APPENDIX P

2023 RHMP HISTORICAL BACTERIA ANALYSIS REPORT

2023 SAN DIEGO REGIONAL HARBOR MONITORING PROGRAM

HISTORICAL BACTERIA ANALYSIS

Submitted to:

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Sustainability & Innovation
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And Partner Agencies:
City of San Diego, City of Oceanside, and County of Orange

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ACRONYMS AND ABBREVIATIONS

=	equal to
>	greater than
>=	greater than or equal to
<	less than
%	percent
303(d) List	Clean Water Act Section 303(d) List of Water Quality Impaired Segments
AB411	California Assembly Bill 411
CFU	colony-forming unit(s)
CFU/100 mL	colony-forming unit(s) per 100 milliliters
ddPCR	droplet digital polymerase chain reaction
FIB	fecal indicator bacteria
GM	geometric mean
ISWEBE Plan	Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California
mL	milliliter(s)
MPN	most probable number
MPN/100 mL	most probable number per 100 milliliters
OCHCA	County of Orange Health Care Agency
REC-1	water contact recreation beneficial use
RHMP	San Diego Regional Harbor Monitoring Program
RHMP Agencies	Port of San Diego, City of San Diego, City of Oceanside, and County of Orange
San Diego Regional Harbors	Dana Point Harbor, Oceanside Harbor, Mission Bay, and San Diego Bay
SDDEHQ	County of San Diego Department of Environmental Health and Quality
SDRWQCB	San Diego Regional Water Quality Control Board
SHELL	shellfish harvesting beneficial use
STV	statistical threshold value
SWRCB	California State Water Resources Control Board
TMDL	total maximum daily load
Wood	Wood Environment & Infrastructure Solutions, Inc.
WQIP	Water Quality Improvement Plan
WQO	water quality objective

1.0 INTRODUCTION

The San Diego Regional Harbor Monitoring Program (RHMP) was developed by the Port of San Diego, City of San Diego, City of Oceanside, and County of Orange (RHMP Agencies) in response to a July 24, 2003, request by the San Diego Regional Water Quality Control Board (SDRWQCB) under Section 13225 of the California Water Code. The RHMP is a comprehensive effort to survey the water quality, sediment quality, and aquatic life in Dana Point Harbor, Oceanside Harbor, Mission Bay, and San Diego Bay (San Diego Regional Harbors) and determine whether beneficial uses are being protected and attained in these harbors. The program is composed of a core chemical, biological, and toxicological monitoring program supplemented by focused special studies. Monitoring occurs once every 5 years and is designed to address the following five core questions regarding the status and trends in the harbors:

1. What are the contributions and spatial distributions of inputs of pollutants to the harbors?
2. Do the waters and sediments in the harbors sustain healthy biota?
3. What are the long-term trends in water and sediment quality in the harbors?
4. Are the waters in the harbors safe for body contact activities?
5. Are fish in the harbors safe to eat?

This report aims to address the fourth core question: Are the waters in the harbors safe for body contact activities? To address this question, fecal indicator bacteria (FIB) data from the San Diego Regional Harbors from November 1, 2018, through October 31, 2023, were compiled for a *post hoc* analysis to address the following specific study questions:

1. What are the extent and magnitude of FIB concentrations in the receiving waters of the San Diego Regional Harbors?
2. What are the historical trends for FIB concentrations throughout the harbors?

FIB concentrations in each harbor were compared with water quality objectives (WQOs) for the water contact recreation (REC-1) beneficial use to evaluate whether waters are safe for human body contact.

Background

During the 2008 RHMP, a set of water grab samples was collected at each of the 75 monitoring locations in the San Diego Regional Harbors. The samples were analyzed for total coliform, fecal coliform, and *Enterococcus*, along with a suite of chemical constituents. To address the RHMP core question related to human water contact recreation, FIB concentrations were compared with WQOs in accordance with California Assembly Bill 411 (AB411), which mandates weekly testing for FIB from April 1 through October 31 for all California beaches adjacent to a storm drain that flows in the summer and visited by at least 50,000 people annually. FIB levels did not exceed the AB411 single-sample maximum thresholds of 10,000 total coliforms per 100 milliliters (mL), 400 fecal coliforms per 100 mL, or 104 enterococci per 100 mL in any of the samples collected during the 2008 RHMP, and FIB concentrations in most of the samples were below detection limits. Total coliforms, fecal coliforms, and enterococci were detected at only 25%, 8%, and 4%

of the monitoring locations, respectively, (Weston Solutions, Inc., 2010) at concentrations below the AB411 WQOs.

Because of the transient and variable nature of FIB, sampling only once in a 5-year period, as in the 2008 RHMP, does not capture sufficient information to assess the overall water quality in relation to the REC-1 beneficial use. Because of these limitations, the RHMP Agencies and the SDRWQCB agreed to eliminate the FIB testing component from the 2013 RHMP, while directed efforts by the RHMP Agencies in support of total maximum daily loads (TMDLs) and beach water quality monitoring programs continued. These long-term monitoring programs are designed to collect data that more appropriately evaluate the safety of waters for human body contact.

In 2018, the SDRWQCB requested that an assessment of human health risk related to the REC-1 beneficial use be reincorporated into the 2018 RHMP. Sampling and analysis of FIB on a regular basis provides a much more informative and accurate assessment of FIB extent, magnitude, and trends compared with a single set of samples collected every 5 years. To provide a more robust assessment of whether the harbor waters are safe for human body contact, historical FIB data collected by the RHMP Agencies and others in the San Diego Regional Harbors were compiled and summarized in a technical report (Wood Environment & Infrastructure Solutions, Inc. [Wood], 2020). The analysis included data collected during dry and wet weather from November 1, 2008, through October 31, 2018, at beaches throughout the San Diego Regional Harbors where REC-1 activity is common. This *post hoc* analysis was performed in lieu of collecting a single grab sample for FIB analysis at each monitoring location during the RHMP core monitoring.

For the 2023 RHMP, a similar *post hoc* analysis was performed using FIB data collected since the most recent RHMP (November 1, 2018, through October 31, 2023), as presented in this report.

2.0 DATA COMPILATION METHODS AND ANALYSIS

This section describes the methods used to compile, analyze, and present the historical FIB data from the San Diego Regional Harbors, including data sources and assumptions.

2.1 Data Compilation Methods

Historical FIB receiving water data for the San Diego Regional Harbors were compiled from the RHMP Agencies' beach water quality programs for both summer and winter seasons, using the AB411 definition of the summer season as April 1 through October 31 and the winter season as November 1 through March 31. The summer season represents the period of peak recreational beach use and is characterized by warmer, drier conditions, as approximately 80% of annual precipitation in the San Diego region occurs during the winter months (November through March; https://www.weather.gov/wrh/climate?wfo=sgx).

As available, FIB data were compiled from November 1, 2018, through October 31, 2023, to capture the 5-year period from the previous 2018 RHMP through the end of the summer season following the 2023 RHMP field efforts. These recent data were used to evaluate the current extent and magnitude of FIB throughout the San Diego Regional Harbors. Data were also compared with historical data from 2008 through 2018 that were compiled for the 2018 RHMP historical bacteria analysis (Wood, 2020) to evaluate historical trends.

Post hoc analysis focused on *Enterococcus* as the primary indicator bacteria to reflect the latest WQOs in the Bacteria Provisions for the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California (ISWEBE Plan; SWRCB, 2019). These provisions identify *Enterococcus* as the most appropriate FIB for the enclosed bays that characterize the San Diego Regional Harbors.

2.1.1 Data Sources

Historical FIB data were compiled using the following sources and methods:

- **Dana Point Harbor:** County of Orange Health Care Agency (OCHCA) Environmental Health Ocean Water Protection Program (OCHCA, 2024; https://ocbeachinfo.com/data/)
    - Data were compiled by selecting the appropriate monitoring years, downloading the data to Microsoft Excel, and filtering for the relevant monitoring locations.
- **Oceanside Harbor:** Oceanside Watershed Protection Program
    - Data were obtained directly from the City of Oceanside via a data request.
- **Mission Bay and San Diego Bay:** County of San Diego Department of Environmental Health and Quality (SDDEHQ) Beach & Bay Water Quality Program (SDDEHQ, 2024; http://www.sdbeachinfo.com/; SWRCB, 2024a; https://www.waterboards.ca.gov/water_issues/programs/beaches/search_beach_mon.html)
    - Data were obtained by searching the database using the following parameters: "San Diego" for the County Name field and "All" for the Station Name, Parameter,

Qualifier, Analysis Method[1], Result Entered, and Year fields. The resultant data were downloaded to Microsoft Excel and filtered for the relevant years and monitoring locations.

Only data from monitoring locations within Dana Point Harbor, Oceanside Harbor, Mission Bay, and San Diego Bay were used for the subsequent data analysis.

In total, 5,297 *Enterococcus* data points were compiled from the 5-year period from November 1, 2018, through October 31, 2023. Table 2-1 lists the sample counts by harbor and season for each monitoring year. Figures 2-1a through 2-1e show the monitoring locations in each of the San Diego Regional Harbors. Maps include current monitoring locations sampled in the past 5 years (yellow circles) and historical monitoring locations sampled only from 2008 through 2018 (gray squares). Note that some locations were monitored for only a portion of the time period included in the current analysis. Appendix A provides a full breakdown of coordinates, sampling dates, and sample counts for each monitoring location within the San Diego Regional Harbors.

[1] Samples collected in Mission Bay and San Diego Bay for the SDDEHQ Beach & Bay Water Quality Program were analyzed using traditional culture methods and/or droplet digital polymerase chain reaction (ddPCR) methods. Only *Enterococcus* data collected using traditional culture methods were included in the analysis in this report, as discussed in Section 2.2.

Table 2-1.
***Enterococcus* Sample Counts by Harbor and Season**
(2018/2019–2022/2023 Monitoring Years)

Harbor	Number of Monitoring Locations	Monitoring Year	Sample Count		
			Winter	Summer	Total
Dana Point Harbor	11	2018/2019	176	357	533
		2019/2020	202	284	486
		2020/2021	211	314	525
		2021/2022	218	346	564
		2022/2023	139	390	529
		Total	**946**	**1,691**	**2,637**
Oceanside Harbor	6	2018/2019	0	3	3
		2019/2020	0	0	0
		2020/2021	0	3	3
		2021/2022	3	0	3
		2022/2023	3	0	3
		Total	**6**	**6**	**12**
Mission Bay	19	2018/2019	50	561	611
		2019/2020	99	467	566
		2020/2021	111	416	527
		2021/2022	96	32	128
		2022/2023	0	10	10
		Total	**356**	**1,486**	**1,842**
North San Diego Bay [a]	2	2018/2019	25	76	101
		2019/2020	38	65	103
		2020/2021	33	56	89
		2021/2022	38	80	118
		2022/2023	25	60	85
		Total	**159**	**337**	**496**
South San Diego Bay [a]	3	2018/2019	5	68	73
		2019/2020	29	93	122
		2020/2021	11	83	94
		2021/2022	17	4	21
		2022/2023	0	0	0
		Total	**62**	**248**	**310**
All Harbors	**41**	**Total**	**1,529**	**3,768**	**5,297**

Notes:
a. In the RHMP Core Monitoring Report (WSP USA Inc., 2026), San Diego Bay was divided into three regions (north, central, and south). However, because of the limited number of monitoring locations for bacteria in Central San Diego Bay (one station in Glorietta Bay, EH-080), monitoring locations south of the Coronado Bridge were categorized as "South San Diego Bay" for the purposes of this historical bacteria analysis (see Figures 2-1d and 2-1e).

