewer Systems

The General Permit for Sanitary Sewer Systems requires all sewer collection systems greater than one mile in length to be designed, operated, and maintained in such a way as to prevent sanitary sewer overflows. However, the TMDL Implementation Plan requires some additional measures for this source, such as inspecting, cleaning, repairing, or replacing sewer lines in the proximity of the beaches or otherwise connected to the beach. The total cost of implementing these measures depends on the extent of the issues discovered during the inspection/evaluation phase. The inspection of the lines with Closed Circuit Television (CCTV) is estimated to cost approximately $2.5 per foot; whereas, the cleaning of the lines is expected to cost around $3 per foot, and cleanup and disposal of debris is estimated at $0.30 per foot (J. Rayner, Granada District Engineer, *pers. comm*). Table 9-2 shows the cost of replacement or repair of sewer line infrastructure. The entities responsible for managing the collection systems are already actively engaged in replacing or rehabilitating the collection system and developing preventive maintenance programs. Therefore, TMDL implementation does not impose additional actions which incur additional costs, but rather requires that maintenance and repairs in proximity to the beaches be prioritized first, when faulty or old infrastructure is detected during the inspection phase.

In the event that public entities that own sanitary sewer collection systems enact new ordinances or programs to require or encourage private property owners to inspect and repair their private sewer laterals, costs to develop the ordinances or programs will be incurred. The cost of developing and implementing a program will depend on the nature and complexity of the local program, and are not estimated here.

Table 9-2 Sewer Collection Systems Cost Estimates

Action	Cost Range [a]	Unit
6 to 8-inch diameter sewer line replacement	Between $150 and $207	Foot
Lateral replacement	~$2000	Each
Spot repair	~$9500	Each
Manhole replacement	Between $5800 and $7700	Each
Manhole raising/partial repair	~$2350	Each

a Cost estimates provided by the Granada Community Services District.

9.3.2 Potential Costs for Onsite Wastewater Treatment Systems

The cost of implementation actions required by the TMDL will be incurred by the property owners and the oversite agency. Effective pathogen removal in OWTS is dependent on proper siting and installation of the OWTS components, proper maintenance, and operation of the septic system within design specifications. As discussed in section 4.1.1, individual OWTS within the project area are regulated by the San Mateo County Health Department following the requirements set in the County Local Agency Management Program (LAMP).

Under the LAMP, San Mateo County oversees compliance with OWTS implementation requirements established in any applicable TMDL. The cost of implementing those requirements will depend on the number of OWTS that are actually in need of replacement or repairs. Based on the age, proximity to the nearest water body and/or pumping reports, we identified 18 OWTS which would require a site-specific evaluation to determine if they are in need of a repair or further action. The LAMP identifies septic tank pumper inspections as the County's primary mechanism to detect inadequate existing OWTS. The County is also responsible for performing design review and approval for installation of smaller OWTS, which discharge less than 10000 gallons per day. According to the well and septic fees adopted by San Mateo County for the 2017/2018 fiscal year, the permit and inspection fee for a standard system is $991, the site investigation fee is $1199, and the permit fee for septic tank replacement at the same location is $1046. (https://www.smchealth.org/pod/environmental-health-services-fees).

Table 9-3 shows unit cost estimates for installation of different elements of OWTS by homeowners, and the ongoing operation and maintenance (O&M) costs. Permit and design fees are an additional cost, on top of the construction cost, and may add $5,000 to $15,000 to the capital and O&M costs, which are usually within $44-$400 per year range or more for complicated designs (North Coast Water Board 2019). Other site preparation costs, such as tree removal, are site-specific but can increase costs significantly.

Table 9-3 Estimated Cost Range of Compliance Measures for Individual OWTS

Compliance Measures	Element	Capital Costs[a]
Septic system for a single home	Tank replacement	$2200 - $4500
	Leachfield replacement	$3300 - $7400
	Whole new standard gravity OWTS	$5600 - $10000
Replace/Upgrade sewer laterals	Burst pipe	$40-$80 per linear foot
	Slip-lining	$80-$170 per linear foot
	Cured-in-place pipe	$25-$65 per linear foot
	Modified cross section	$18-$50 per linear foot

a Sources of data:

U.S. EPA – US Environmental Protection Agency Technology Fact Sheets https://www.epa.gov/septic/decentralized-wastewater-systems-technology-fact-sheets,

SWRCB 2012 – State Water Resources Control Board Onsite Wastewater Treatment System Policy Final Substitute Environmental Document, June 19, 2012 Section 8. Pp.236-243 https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2012/0032sed.pdf

In the absence of a TMDL, the existing OWTS that do not meet requirements in the statewide Conditional Waiver of Waste Discharge Requirements (State Water Board 2012a) or the conditions and requirements set forth in an approved LAMP, may be required to submit a report of waste discharge, obtain a waste discharge requirements permit, and pay an annual fee for their OWTS. The cost of preparing a complete report of waste discharge will vary depending on whether the report is prepared by the property owner or a qualified professional, how much information is available to characterize the discharge and site conditions, and the site-specific conditions and constraints. The cost for a general site evaluation to obtain local agency approvals for a new or replacement OWTS is approximately $1000, and the preparation of a report of waste discharge by a qualified professional could cost from $2000 to $6000 (North Coast Water Board 2019). The application fee and first annual fee submitted to the Regional Water Board for waste discharge requirements is currently $2088 (Fiscal Year 2017-18). At present, we do not have the specific information from homeowners or the County regarding what subset of the OWTS located in close proximity to the creeks need repairs. However, nationwide surveys report that over 10 percent of OWTS are not functioning according to the design and might require repair.

9.3.3 Potential Costs for Pillar Point Harbor and Vessel Marinas

The Implementation Plan requires the Harbor District to submit a plan and an implementation schedule for evaluating and ensuring the adequacy and proper functioning of sewage collection systems (e.g., sewage dump stations, sewage pump-out stations, sewer lines, etc.) in Pillar Point Harbor. The results of a boating survey conducted in 2004 indicated that the existing sewage pump-out facility was sufficient to serve all boats in the marina, however, the survey did not consider the transient boats in the outer harbor.

The Richardson Bay Pathogens TMDL (2008) estimated the cost of installation of a dump station to range from $500 to $10000. It also estimated that installation of a pump-out station could range from $3000 to $20000 depending upon site conditions. After adjusting those numbers for inflation, those cost estimates would range from $585 to $11700, and $3510 to $23400, respectively.

Estimates for repair and maintenance for sewage dump stations range from $100 to $500 per year, and for sewage pump-out stations the range is from $100 to $2500 per year (CDBW 2004). After adjusting those numbers for inflation, those cost estimates would range from approximately $130 to $670 and $130 to $3340, respectively.

The cost of sewer lines inspection and repairs is discussed in section 9.3.1. The Marina Facility Condition Survey (2014) prioritized restrooms in Pillar Point Harbor for major maintenance and repairs. The estimated cost of the repairs per restroom was estimated at $150000.

9.3.4 Potential Costs to Control Bacteria in Urban Runoff

As discussed in Section 7.2.5, urban storm water runoff within the project area is regulated under conditions in the Municipal Regional Stormwater Permit. Under the terms of the Municipal Regional Stormwater Permit, Permittees responsible for municipal separate storm sewer systems (MS4) are required to identify tasks and programs to reduce the discharge of pollutants in storm water to the maximum extent practicable in a manner designed to achieve compliance with water quality standards and objectives. They also must develop and implement a Stormwater Management Plan and Monitoring Program, which includes ongoing costs for operations and maintenance, inspections, enforcement, staff training, public education and outreach, illicit connections, response and abatement, and effectiveness monitoring. The costs for implementing the Stormwater Management Plan and Monitoring Program are baseline program costs, which will be incurred by MRP Permittees with or without additional, incremental costs associated with a TMDL Implementation Plan to control fecal indicator bacteria.

The TMDL Implementation Plan requires the MRP Permittees to develop and implement BMPs to reduce the levels of bacteria in stormwater discharged to surface waters contributing to the beaches. It is anticipated that MRP Permittees will develop specific BMPs to control the sources of bacteria within their jurisdictions. Potential stormwater control measures are unknown at this time but include steps to detect and eliminate illicit discharges, pipe cleanups, littering control and pet waste elimination. Other TMDLs within the Region (e.g., the pathogen TMDLs for Napa River and Tomales Bay) have estimated that additional bacteria-specific control measures would result in a two to 15 percent increase to their annual MS4 program budget. Using this estimate, we can calculate a range of incremental costs for implementing MS4 bacteria-control measures. As an example, costs for the City of Half Moon Bay are expected to vary from $2000 to $12000. We expect that MRP Permittees that are already addressing fecal indicator bacteria issues would fall at the low end of the incremental cost increases.