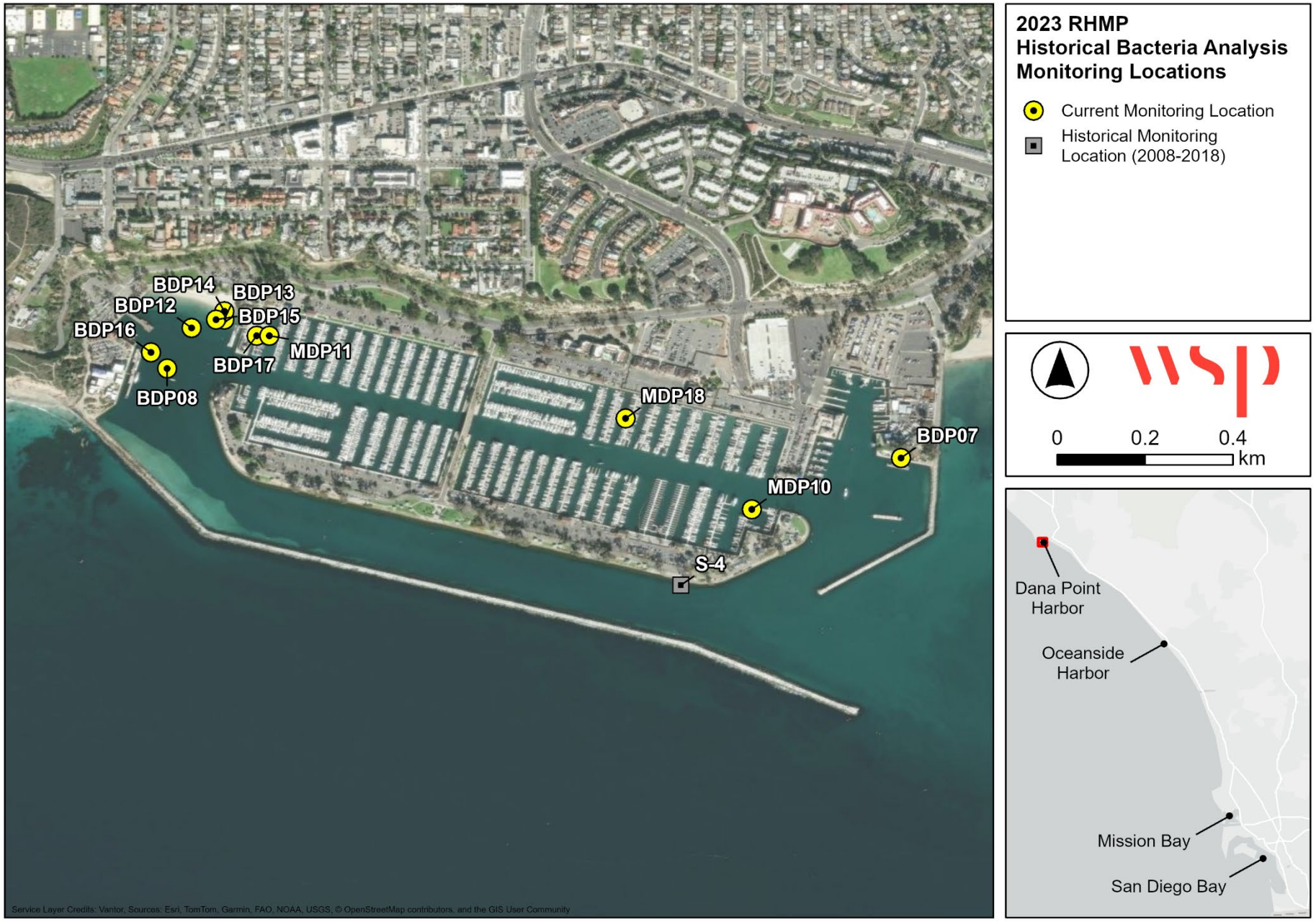

Figure 2-1a. Bacteria Monitoring Locations in Dana Point Harbor

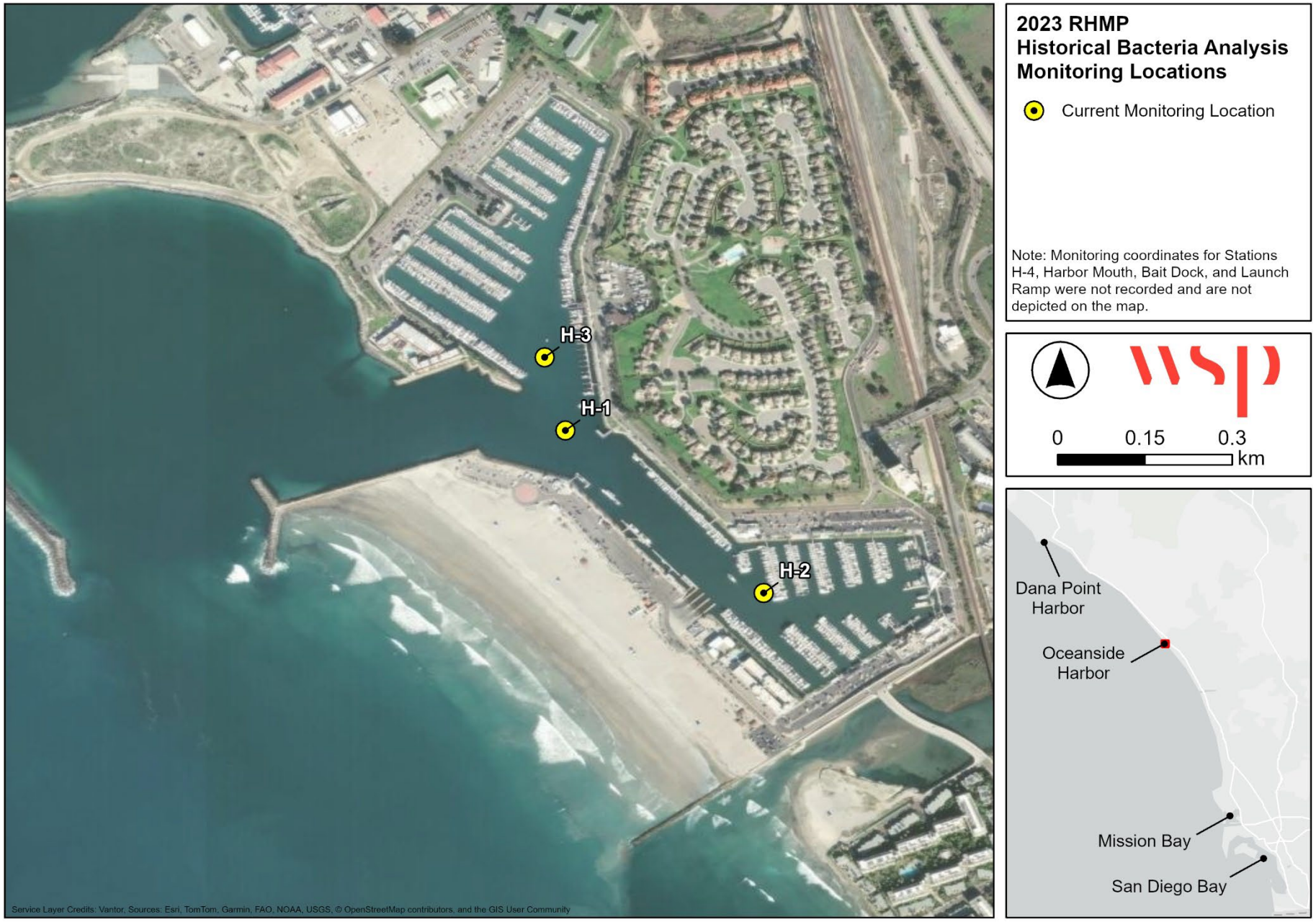

Figure 2-1b. Bacteria Monitoring Locations in Oceanside Harbor

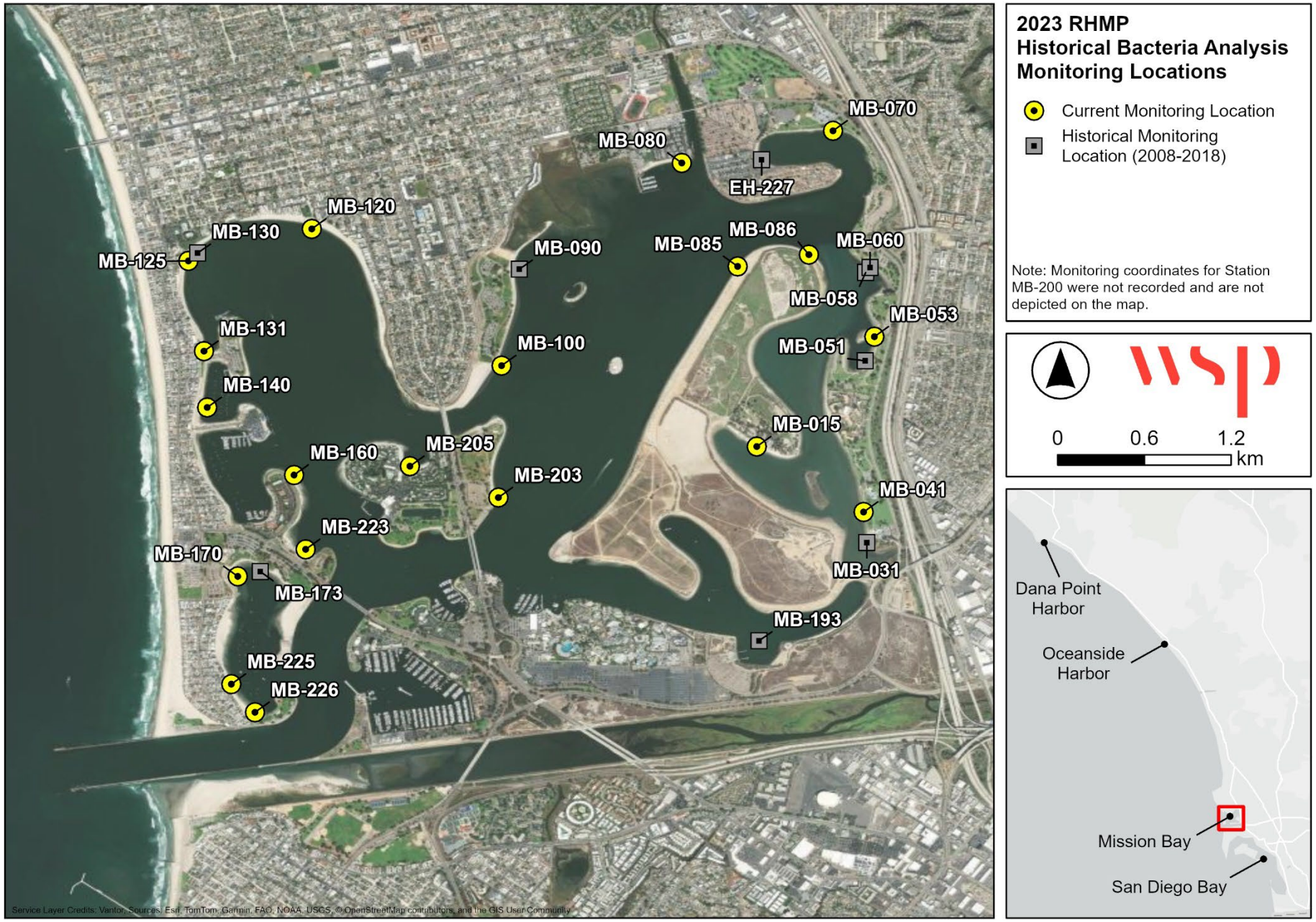

Figure 2-1c. Bacteria Monitoring Locations in Mission Bay

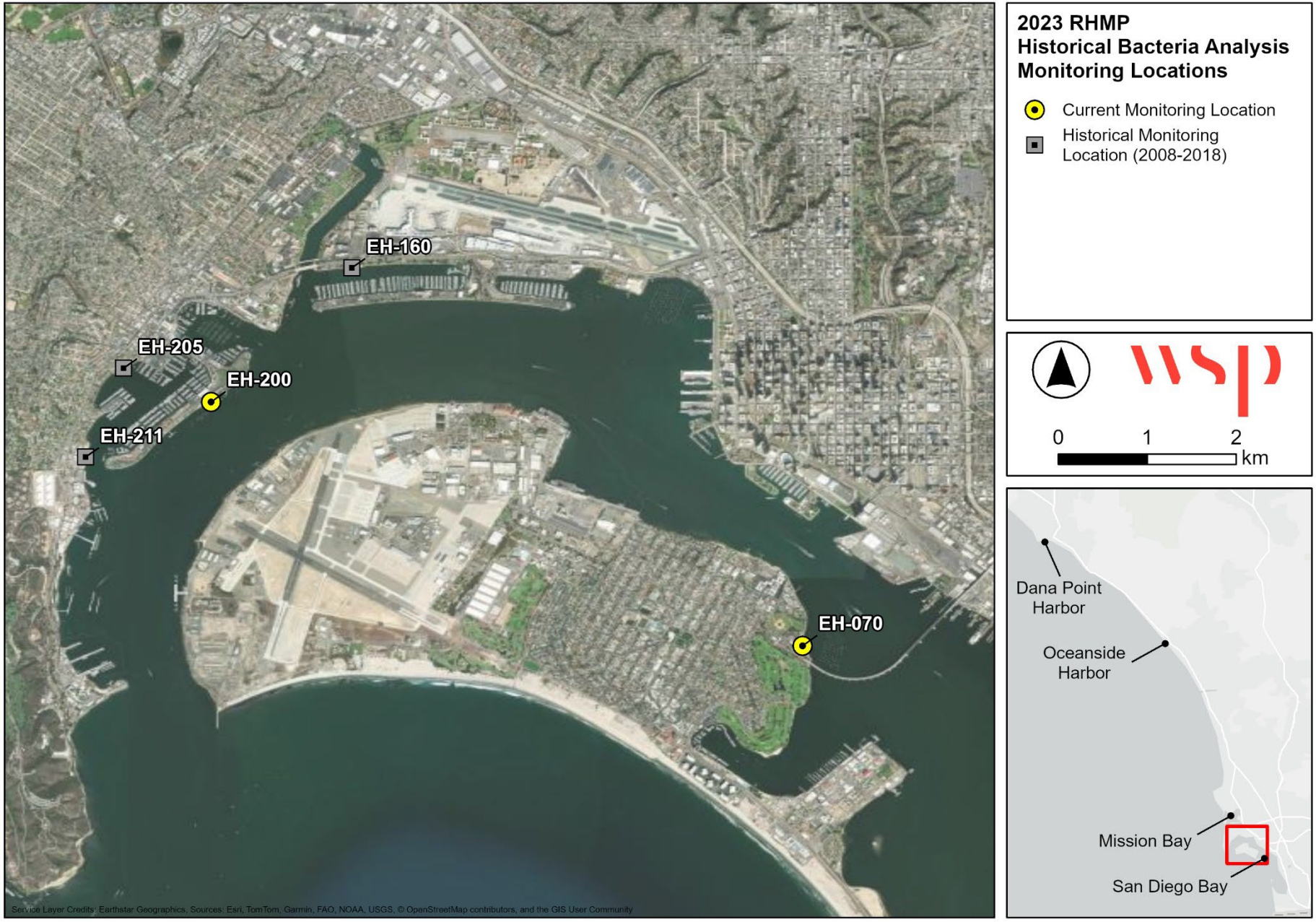

Figure 2-1d. Bacteria Monitoring Locations in North San Diego Bay

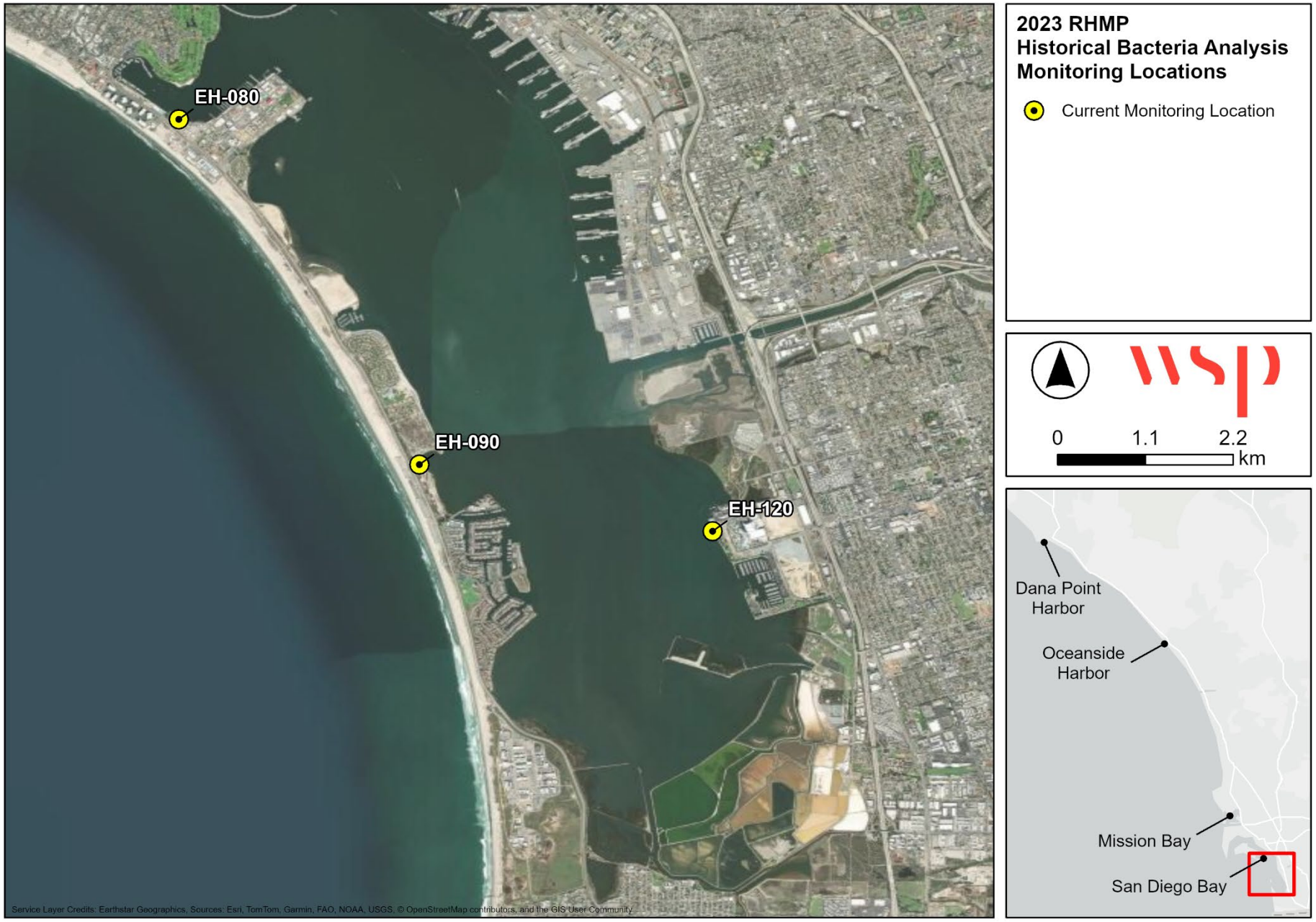

Figure 2-1e. Bacteria Monitoring Locations in South San Diego Bay

2.1.2 Assumptions

Because of inconsistencies among data from different sources, several assumptions were made during data processing and analysis, as described in this section.

Units

Bacteria data are commonly reported in units of either most probable number (MPN) or colony forming units (CFU) depending on the analysis method. MPN results represent a statistical estimate of the most probable number of bacteria (e.g., multiple-tube fermentation method), and CFU results represent an actual count of bacterial colony-forming units on a plate or film (e.g., membrane filtration method). These units are assumed to be equivalent for regulatory analysis and compliance in California.

Approximately one-half of the historical *Enterococcus* data compiled from the San Diego Regional Harbors were reported in MPN per 100 milliliters (MPN/100 mL), and the other half were reported in CFU per 100 milliliters (CFU/100 mL). For the current analysis, one MPN/100 mL and one CFU/100 mL were assumed to be equivalent. Data reported as MPN and CFU were pooled for analysis and reported as "density."

Non-Detects

Enterococcus results that were below the detection limit (non-detects), reported as zero, or accompanied by a less than (<) qualifier were included in calculations as one-half of the method detection limit. This method is a conservative approach that is commonly used for environmental data analysis, including for bacteria (see the California Surface Water Ambient Monitoring Program methods for additional guidance: https://www.waterboards.ca.gov/water_issues/programs/swamp/docs/cwt/guidance/3413.pdf).

Other Qualifiers

Enterococcus results with the following qualifiers were included in calculations as the reported value: "=" (equal), "E" (estimated), ">" (greater than), and ">=" (greater than or equal to).

Wet and Dry Weather Samples

AB411 monitoring occurs during the summer from April 1 through October 31 and, therefore, samples are typically collected during dry weather conditions. However, other monitoring programs (e.g., TMDL, Swimmable Waters) also collect FIB data during the winter, which may include samples collected during both wet weather and dry weather conditions. Limited information was available regarding the weather conditions during sample collection. Therefore, all results were included in the analysis as reported, and data were analyzed based on season (depending on the sampling date) rather than weather condition.

Monitoring Locations with Multiple Samples Collected on a Given Date

In some cases, two or more results were reported for a monitoring location on a given date. Limited information was available regarding the sample collection methodology (e.g., duplicate, replicate, or follow-up samples). Therefore, all results were included in the analysis as reported, unless otherwise noted in the assumptions.

Follow-Up Samples

In some cases, follow-up samples were taken if *Enterococcus* densities exceeded REC-1 WQOs at a given monitoring location to determine when waters are safe for contact. As described above, limited information was available regarding the sample collection methodology, so it was not possible to identify follow-up samples in the data set. Therefore, all sampling results, including those for any potential follow-up samples, were included in the analysis. Note that inclusion of results for follow-up samples tends to give more weight to samples with elevated bacteria densities.

2.2 Analysis Methodology

In 2018, the SWRCB adopted Bacteria Provisions for the ISWEBE Plan (SWRCB, 2019) to reflect best available science. *Enterococcus* was identified as the applicable FIB for saline enclosed bays characteristic of the San Diego Regional Harbors. As such, *Enterococcus* is the focus of the analysis presented in this report.