Structural controls for nonpoint sources aim to divert, store, treat, or infiltrate stormwater to prevent the discharge of waste material to water bodies through stormwater runoff. Structural controls for point sources are implemented to treat waste before discharge or prevent a direct discharge of waste into water bodies, and include soil infiltration, rainfall harvest and reuse, and evaporative and biofiltration devices. The approximate costs associated with typical

structural BMPs that might be implemented in order to comply with the requirements of this TMDL project are listed in Table 9-4. The installation and 20-year operation and maintenance costs have been evaluated based on the assessment by Gray et al. (2013) conducted for Orange County, and adjusted for inflation. On an area basis, installation costs range from a low of $1 per square foot up to nearly $80 per square foot, except for green roofs. Infiltration and biofiltration BMPs are the least expensive BMPs to install and are reported to cost as little as $1 per square foot for generic biofiltration systems and swales. Infiltration BMPs including concrete pavers are somewhat more costly to install than biofiltration units, with trenches, curb-contained planters, and paver systems generally being the most expensive infiltration BMPs.

Table 9-4 Cost of Common Measures to Control Pollutants in Stormwater

Category	BMP Type	Cost $/square foot Low	Cost $/square foot High	Annual O&M[a] as percent of construction cost
Infiltration	Trench	$15	$47	5 to 20 percent
Infiltration	Planter	$27	$71	highly variable
Infiltration	Pervious concrete/joint pavers	$9	$41	1 to 2 percent
Green Roof	Filter, volume reduction	$8	$357	highly variable
Biofiltration	Biofilter and bioretention	$2	$76	1 to 11 percent
Biofiltration	Vegetated/ grass swale	$1	$45	4 to 7 percent

a 20-year operation and maintenance (O&M) costs of installing BMP

9.3.5 Potential Costs for Horse Establishments

Currently, the commercial horse facilities in the project watersheds are not regulated by the Regional Water Board. However, the TMDL implementation plan requires all such facilities to obtain coverage under the Regional Water Board's 2016 CAF Order. To do that, owners or operators of the horse facilities are required to submit a "Notice of Intent" that indicates their intent to obtain coverage under the Order and characterizes waste discharges and site conditions for their facilities. The cost for preparing a Notice of Intent will vary depending on whether the report will be prepared by the property owner or a qualified professional and how much information is available to characterize the discharge and site conditions. The application fee and first annual fee for small-scale animal operations is prescribed in California Code of Regulations, title 23, division 3, chapter 9, article 1, section 2200 (Annual Fee Schedules). For the fiscal year 2018/2019, the cost for a horse facility with up to 75 animals is a one-time application fee of $200, and no annual fees.

The CAF Order requires implementation of various BMPs to prevent the deposition or migration of animal waste to surface waters. The specific control measures will vary with the geography, pattern of animal use, and management practices. Estimates of potential cost for common bacteria control measures for CAF operations are listed in Table 9-5.

Table 9-5 Example Cost of BMPs for Confined Animal Facilities

Compliance Measure	Practice Name/Description	Cost Range
Use Exclusion	Forage exclusion	$0.64-$1.32 per foot [a]
Vegetated filter strips	Filter strip	$210-$448 per acre [a]
Stream buffer areas/Field borders	Field borders: riparian tree & shrub establishment; non- native or native seedbed preparation	$211-$1,617 per acre [a]
Fencing	Forage exclusion	$6 per foot [b]
Technical assistance	For permit application preparation, etc.	$1250 per day [b] $625 per half-day
Inspection	For Regional Water Board staff inspection of facilities	$625 per half-day [b]

a North Coast Water Board (2019)

b Water Board (2006), adjusted for inflation

9.3.6 Pet Waste Management

A successful pet waste management program is dependent of the participation and cooperation of individual pet owners. The cost of a public education program depends on the type of materials produced and the method of distribution. It is estimated that enforcement of litter and pet waste ordinances could cost about $12000 per year. However, implementation of a pet waste management program is an existing program under the MRP. Therefore, no new costs are anticipated to continue implementing this program beyond the installation of new trash receptacles and pet waste bag dispensers. The cost of a bag dispenser ranges from $100 to $200.