In Dana Point Harbor and Oceanside Harbor, the samples included in the analysis were analyzed for *Enterococcus* using traditional culture methods (e.g., multiple-tube fermentation, enzyme substrate, or membrane filtration). Samples collected in Mission Bay and San Diego Bay were analyzed using traditional culture methods and/or droplet digital polymerase chain reaction (ddPCR) methods. Beginning in May 2022, SDDEHQ began using the ddPCR method for *Enterococcus* analysis for the Beach & Bay Water Quality Program in San Diego County. This method provides more rapid, same-day FIB results in comparison with traditional culture methods, which require 24 to 72 hours to obtain results.

For the purposes of this report, only *Enterococcus* data collected using traditional culture methods were included in the analysis to ensure consistency with historical data collected throughout the San Diego Regional Harbors and to allow for comparison with the current REC-1 WQOs in the ISWEBE Plan. *Enterococcus* densities were compared with WQOs for the 6-week geometric mean (GM) and statistical threshold value (STV).

2.2.1 *Enterococcus* 6-week Geometric Mean

The ISWEBE Plan (SWRCB, 2019) REC-1 WQO for the 6-week GM is as follows:

> *For all waters where the salinity is greater than 1 part per thousand more than 5 percent of the time during the calendar year: a 6-week rolling GM of enterococci is not to exceed 30 CFU/100 mL, calculated weekly.*

A GM was calculated for every sampling date from November 1, 2018, through October 31, 2023. For the purposes of this report, the GM calculations included data collected from 6 weeks prior to each sampling date, regardless of sample count.

2.2.2 *Enterococcus* Statistical Threshold Value

The ISWEBE Plan (SWRCB, 2019) REC-1 WQO for the STV is as follows:

> *For all waters where the salinity is greater than 1 part per thousand more than 5 percent of the time during the calendar year: a STV of 110 CFU/100 mL is not to be exceeded by more than 10 percent of samples collected in a calendar month, calculated in a static manner.*

For the purpose of this report, the percentage of samples for which the *Enterococcus* density exceeded the STV was calculated for each harbor by season (winter or summer), rather than by calendar month. Given the large 15-year dataset and high temporal variability frequently observed for bacteria density, this combined approach provides a more robust summary for comparison purposes focusing on entire seasons when direct human exposure in bays and harbors is more likely (summer) versus less likely (winter). Use of the STV versus the 6-week geomean also provides a more transparent evaluation showing transient short-term spikes in density that can also have a substantial influence on geomean calculations. Box plots presented in Section 3.0 show the 90th percentile as the upper whisker to indicate whether greater or less than 10% of the samples collected during a given season (e.g., 2018/2019 winter, 2020/2021 summer) had *Enterococcus* densities that exceeded the STV. For example, if the 90th percentile fell below 110 CFU/100 mL, at least 90% of samples collected during that season had *Enterococcus* densities below the STV.

2.3 Data Availability and Quality

As discussed in Section 2.2, SDDEHQ began using the ddPCR method for *Enterococcus* analysis for the Beach & Bay Water Quality Program in San Diego County in May 2022. As such, limited *Enterococcus* data collected using traditional culture methods were available for Mission Bay and San Diego Bay after May 2022. In addition, winter and/or summer season data were not available for all monitoring locations and monitoring years for the following reasons:

- Winter sampling may not have occurred at some locations because AB411 requires sampling only during the summer.
- Drought conditions throughout the state of California may have prohibited winter wet weather sampling during those years because of the lack of rainfall (e.g., 2013/2014 and 2017/2018).
- Changes in regulatory status at some monitoring locations may have activated or deactivated sample collection.
- Special studies at some monitoring locations may have been conducted for shorter time periods.