9.3.7 Cost Estimates for Surface Water Monitoring

Monitoring and reporting for indicator bacteria at ocean beaches, as required by the Health and Safety Code, is ongoing, and San Mateo County Health Department conducts year-round monitoring of *E. coli, Enterococcus* and Total Coliform weekly. Thus, the dischargers will incur no additional costs for monitoring water quality at beaches.

However, additional upland creek or storm drain monitoring may be needed to detect, identify and monitor sources of bacteria to the beaches, particularly in Frenchmans and Pilarcitos creeks which have large land areas discharging to Venice Beach. The specifics of this monitoring, such as the exact number of monitoring stations and the sampling frequency, have not yet been determined. For the purpose of the cost estimate, it is assumed that in addition to the existing water quality monitoring conducted at the beaches, up to 4 upland locations will also be monitored in each Creek draining to Venice Beach. Based on the prices for bacteriological analyses provided by a local laboratory, the cost per sample for analyzing *E. Coli* or *Enterococcus* is approximately $50. Assuming a monitoring frequency of 5 times a month for each monitoring site, twice a year, the annual cost for bacteriological analysis from creeks draining to Venice Beach is estimated at $4000. The cost of collecting and transporting samples, and the subsequent reporting and uploading of data to a certified

database is approximately $900 per sampling event. This estimate is based on traveling of 80 miles and a mileage reimbursement of $0.60 per mile, collection cost for a two-person team of $750, and a reporting cost of $100 per sampling event.

Because the Ox Mountain Sanitary Landfill already conducts quarterly monitoring in the receiving waters to demonstrate compliance with the effluent limitations, discharge specifications, and other requirements of the NPDES order, the cost of additional *E. coli* monitoring will be small and limited to the laboratory analysis. The cost of quarterly monitoring at three locations in Corinda Los Trancos Creek is about $600 per year.

9.4 Potential Sources of Funding

There are several potential sources of public financing through grant and loan funding programs administered, at least in part, by the Regional Water Board and the State Water Board. The Division of Financial Assistance (DFA) administers the implementation of the State Water Board financial assistance programs that include loan and grant funding for project planning, construction of municipal sewage and water recycling facilities, remediation of underground storage tank releases, watershed protection projects, and nonpoint source pollution control projects.

The resources available through these programs vary over time depending upon federal and state budgets and ballot propositions approved by voters. State funding programs pertinent to the proposed project are summarized and described below.

9.4.1 Clean Beaches Initiative Grant Program - Superseded by Proposition 1

After approval of *Proposition 1* in 2014, a stormwater grant program (SWGP) was created with a budget of approximately $200 million in grant funds for multi-benefit storm water management projects. Funds remaining in the *Clean Beaches Initiative Grant Program* were incorporated into the *Proposition 1* SWGP at that time. Funding is available for projects that contribute to improved storm water resources management, including resource plan development initiatives, storm water capture projects, stormwater treatment facilities, and other forms of green infrastructure. The purpose of the *Proposition 1* SWGP is to fund projects improving water quality and realizing multiple benefits from the use of storm water and dry weather runoff as a resource. The match requirements are 50 percent of total project costs. The State Water Board administers the program.

9.4.2 Clean Water State Revolving Fund

The Federal Clean Water Act provides for establishment of a Clean Water State Revolving Fund (CWSRF) program. The program is funded by federal grants, State funds, and revenue bonds. The purpose of the CWSRF program is to implement the CWA and various State laws by providing financial assistance for the construction of facilities or implementation of measures necessary to address water quality problems, and to prevent pollution of the waters of the State, including federal waters.