Despite the limited availability of data for some monitoring locations and monitoring years, sufficient data were available to evaluate general spatial and temporal trends in *Enterococcus* densities throughout the San Diego Regional Harbors.

In addition, the data analysis assumptions used in this report facilitated a better understanding of the extent, magnitude, and trends in *Enterococcus* densities, but not all data used were collected or analyzed under AB411 and ISWEBE data requirements for regulatory compliance. In particular, depending on the monitoring location, dates, and program requirements for the data collected, it was not possible in many cases to calculate the GM using the minimum number of samples required. Even so, given the large amount of data available for the evaluation, this deviation is not expected to have a considerable impact on the high-level conclusions.

2.4 Data Presentation

The four harbors monitored under the RHMP are all semi-enclosed embayments in southern California, but each has its own unique set of characteristics that are important to consider when interpreting data and making comparisons among them. Geography and both current and historical uses have considerable influence on water quality conditions. As such, results are presented separately for each individual harbor. San Diego Bay was further divided into north and south regions[2] because of the size and geographic diversity of this large water body.

Enterococcus results from 2018 through 2023 are summarized in tables for each harbor to evaluate recent conditions since the previous RHMP. These data are compared with the current ISWEBE WQOs for the STV and 6-week GM. Use of GMs calculated over a 6-week timeframe assesses the central tendency of a data set and information about general or seasonal variability in FIB conditions and potential risk to human health for REC-1 activities. The STV is used to help identify acute spikes of FIB densities, providing information about specific instances in which WQO exceedances occurred. Evaluating the GM and STV provides a more accurate representation of both chronic (GM) and acute (STV) exceedances of FIB WQOs in water bodies.

For historical comparisons, *Enterococcus* results from 2008 through 2023 are presented in box plots for each harbor by season (winter and summer) for the 6-week GM and STV. Plots for the 6-week GM include *Enterococcus* GMs calculated for each sampling date. Note that for data collected prior to the 2018/2019 monitoring year (i.e., before November 1, 2018), GMs were calculated for 30-day periods rather than 6-week periods for consistency with the historical WQOs. A comparison of WQO exceedance rates using 30-day and 6-week GMs for the 2017/2018 monitoring year yielded similar results, indicating that both are suitable for evaluating historical trends (Wood, 2020). Plots for the STV include raw *Enterococcus* results.

Box plots show the median value (horizontal line) and 25th and 75th percentiles (represented by the colored box). For the 6-week GM box plots, whiskers represent the minimum and maximum values. For the STV box plots, whiskers represent the 10th and 90th percentiles. The applicable WQO (6-week GM or STV) is plotted as a horizontal dashed line on all figures for comparison.

[2] In the RHMP Core Monitoring Report (WSP USA Inc., 2026), San Diego Bay was divided into three regions (north, central, and south). However, because of the limited number of monitoring locations for bacteria in Central San Diego Bay (one station in Glorietta Bay, EH-080), monitoring locations south of the Coronado Bridge were categorized as "South San Diego Bay" for the purposes of this historical bacteria analysis.

3.0 RESULTS

Bacteria analysis results are presented in this section for each of the San Diego Regional Harbors, including an assessment of the current extent and magnitude of FIB based on data collected from 2018 through 2023 and an evaluation of historical trends using data from 2008 through 2023. A summary of WQO exceedances by individual monitoring location is provided in Appendix B.

3.1 Dana Point Harbor

Enterococcus densities in Dana Point Harbor were below both the 6-week GM and STV WQOs in over 90% of samples collected during both the winter and summer seasons from 2018 through 2023, with densities below detection limits in approximately 61% of samples (Table 3-1). From 2008 through 2023, median raw *Enterococcus* densities ranged from 4 to 8 CFU/100 mL in the summer and from 5 to 38 CFU/100 mL in the winter (Figure 3-1b). Densities of *Enterococcus* decreased slightly over time, particularly during the winter, with lower medians and less variability in *Enterococcus* densities in the 2015/2016 through 2022/2023 monitoring years (Figures 3-1a and 3-1b). Historically, *Enterococcus* densities were higher in the winter than in the summer; however, densities in recent years (2015/2016 through 2022/2023) were more similar across seasons (Table 3-1; Figures 3-1a and 3-1b).

Table 3-1.
6-Week Geometric Mean and STV WQO Exceedances for *Enterococcus* in Dana Point Harbor (2018/2019–2022/2023 Monitoring Years)

Metric	Winter (n=946)	Summer (n=1,691)	All Seasons (n=2,637)
% of Non-Detect Sample Results	62%	60%	61%
% of Samples with *Enterococcus* Concentrations Exceeding the 6-Week GM WQO (30 CFU/100 mL)	5%	7%	6%
% of Samples with *Enterococcus* Concentrations Exceeding the STV (110 CFU/100 mL)	3%	5%	4%

Notes:
% = percent; CFU/100 mL = colony-forming unit(s) per 100 milliliters; GM = geometric mean; n = sample count; STV = statistical threshold value; WQO = water quality objective

Most of the *Enterococcus* WQO exceedances in Dana Point Harbor were observed at Baby Beach (Stations BDP12, BDP13, BDP14, and BDP15) and at M Dock in the east basin (Station MDP18; Figure 2-1a; Appendix B). These results are consistent with results from 2008 through 2018 (Wood, 2020). A TMDL was adopted for indicator bacteria at Baby Beach in 2008 (Resolution R9-2008-0027; SDRWQCB, 2008). Since the time of adoption of the TMDL, water quality at Baby Beach has improved substantially following the implementation of multiple strategies, including surveying sewage collection infrastructure, applying source control measures, and performing microbial source identification. These efforts have led to a decline in the number of health advisory postings for high bacteria concentrations; excellent “grades” on the Heal the Bay Annual Beach Report Card; and delisting of Baby Beach from the Clean Water Act Section 303(d) List of Water Quality Impaired Segments (303(d) List) for fecal coliform and

Enterococcus in the 2010 and 2014/2016 cycles, respectively (County of Orange and City of Dana Point, 2024).

The following sources provide additional information on historical trends and the extent and magnitude of FIB at Baby Beach and in Dana Point Harbor: OCHCA Annual Ocean, Harbor, and Bay Water Quality Reports (OCHCA, 2026), South Orange County Water Quality Improvement Plan (WQIP) Annual Reports (County of Orange Public Works, 2026), and Heal the Bay Annual Beach Report Cards (Heal the Bay, 2026).

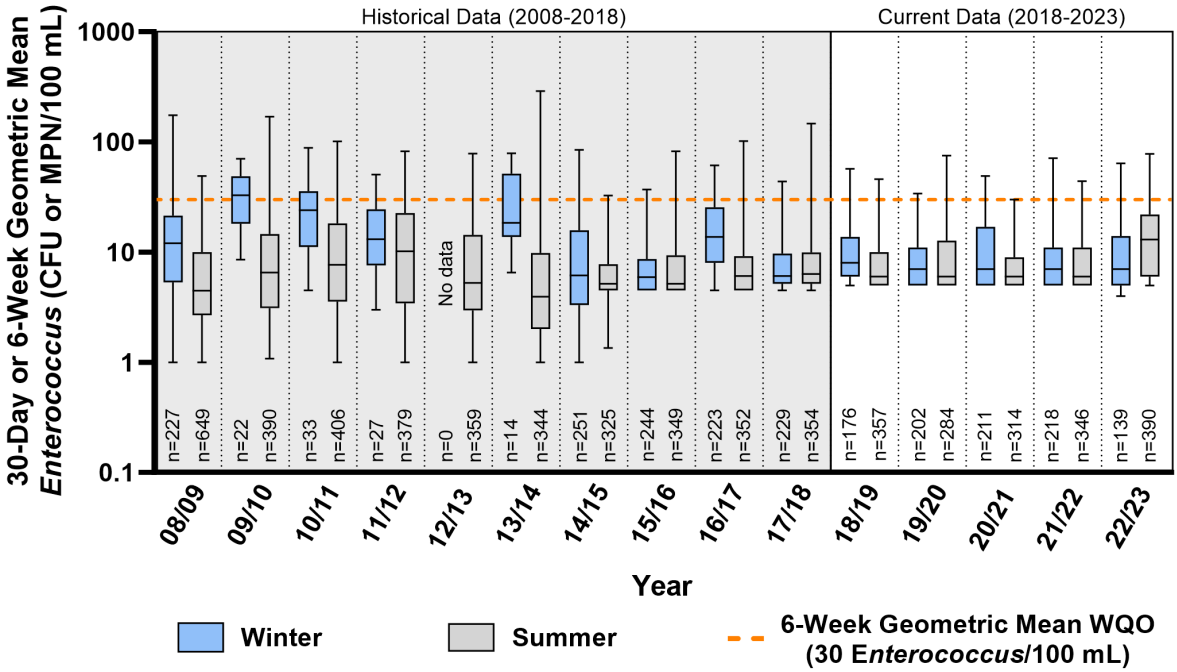

Figure 3-1a. Geometric Mean *Enterococcus* Densities in Dana Point Harbor (All Monitoring Locations Combined)

Notes: Box plots show the 25th and 75th percentiles (boxes), median (line), and minimum and maximum (whiskers).
Results for the 2008/2009 through 2017/2018 monitoring years represent 30-day geometric means.
Results for the 2018/2019 through 2022/2023 monitoring years represent 6-week geometric means.
CFU = colony-forming unit(s); mL = milliliter(s); MPN = most probable number; WQO = water quality objective

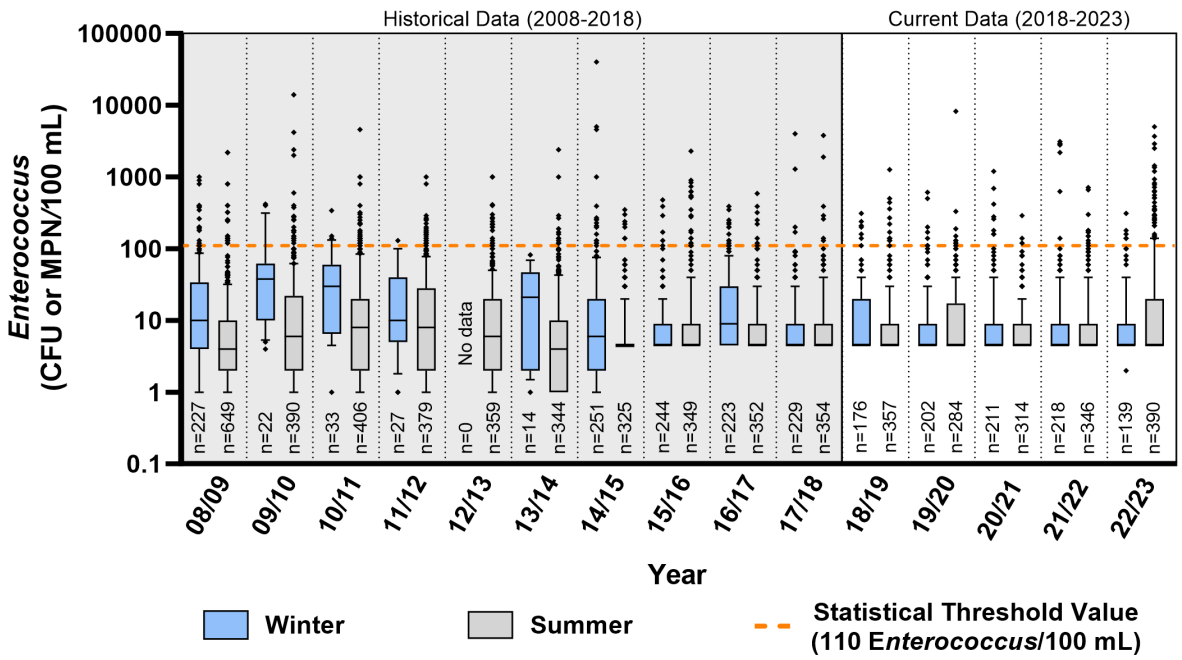

Figure 3-1b. *Enterococcus* Densities Compared with Statistical Threshold Value in Dana Point Harbor (All Monitoring Locations Combined)

Notes: Box plots show the 25th and 75th percentiles (boxes), median (line), and 10th and 90th percentiles (whiskers). An upper whisker (90th percentile) above the STV threshold line indicates more than 10% of samples exceeded the STV in a given season. Dots represent individual sample results below the 10th percentile or above the 90th percentile. CFU = colony-forming unit(s); mL = milliliter(s); MPN = most probable number; WQO = water quality objective

3.2 Oceanside Harbor

Limited FIB data were available for Oceanside Harbor for the 2018/2019 through 2022/2023 monitoring years. None of the samples collected during this period contained *Enterococcus* at densities exceeding the STV of 110 CFU/100 mL (Table 3-2). These results are consistent with historical results for Oceanside Harbor, with *Enterococcus* densities below WQOs for over 98% of samples collected from 2008/2009 through 2017/2018 during both the winter and summer seasons (Figure 3-2; Wood, 2020). Historically, exceedances of the STV for *Enterococcus* were observed only at Station H-3 near the entrance of the West Basin. Given the limited data available for Oceanside Harbor, geometric means were not calculated; only raw *Enterococcus* densities were plotted in Figure 3-2. Overall, *Enterococcus* densities were generally low, and no clear temporal trends in *Enterococcus* densities were apparent in Oceanside Harbor over the past 15 years.

Table 3-2.
***Enterococcus* Densities in Oceanside Harbor (2018/2019–2022/2023 Monitoring Years)**

Sampling Date	Monitoring Location	*Enterococcus* Density (MPN/100 mL)
4/2/2019	Bait Dock	<10
	Harbor Mouth	<10
	Launch Ramp	<10
10/28/2021	H-1	10
	H-2	<10
	H-3	20
3/30/2022	H-1	<10
	H-2	10
	H-3	20
3/29/2023	H-1	52
	H-2	20
	H-3	10

Notes:
< = less than (i.e., not detected above the detection limit); MPN/100 mL = most probable number per 100 milliliters

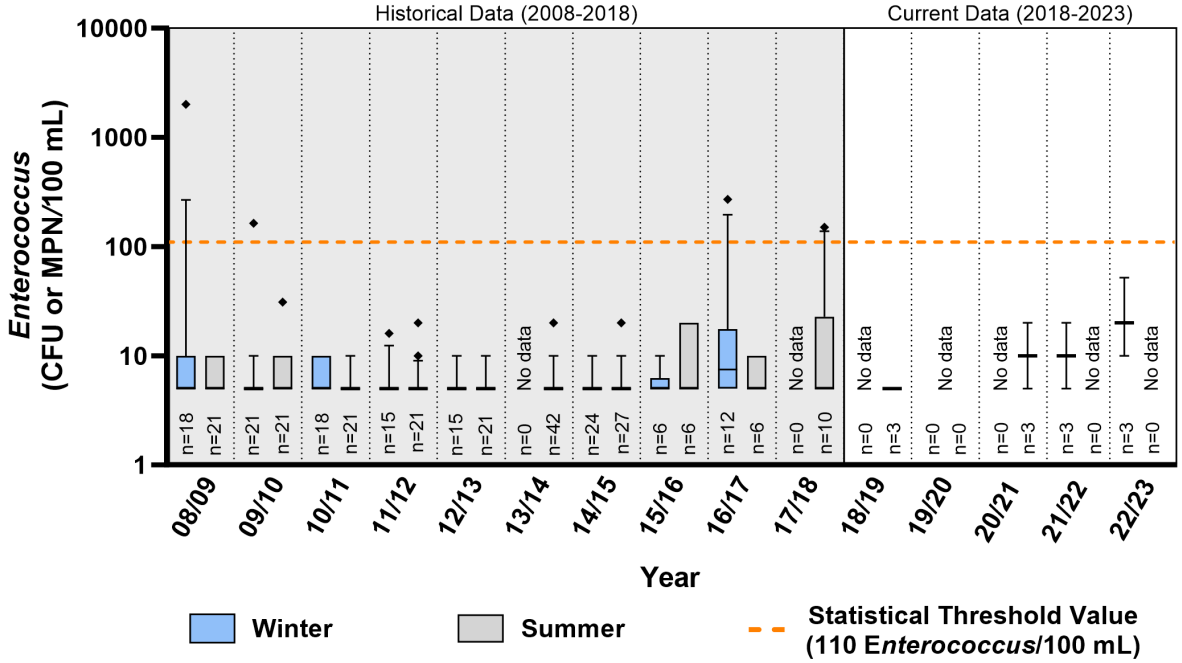

Figure 3-2. *Enterococcus* Densities Compared with Statistical Threshold Value in Oceanside Harbor (All Monitoring Locations Combined)

Notes: Box plots show the 25th and 75th percentiles (boxes), median (line), and 10th and 90th percentiles (whiskers). An upper whisker (90th percentile) above the STV threshold line indicates more than 10% of samples exceeded the STV in a given season. Dots represent individual sample results below the 10th percentile or above the 90th percentile.
CFU = colony-forming unit(s); mL = milliliter(s); MPN = most probable number; WQO = water quality objective

3.3 Mission Bay

Enterococcus densities in Mission Bay were below both the 6-week GM and STV WQOs in over 80% of samples collected during the winter and summer seasons from 2018 through 2023 (Table 3-3). From 2008 through 2023, median raw *Enterococcus* densities ranged from 7 to 22 CFU or MPN/100 mL in the summer and from 5 to 691 CFU or MPN/100 mL in the winter (Figure 3-3b). Consistent with historical results from 2008/2009 through 2017/2018, WQO exceedance frequencies were generally higher during the winter than the summer. However, differences between seasons were less pronounced in recent years (2019/2020 through 2022/2023), and *Enterococcus* densities were lower overall, particularly in the winter (Figures 3-3a and 3-3b).

Most of the *Enterococcus* WQO exceedances in Mission Bay over the past 5 years were observed at Station MB-205 in Vacation Isle North Cove and Station MB-053 north of Leisure Lagoon (Figure 2-1c; Appendix B). At both monitoring locations, FIB concentrations exceeded the 6-week GM WQO in more than 25% of samples and the STV in more than 10% of samples collected during all seasons combined (Appendix B). Despite periodic WQO exceedances observed throughout Mission Bay, *Enterococcus* densities were generally low, with densities below detection limits in 50% of samples (Table 3-3). Reductions in bacteria levels in Mission Bay may be attributed to strategies implemented by the City of San Diego, including (but not limited to), bacteria source investigations, stormwater diversion and capture, irrigation runoff reduction, street sweeping, storm drain cleaning, transient encampment abatement, and public outreach (City of San Diego and California Department of Transportation, 2024).

Table 3-3.
6-Week Geometric Mean and STV WQO Exceedances for *Enterococcus* in Mission Bay (2018/2019–2022/2023 Monitoring Years)

Metric	Winter (n=356)	Summer (n=1,486)	All Seasons (n=1,842)
% of Non-Detect Sample Results	40%	52%	50%
% of Samples with *Enterococcus* Concentrations Exceeding the 6-Week GM WQO (30 CFU/100 mL)	19%	9%	11%
% of Samples with *Enterococcus* Concentrations Exceeding the STV (110 CFU/100 mL)	10%	6%	7%

Notes:
% = percent; CFU/100 mL = colony-forming unit(s) per 100 milliliters; GM = geometric mean; n = sample count; STV = statistical threshold value; WQO = water quality objective

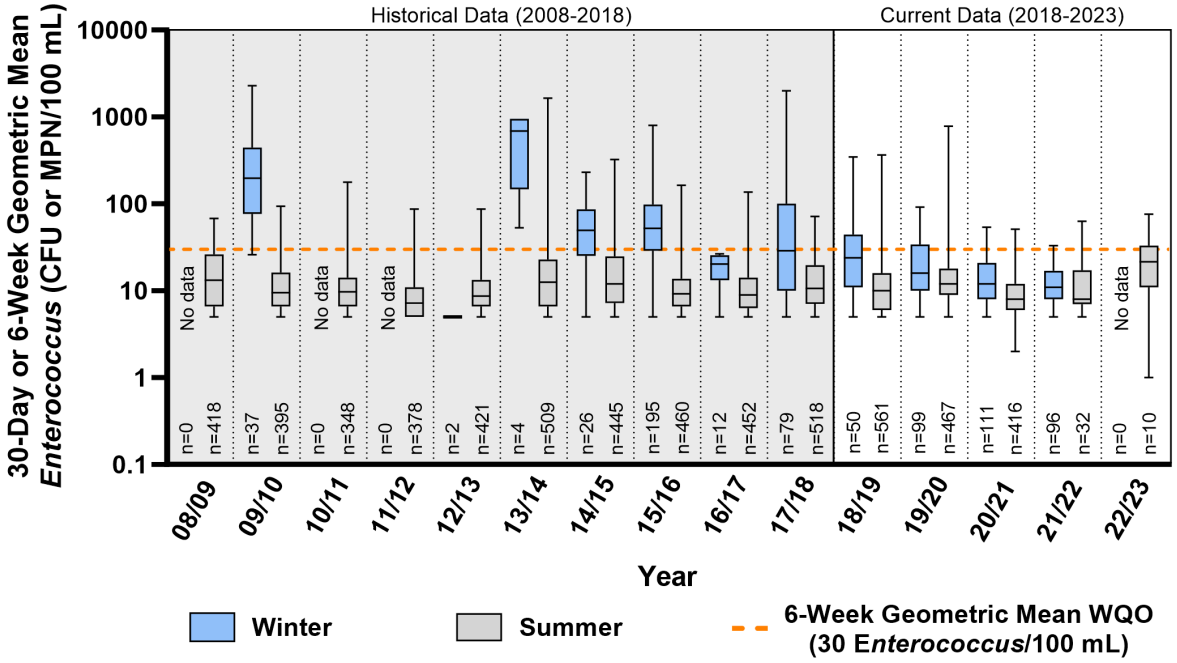

Figure 3-3a. Geometric Mean *Enterococcus* Densities in Mission Bay (All Monitoring Locations Combined)

Notes: Box plots show the 25th and 75th percentiles (boxes), median (line), and minimum and maximum (whiskers).
Results for the 2008/2009 through 2017/2018 monitoring years represent 30-day geometric means.
Results for the 2018/2019 through 2022/2023 monitoring years represent 6-week geometric means.
CFU = colony-forming unit(s); mL = milliliter(s); MPN = most probable number; WQO = water quality objective

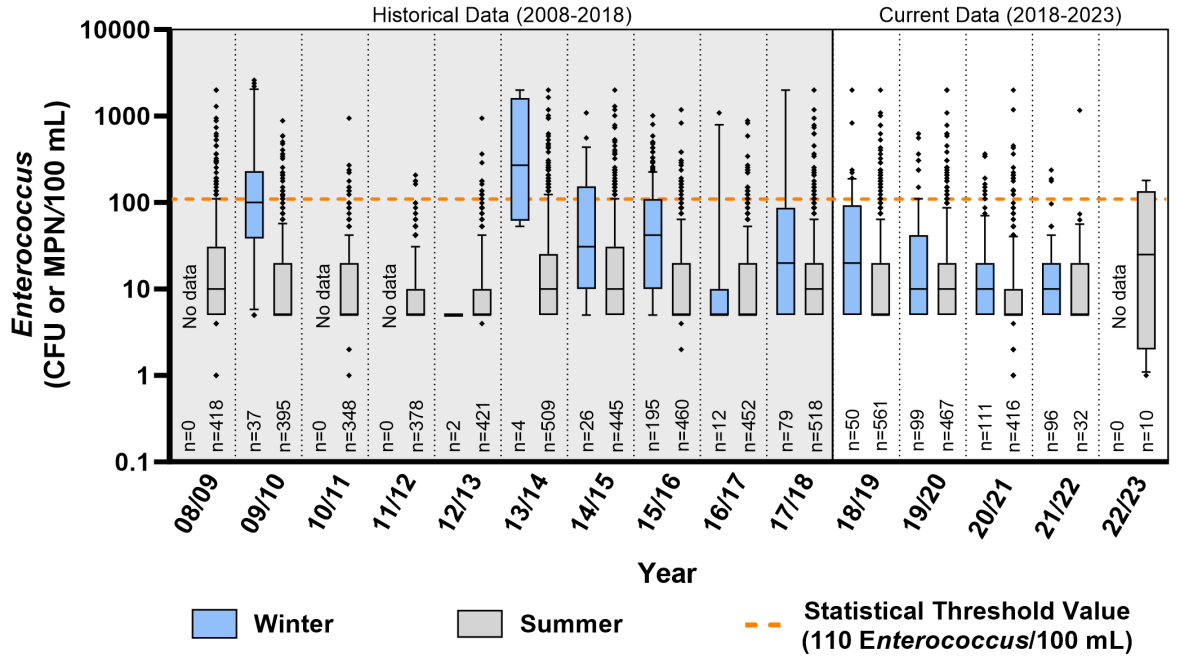

Figure 3-3b. *Enterococcus* Densities Compared with Statistical Threshold Value in Mission Bay (All Monitoring Locations Combined)

Notes: Box plots show the 25th and 75th percentiles (boxes), median (line), and 10th and 90th percentiles (whiskers). An upper whisker (90th percentile) above the STV threshold line indicates more than 10% of samples exceeded the STV in a given season.
Dots represent individual sample results below the 10th percentile or above the 90th percentile.
CFU = colony-forming unit(s); mL = milliliter(s); MPN = most probable number; WQO = water quality objective

3.4 San Diego Bay

For the purposes of the analysis, San Diego Bay was divided into north and south regions because of unique hydrodynamic and geographic conditions that affect flushing, temperature, and other physical and chemical characteristics of this large, diverse water body. North San Diego Bay included monitoring locations north of the Coronado Bridge, and South San Diego Bay included monitoring locations south of the Coronado Bridge.