In 2014, California voters passed the Water Quality, Supply, and Infrastructure Improvement Act of 2014 (Proposition 1; Prop 1), which authorized $7.545 billion in general obligation bonds for water projects including surface and groundwater storage, ecosystem and watershed protection and restoration, and drinking water protection. The State Water Board administers *Proposition 1* grants for five programs: Small Community Wastewater, Water Recycling, Drinking Water, Stormwater, and Groundwater Sustainability. For small community

wastewater projects, *Proposition 1* allocates $260 million to the CWSRF Small Community Grant (SCG) Fund. The State Water Board has an annual SCG appropriation of $8 million dollars, which is administered consistent with the CWSRF Intended Use Plan (IUP), and the CWSRF Policy. Administering these funds as a part of the CWSRF Program allows grant funds to be easily leveraged with low-interest financing available through the CWSRF Program. CWSRF applications are accepted on a continuous basis, and eligible projects are funded as applications are completed and approved.

In addition to capital projects, up to 15 percent of the funds available from Prop 1 is allocated to a multi-disciplinary technical assistance (TA) program. The Prop 1 TA Funding Plan (Plan) was adopted by the State Water Board on November 4, 2015. The TA efforts are focused on helping small disadvantaged communities develop, fund, and implement capital improvement projects.

9.4.3 Nonpoint Source Implementation Grants (319 Program)

This program is a federally funded nonpoint source pollution control program that is focused on controlling activities that impair beneficial uses and on limiting pollutant effects caused by those activities. The 319(h) grant program offers funds to non-profit organizations, government agencies including special districts, and educational institutions. Specific nonpoint source activities that are eligible for 319(h) funds may include, but are not limited to: the implementation of best management practices for agricultural drainage; physical habitat alteration; channel stabilization; sediment control; hydrologic modification; livestock grazing; irrigation water management; and confined animal facilities management. Other eligible activities include: technology transfer; groundwater protection; pollution prevention; technical assistance; facilitation of citizen monitoring; and facilitation of education elements of projects.

More information is available from the State Water Resources Control Board site at https://www.waterboards.ca.gov/water_issues/programs/nps/319grants.html

9.4.4 Proposition 84 Stormwater Grant Program

The Public Resources Code requires that *Proposition 84* SGP funds be used to provide matching grants to local public agencies for the reduction and prevention of stormwater contamination of rivers, lakes, and streams. The Legislature may enact legislation to further define this grant program.

Assembly Bill 739 requires the development of project selection and evaluation guidelines for the Proposition 84 SWGP and provides additional information regarding the types of projects eligible for funding. Assembly Bill 739 also requires creation of a Stormwater Advisory Task Force that will provide advice to the State Water Board on its Stormwater Management Program, which may include program priorities, funding criteria, project selection, and interagency coordination of State programs that address stormwater management.

9.4.5 Other Sources of Funding for Growers, Ranchers, and Landowners

The United States Department of Agriculture has a wide variety of financial support programs that provide assistance to agricultural producers to help plan and implement conservation practices that address natural resource concerns, and for opportunities to improve soil, water, plant, animal, air and related resources on agricultural land and non-industrial private forestland.

The Resource Conservation Districts (RCDs) can provide access to and/or facilitate a landowner's application for federal cost-share assistance through various local, state, and federal funding programs. For certain projects the RCD may also be able to apply for other grant funds on behalf of a cooperating landowner, grower, or rancher. For more information, please see the San Mateo Resource Conservation District's website at http://www.sanmateorcd.org

9.5 Scientific Peer Review

This draft Report conforms with the Section 57004 of the California Health and Safety Code which requires external scientific peer review of the scientific basis for any rule proposed by any board, office or department within California Environmental Protection Agency. Based on the interpretation of Health and Safety Code, section 57004 and APM Section 8, III. D., we have determined that the proposed Basin Plan amendment to establish a bacteria TMDL for Pillar Point Harbor and Venice Beach does not contain new science that would require a peer review. The proposed amendment is an application of earlier, extensively peer-reviewed TMDLs, such as Richardson Bay (2009), San Pedro Creek and Pacifica State Beach (2013), and San Francisco Bay Beaches (2017) TMDLs. Specifically, the TMDL targets are consistent with the U.S. EPA 2012 Recreational Water Quality Criteria, which underwent extensive internal, external and public review process, and are based on the State-wide bacteria provisions in the Water Quality Control Plan for Inland Surface Water and Enclosed Bays and Estuaries of California, adopted in 2018 (SWRCB 2018).

The proposed amendment does not depart from the scientific approach of other Basin Plan amendments from which it is derived. Therefore, the proposed amendment has already satisfied the peer review requirement of Health and Safety Code §57004, and no additional peer review is needed.

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