3.4.1 North San Diego Bay

Only two monitoring locations were monitored routinely in North San Diego Bay during the 2018/2019 through 2022/2023 monitoring years: Station EH-200 at Shelter Island Shoreline Park and Station EH-070 at Tidelands Park. Consistent with historical results, the majority of samples (over 80%) collected in North San Diego Bay had *Enterococcus* densities below WQOs (Table 3-4).

Table 3-4.
6-Week Geometric Mean and STV WQO Exceedances for *Enterococcus* in North San Diego Bay (2018/2019–2022/2023 Monitoring Years)

Metric	Winter (n=159)	Summer (n=337)	All Seasons (n=496)
% of Non-Detect Sample Results	14%	40%	32%
% of Samples with *Enterococcus* Concentrations Exceeding the 6-Week GM WQO (30 CFU/100 mL)	33%	11%	18%
% of Samples with *Enterococcus* Concentrations Exceeding the STV (110 CFU/100 mL)	13%	6%	8%

Notes:
% = percent; CFU/100 mL = colony-forming unit(s) per 100 milliliters; GM = geometric mean; n = sample count; STV = statistical threshold value; WQO = water quality objective

From 2008 through 2023, median raw *Enterococcus* densities ranged from 5 to 10 CFU or MPN/100 mL in the summer and from 10 to 197 CFU or MPN/100 mL in the winter (Figure 3-4b). WQO exceedance frequencies for both the 6-week GM and STV were generally higher in the winter than the summer (Table 3-4; Figures 3-4a and 3-4b). Densities of *Enterococcus* decreased slightly over time in North San Diego Bay, particularly during the winter, with lower medians and less variability in *Enterococcus* densities beginning in the 2017/2018 monitoring year.

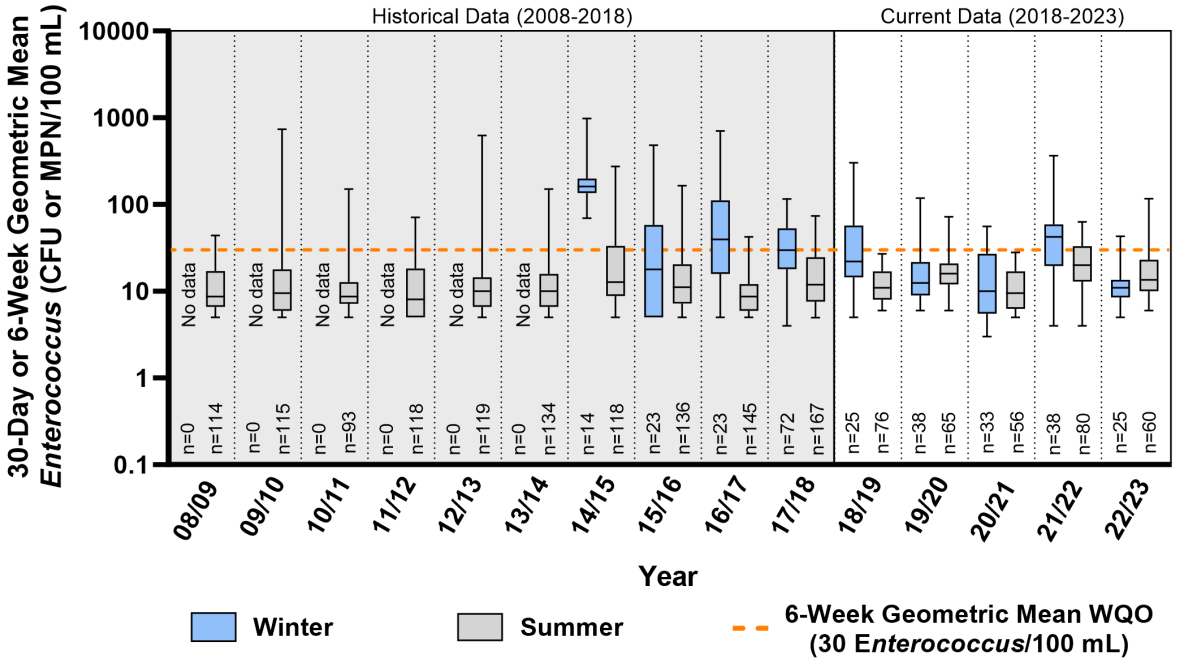

Figure 3-4a. Geometric Mean *Enterococcus* Densities in North San Diego Bay (All Monitoring Locations Combined)

Notes: Box plots show the 25th and 75th percentiles (boxes), median (line), and minimum and maximum (whiskers).
Results for the 2008/2009 through 2017/2018 monitoring years represent 30-day geometric means.
Results for the 2018/2019 through 2022/2023 monitoring years represent 6-week geometric means.
CFU = colony-forming unit(s); mL = milliliter(s); MPN = most probable number; WQO = water quality objective

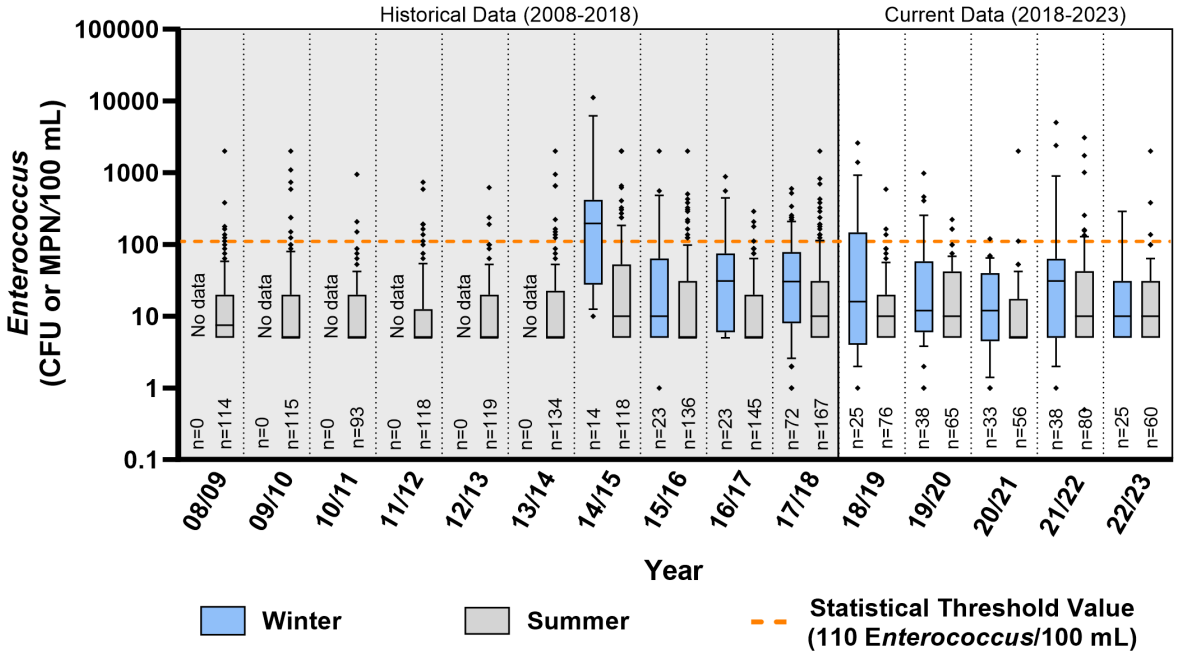

Figure 3-4b. *Enterococcus* Densities Compared with Statistical Threshold Value in North San Diego Bay (All Monitoring Locations Combined)

Notes: Box plots show the 25th and 75th percentiles (boxes), median (line), and 10th and 90th percentiles (whiskers). An upper whisker (90th percentile) above the STV threshold line indicates more than 10% of samples exceeded the STV in a given season.
Dots represent individual sample results below the 10th percentile or above the 90th percentile.
CFU = colony-forming unit(s); mL = milliliter(s); MPN = most probable number; WQO = water quality objective

Shelter Island Shoreline Park and Tidelands Park were placed on the 303(d) List for indicator bacteria in 2002 and 2010, respectively, because of exceedances of REC-1 WQOs. Reductions in *Enterococcus* WQO exceedance frequencies have been observed at both Shelter Island Shoreline Park and Tidelands Park in recent years as a result of management strategies implemented by the Port of San Diego, including (but not limited to) source investigation studies, source control, waste management, irrigation runoff reduction, structural best management practice implementation, and public outreach. Shelter Island Shoreline Park remains on the 303(d) List for impairment of the REC-1 beneficial use, which is being addressed under a TMDL adopted in 2008 (SDRWQCB, 2008). However, Tidelands Park is currently on the 303(d) List only for impairment of the shellfish harvesting beneficial use (SHELL). SDRWQCB conclusions from the California 2024 Integrated Report (SWRCB, 2024b) state that "there is sufficient justification against placing [Tidelands Park] on the [Clean Water Act] Section 303(d) List for impairment of REC-1" beneficial uses. The Port of San Diego continues to conduct bacteria monitoring at Tidelands Park to track progress toward Swimmable Waters goals under the San Diego Bay Watershed Management Area WQIP. The WQIP Annual Reports provide additional information on historical trends and the extent and magnitude of FIB in San Diego Bay (San Diego Bay Responsible Parties,[3] 2024; https://projectcleanwater.org/watersheds/san-diego-bay-wma/).

3.4.2 South San Diego Bay

Enterococcus densities in South San Diego Bay were below the 6-week GM and STV WQOs in 93% of samples collected from 2018 through 2022 (Table 3-5). No samples from South San Diego Bay were analyzed using culture methods following the transition to ddPCR methods for the SDDEHQ Beach & Bay Water Quality Program beginning in May 2022. Therefore, no data were available for the 2022/2023 monitoring year, limiting the ability to evaluate recent FIB conditions in South San Diego Bay.

From 2008 through 2023, median raw *Enterococcus* densities ranged from 5 to 10 CFU or MPN/100 mL in the summer and from 5 to 71 CFU or MPN/100 mL in the winter (Figure 3-5b). Similar to results for other RHMP embayments, there were higher WQO exceedance rates in South San Diego Bay in the winter than the summer (Figures 3-5a and 3-5b). *Enterococcus* WQO exceedances were most frequently observed at Station EH-120 near Bayside Park at J Street (Figure 2-1e; Appendix B). Notably, *Enterococcus* was not detected in 98% of samples (n=58 of 59) collected at Station EH-090 on the bayside of Silver Strand from 2019 through 2022. No other clear trends were apparent in the *Enterococcus* densities in South San Diego Bay over the past 15 years.

[3] The San Diego Bay Responsible Parties include the City of Chula Vista, City of Coronado, City of Imperial Beach, City of La Mesa, City of Lemon Grove, City of National City, City of San Diego, County of San Diego, Port of San Diego, San Diego County Regional Airport Authority, and California Department of Transportation.

Table 3-5.
6-Week Geometric Mean and STV WQO Exceedances for *Enterococcus* in South San Diego Bay (2018/2019–2021/2022[a] Monitoring Years)

Metric	Winter (n=62)	Summer (n=248)	All Seasons (n=310)
% of Non-Detect Sample Results	49%	64%	61%
% of Samples with *Enterococcus* Concentrations Exceeding the 6-Week GM WQO (30 CFU/100 mL)	19%	4%	7%
% of Samples with *Enterococcus* Concentrations Exceeding the STV (110 CFU/100 mL)	13%	5%	7%

Notes:
a. No samples from South San Diego Bay were analyzed using culture methods following the transition to ddPCR methods for the SDDEHQ Beach & Bay Water Quality Program beginning in May 2022. Therefore, no data were available for the 2022/2023 monitoring year.
% = percent; CFU/100 mL = colony-forming unit(s) per 100 milliliters; GM = geometric mean; n = sample count; STV = statistical threshold value; WQO = water quality objective

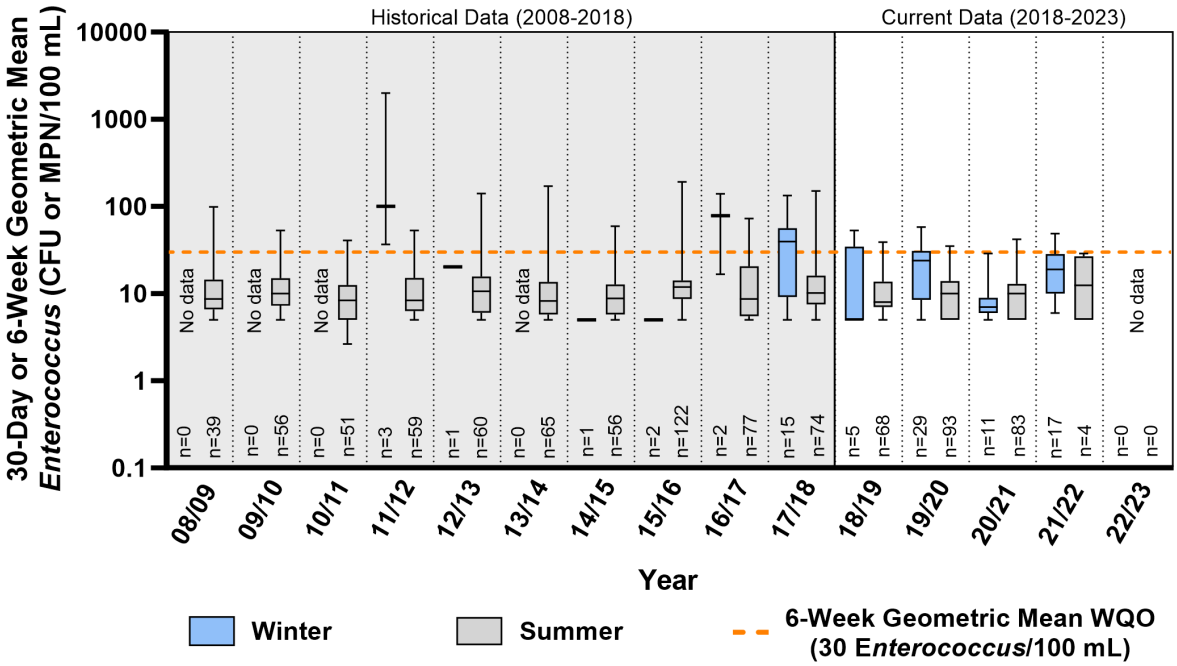

Figure 3-5a. Geometric Mean *Enterococcus* Densities in South San Diego Bay (All Monitoring Locations Combined)

Notes: Box plots show the 25th and 75th percentiles (boxes), median (line), and minimum and maximum (whiskers).
Results for the 2008/2009 through 2017/2018 monitoring years represent 30-day geometric means.
Results for the 2018/2019 through 2022/2023 monitoring years represent 6-week geometric means.
CFU = colony-forming unit(s); mL = milliliter(s); MPN = most probable number; WQO = water quality objective

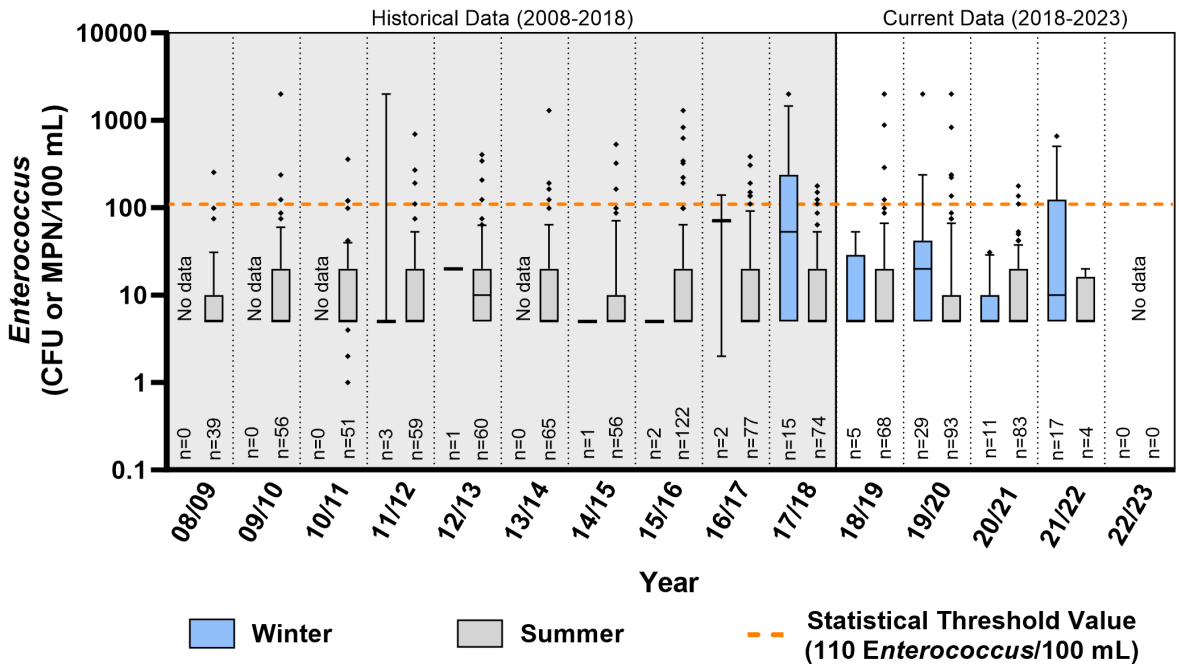

Figure 3-5b. *Enterococcus* Densities Compared with Statistical Threshold Value in South San Diego Bay (All Monitoring Locations Combined)

Notes: Box plots show the 25th and 75th percentiles (boxes), median (line), and 10th and 90th percentiles (whiskers). An upper whisker (90th percentile) above the STV threshold line indicates more than 10% of samples exceeded the STV in a given season. Dots represent individual sample results below the 10th percentile or above the 90th percentile.
CFU = colony forming unit(s); mL = milliliter(s); MPN = most probable number; WQO = water quality objective

4.0 DISCUSSION

This section discusses the current extent and magnitude and historical trends in *Enterococcus* densities throughout the San Diego Regional Harbors to evaluate whether the waters in the harbors are safe for body contact activities.

Current Extent and Magnitude and Historical Trends in *Enterococcus*

The results of this historical bacteria analysis indicate that the extent and magnitude of *Enterococcus* densities throughout the San Diego Regional Harbors can be highly variable depending on the monitoring location and date. Although the range in *Enterococcus* densities was wide at some locations driven by occasional WQO exceedances, densities were generally below WQOs, with less than 10% of *Enterococcus* samples exceeding the 6-week GM and STV WQOs across all harbors and seasons combined for the 2018 through 2023 monitoring period. The wide range of data is not unexpected given the ability of bacteria to grow exponentially under favorable conditions. These results are consistent with findings from the 2018 RHMP historical bacteria analysis, which included data from 2008 through 2018 (Wood, 2020).

Consistent with historical results (Wood, 2020), densities of *Enterococcus* in all harbors were generally greatest during the winter, resulting in higher exceedance rates of the 6-week GM and STV WQOs. This is likely due to stormwater runoff and associated bacterial sources entering the receiving waters during rain events, which are more frequent during the winter months. Bacterial levels in ocean and bay waters can increase significantly during and after rain events, especially near storm drain, river, and lagoon outlets. This can lead to periodic acute spikes in *Enterococcus* densities above the STV and potentially contribute to exceedances of 6-week GMs.

These findings indicate that both current and historical potential impacts on human health from water contact recreation are limited overall, but risk appears to be greater during the winter when rain events are more frequent compared with the summer. To mitigate the risk of illness from REC-1 activities, the public should follow general rain advisories, including avoiding water contact for at least 72 hours following a rain event. In addition, the public should check water quality websites for Orange County (https://ocbeachinfo.com/) and San Diego County (https://www.sdbeachinfo.com/) for current water quality conditions (e.g., beach advisories, warnings, and closures) prior to entering the water.

Based on a combined assessment of monitoring locations across all San Diego Regional Harbors and within the individual harbors, no obvious long-term temporal trends were apparent for *Enterococcus* densities over the 15-year period evaluated. However, when evaluated on a site-by-site basis, data for locations that have been on the 303(d) List for FIB and subsequently addressed via TMDLs and WQIP Priority Conditions (e.g., Baby Beach in Dana Point Harbor; Shelter Island Shoreline Park and Tidelands Park in North San Diego Bay) show decreases in *Enterococcus* densities over time. Reductions in FIB at these locations may be attributed to source control and management actions implemented by the RHMP Agencies, as discussed in Section 3.0.

FIB conditions throughout the San Diego Regional Harbors continue to be evaluated as part of several monitoring programs in support of AB411, TMDL, and WQIP monitoring requirements.

Because of the transient and variable nature of FIB over space and time, these long-term, focused monitoring programs are designed to collect data that more appropriately evaluate the safety of waters for human body contact. The following sources provide additional information on historical trends and the extent and magnitude of FIB in the San Diego Regional Harbors:

- OCHCA Annual Ocean, Harbor, and Bay Water Quality Reports (OCHCA, 2026)
- South Orange County WQIP Annual Reports (County of Orange Public Works, 2026)
- Heal the Bay Annual Beach Report Cards (Heal the Bay, 2026)
- Mission Bay Watershed Management Area WQIP Annual Reports (https://projectcleanwater.org/watersheds/mission-bay-la-jolla-wma/).
- San Diego Bay Watershed Management Area WQIP Annual Reports (https://projectcleanwater.org/watersheds/san-diego-bay-wma/).

5.0 CONCLUSION

The intent of this historical analysis of bacteria was to address the RHMP core monitoring question: Are the waters in the harbors safe for body contact activities? This question was addressed by compiling historical data sets from several long-term bacteria monitoring programs already in place and comparing results against the latest WQOs provided in the Bacteria Provisions of the ISWEBE Plan (SWRCB, 2019). *Post hoc* analysis focused on *Enterococcus* as the primary indicator bacteria identified in the Bacteria Provisions of the ISWEBE Plan (SWRCB, 2019) as the most appropriate FIB for the enclosed bays that characterize the San Diego Regional Harbors. *Enterococcus* densities in each harbor were compared with WQOs for the REC-1 beneficial use to evaluate whether waters are safe for human body contact. Temporal trends in *Enterococcus* densities within the San Diego Regional Harbors were also evaluated using data collected over a 15-year period extending from 2008 through 2023.

Results of this historical analysis indicated that *Enterococcus* densities throughout the San Diego Regional Harbors are highly variable depending on the monitoring location and date. However, *Enterococcus* densities were generally below WQOs, with most exceedances occurring during the winter months when rain events are more frequent. These results indicate that potential impacts on human health from water contact exposure are limited overall, particularly during the summer, and general rain advisories to avoid water contact during or immediately following rain events should be followed.

No obvious temporal trends were apparent for *Enterococcus* densities over the 15-year period evaluated based on combined results across harbors. However, decreases in WQO exceedance frequencies for *Enterococcus* were observed for some individual monitoring locations, including Baby Beach in Dana Point Harbor and Shelter Island Shoreline Park and Tidelands Park in North San Diego Bay, following implementation of a variety of source control and management strategies by the RHMP Agencies. FIB conditions at these locations, as well as other frequently visited public beaches, are evaluated under long-term focused monitoring programs to fulfill AB411, TMDL, and WQIP monitoring requirements.

It is recommended that FIB conditions continue to be addressed under these focused monitoring programs to better evaluate the safety of the San Diego Regional Harbor waters for human body contact.

6.0 REFERENCES

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APPENDIX A
SUMMARY OF MONITORING LOCATIONS

Table A-1. 2023 RHMP Historical Bacteria Analysis – Summary of Monitoring Locations

Harbor	Station ID	Latitude	Longitude	Sampling Period		Sample Count			
						Historical (11/1/2008–10/31/2018)		Current (11/1/2018–10/31/2023)	
				Start Date	End Date	Winter	Summer	Winter	Summer
Dana Point Harbor	BDP07	33.45950	-117.69050	11/13/2008	10/31/2023	103	318	84	144
Dana Point Harbor	BDP08	33.46133	-117.70550	11/13/2008	10/31/2023	103	318	83	148
Dana Point Harbor	BDP12	33.46216	-117.70500	11/13/2008	10/31/2023	119	356	87	164
Dana Point Harbor	BDP13	33.46233	-117.70433	11/13/2008	10/31/2023	104	352	90	157
Dana Point Harbor	BDP14	33.46250	-117.70433	11/13/2008	10/31/2023	121	365	93	164
Dana Point Harbor	BDP15	33.46233	-117.70450	11/13/2008	10/31/2023	115	349	91	159
Dana Point Harbor	BDP16	33.46166	-117.70583	11/13/2008	10/31/2023	105	324	83	159
Dana Point Harbor	BDP17	33.46200	-117.70367	11/13/2008	10/31/2023	103	324	83	147
Dana Point Harbor	MDP10	33.45845	-117.69355	11/13/2008	10/31/2023	103	332	83	145
Dana Point Harbor	MDP11	33.46200	-117.70341	11/13/2008	10/31/2023	103	320	84	147
Dana Point Harbor	MDP18	33.46031	-117.69613	11/13/2008	10/31/2023	106	331	85	157
Dana Point Harbor	S-4	33.45690	-117.69500	11/4/2008	5/30/2012	85	218	No data	No data
Oceanside Harbor	H-1	33.20806	-117.39501	1/13/2009	3/29/2023	42	64	2	1
Oceanside Harbor	H-2	33.20555	-117.39195	1/13/2009	3/29/2023	42	64	2	1
Oceanside Harbor	H-3	33.20919	-117.39533	1/13/2009	3/29/2023	45	67	2	1
Oceanside Harbor	H-4	Not recorded	Not recorded	4/3/2018	4/3/2018	No data	1	No data	No data
Oceanside Harbor	Bait Dock	Not recorded	Not recorded	4/2/2019	4/2/2019	No data	No data	No data	1
Oceanside Harbor	Harbor Mouth	Not recorded	Not recorded	4/2/2019	4/2/2019	No data	No data	No data	1
Oceanside Harbor	Launch Ramp	Not recorded	Not recorded	4/2/2019	4/2/2019	No data	No data	No data	1
Mission Bay	EH-227	32.79510	-117.21634	11/15/2016	12/13/2016	10	No data	No data	No data
Mission Bay	MB-015	32.77727	-117.21664	4/14/2020	4/7/2022	No data	No data	No data	62
Mission Bay	MB-031	32.77130	-117.20980	4/7/2009	10/30/2018	26	311	No data	No data
Mission Bay	MB-041	32.77320	-117.21000	6/23/2009	4/7/2022	25	290	2	94
Mission Bay	MB-051	32.78260	-117.20990	4/7/2009	10/30/2018	21	295	No data	No data
Mission Bay	MB-053	32.78410	-117.20933	6/23/2009	4/7/2022	28	322	65	102
Mission Bay	MB-058	32.78809	-117.20987	2/5/2014	5/24/2016	21	17	No data	No data
Mission Bay	MB-060	32.78840	-117.20960	4/1/2009	10/30/2018	48	355	No data	No data
Mission Bay	MB-070	32.79690	-117.21190	4/7/2009	10/27/2020	31	316	27	67
Mission Bay	MB-080	32.79490	-117.22130	4/7/2009	5/2/2022	30	317	59	109
Mission Bay	MB-085	32.78847	-117.21783	9/24/2009	4/11/2022	8	2	No data	100
Mission Bay	MB-086	32.78920	-117.21340	1/15/2016	10/30/2019	28	No data	No data	32

Table A-1. 2023 RHMP Historical Bacteria Analysis – Summary of Monitoring Locations

Harbor	Station ID	Latitude	Longitude	Sampling Period		Sample Count			
						Historical (11/1/2008–10/31/2018)		Current (11/1/2018–10/31/2023)	
				Start Date	End Date	Winter	Summer	Winter	Summer
Mission Bay	MB-090	32.78830	-117.23140	6/23/2009	10/30/2018	15	287	No data	No data
Mission Bay	MB-100	32.78230	-117.23250	6/23/2009	4/7/2022	5	292	1	86
Mission Bay	MB-120	32.79080	-117.24430	6/23/2009	4/11/2022	5	294	43	92
Mission Bay	MB-125	32.78881	-117.25197	4/5/2021	4/11/2022	No data	No data	16	30
Mission Bay	MB-130	32.78930	-117.25140	8/22/2011	8/22/2011	No data	1	No data	No data
Mission Bay	MB-131	32.78320	-117.25100	6/3/2014	11/2/2020	No data	13	2	63
Mission Bay	MB-140	32.77970	-117.25080	4/2/2019	4/11/2022	No data	No data	1	84
Mission Bay	MB-160	32.77550	-117.24540	6/23/2009	4/11/2022	5	299	33	93
Mission Bay	MB-170	32.76920	-117.24890	4/2/2019	4/11/2022	No data	No data	1	89
Mission Bay	MB-173	32.76950	-117.24750	4/7/2009	10/30/2018	8	305	No data	No data
Mission Bay	MB-193	32.76520	-117.21650	10/25/2011	10/25/2011	No data	1	No data	No data
Mission Bay	MB-200	Not recorded	Not recorded	6/14/2011	8/30/2011	No data	7	No data	No data
Mission Bay	MB-203	32.77410	-117.23270	6/23/2009	4/7/2022	7	296	16	92
Mission Bay	MB-205	32.77605	-117.23820	6/23/2009	10/19/2023	33	324	57	113
Mission Bay	MB-223	32.77088	-117.24468	3/20/2013	4/11/2022	1	No data	1	89
Mission Bay	MB-225	32.76250	-117.24930	4/2/2019	3/29/2021	No data	No data	17	60
Mission Bay	MB-226	32.76075	-117.24783	4/5/2021	4/11/2022	No data	No data	15	29
North San Diego Bay	EH-070	32.69012	-117.16440	4/1/2009	10/19/2023	31	343	81	169
North San Diego Bay	EH-160	32.72834	-117.20994	4/15/2009	10/30/2018	11	299	No data	No data
North San Diego Bay	EH-200	32.71477	-117.22416	4/1/2009	10/31/2023	79	326	78	168
North San Diego Bay	EH-205	32.71820	-117.23300	4/16/2009	7/27/2009	No data	3	No data	No data
North San Diego Bay	EH-211	32.70921	-117.23684	6/22/2009	10/30/2018	11	288	No data	No data
South San Diego Bay	EH-080	32.67521	-117.16818	6/22/2009	4/6/2022	9	342	40	91
South San Diego Bay	EH-090	32.63631	-117.14110	9/9/2011	4/11/2022	9	4	2	57
South San Diego Bay	EH-120	32.62880	-117.10809	6/22/2009	4/6/2022	6	313	20	100

APPENDIX B
SUMMARY OF 6-WEEK GEOMETRIC MEAN AND STATISTICAL THRESHOLD VALUE WQO EXCEEDANCES BY MONITORING LOCATION

Table B-1. 2023 RHMP Historical Bacteria Analysis – Summary of 6-Week Geometric Mean (GM) and Statistical Threshold Value (STV) Water Quality Objective (WQO) Exceedances by Monitoring Location

Harbor/ Station ID	Winter (November 1 – March 31)				Summer (April 1 – October 31)				Total (All Seasons)			
	Sample Count	% Non-Detect	% Over 6-Week GM WQO (30 CFU/100 mL)	% Over STV (110 CFU/100 mL)	Sample Count	% Non-Detect	% Over 6-Week GM WQO (30 CFU/100 mL)	% Over STV (110 CFU/100 mL)	Sample Count	% Non-Detect	% Over 6-Week GM WQO (30 CFU/100 mL)	% Over STV (110 CFU/100 mL)
Dana Point Harbor	**946**	**62%**	**5%**	**3%**	**1691**	**60%**	**7%**	**5%**	**2637**	**61%**	**6%**	**4%**
BDP07	84	76%	0%	0%	144	84%	0%	0%	228	81%	0%	0%
BDP08	83	88%	0%	0%	148	81%	0%	1%	231	84%	0%	1%
BDP12	87	43%	21%	7%	164	34%	20%	9%	251	37%	20%	8%
BDP13	90	44%	12%	7%	157	48%	8%	6%	247	47%	10%	6%
BDP14	93	45%	8%	11%	164	46%	9%	10%	257	46%	8%	10%
BDP15	91	41%	10%	5%	159	36%	16%	5%	250	38%	14%	5%
BDP16	83	86%	0%	0%	159	72%	4%	5%	242	77%	3%	3%
BDP17	83	83%	0%	0%	147	75%	0%	2%	230	78%	0%	1%
MDP10	83	67%	0%	0%	145	75%	1%	1%	228	72%	0%	1%
MDP11	84	82%	0%	1%	147	73%	0%	1%	231	77%	0%	1%
MDP18	85	39%	4%	4%	157	43%	11%	8%	242	41%	9%	6%
Oceanside Harbor	**6**	**17%**	**17%**	**0%**	**6**	**67%**	**0%**	**0%**	**12**	**42%**	**8%**	**0%**
H-1	2	50%	50%	0%	1	0%	0%	0%	3	33%	33%	0%
H-2	2	0%	0%	0%	1	100%	0%	0%	3	33%	0%	0%
H-3	2	0%	0%	0%	1	0%	0%	0%	3	0%	0%	0%
Bait Dock	0	N/A	N/A	N/A	1	100%	0%	0%	1	100%	0%	0%
Harbor Mouth	0	N/A	N/A	N/A	1	100%	0%	0%	1	100%	0%	0%
Launch Ramp	0	N/A	N/A	N/A	1	100%	0%	0%	1	100%	0%	0%
Mission Bay	**356**	**40%**	**19%**	**10%**	**1486**	**52%**	**9%**	**6%**	**1842**	**50%**	**11%**	**7%**
MB-015	0	N/A	N/A	N/A	62	58%	2%	5%	62	58%	2%	5%
MB-041	2	0%	0%	0%	94	60%	5%	4%	96	58%	5%	4%
MB-053	65	45%	26%	12%	102	32%	28%	9%	167	37%	28%	10%
MB-070	27	37%	19%	11%	67	49%	3%	3%	94	46%	7%	5%
MB-080	59	31%	17%	12%	109	28%	10%	6%	168	29%	13%	8%
MB-085	0	N/A	N/A	N/A	100	49%	15%	9%	100	49%	15%	9%
MB-086	0	N/A	N/A	N/A	32	56%	0%	3%	32	56%	0%	3%
MB-100	1	100%	0%	0%	86	64%	3%	2%	87	64%	3%	2%
MB-120	43	56%	30%	16%	92	45%	5%	7%	135	48%	13%	10%
MB-125	16	44%	0%	6%	30	73%	0%	3%	46	63%	0%	4%
MB-131	2	100%	0%	0%	63	62%	2%	5%	65	63%	2%	5%
MB-140	1	0%	0%	0%	84	73%	5%	5%	85	72%	5%	5%
MB-160	33	42%	18%	6%	93	72%	0%	5%	126	64%	5%	6%
MB-170	1	0%	0%	0%	89	49%	11%	3%	90	49%	11%	3%
MB-203	16	38%	0%	0%	92	43%	10%	7%	108	43%	8%	6%
MB-205	57	26%	26%	9%	113	32%	36%	17%	170	30%	33%	14%
MB-223	1	0%	100%	0%	89	60%	6%	3%	90	59%	7%	3%
MB-225	17	53%	0%	6%	60	68%	0%	3%	77	65%	0%	4%
MB-226	15	60%	0%	0%	29	79%	0%	0%	44	73%	0%	0%
North San Diego Bay	**159**	**14%**	**33%**	**13%**	**337**	**40%**	**11%**	**6%**	**496**	**32%**	**18%**	**8%**
EH-070	81	12%	47%	17%	169	38%	11%	4%	250	30%	23%	8%
EH-200	78	15%	19%	9%	168	42%	11%	7%	246	33%	14%	8%
South San Diego Bay	**62**	**50%**	**18%**	**13%**	**248**	**64%**	**4%**	**5%**	**310**	**61%**	**6%**	**7%**
EH-080	40	48%	15%	13%	91	62%	0%	4%	131	57%	5%	7%
EH-090	2	100%	0%	0%	57	98%	0%	0%	59	98%	0%	0%
EH-120	20	50%	25%	15%	100	46%	9%	9%	120	47%	12%	10%
All Harbors	**1529**	**52%**	**12%**	**6%**	**3768**	**55%**	**8%**	**5%**	**5297**	**54%**	**9%**	**6%**