

Adopted Basin Plan Amendment

Richardson Bay Pathogens Total Maximum Daily Load (TMDL)

The following sections establish the TMDL for pathogens in Richardson Bay. The numeric targets, load allocations, and implementation plan are designed to support and protect the Bay's designated beneficial uses, water contact recreation and shellfish harvesting. The TMDL includes actions for adaptive implementation to evaluate the effectiveness of implementation actions, monitor progress toward targets, and review the scientific understanding pertaining to pathogens, which may result in modifying the TMDL in the future.

Problem Statement

Richardson Bay is impaired by pathogens. Monitoring results indicate that the Bay exceeds bacteria water quality objectives for shellfish harvesting (e.g., clam, mussel, and oyster harvesting), and water contact recreation (swimming, fishing); Table 3-1). The presence of pathogens is inferred from high concentrations of fecal coliform bacteria, a commonly used indicator of human pathogenic organisms. Therefore, the beneficial uses of shellfish harvesting and recreational water contact are not fully supported.

Sources

Pathogen sources are identified based on elevated coliform bacteria (pathogen indicator) levels downstream or in the vicinity of identified land uses or facilities and from documentation of inadequately treated human waste discharges. If not properly managed, the following source categories have the potential to discharge pathogens to Richardson Bay: sanitary sewer systems, stormwater runoff, houseboats, and vessels.

- High coliform levels detected downstream of storm drains, and the increase in the number of wet season exceedances as compared to the number of dry season exceedances, point to stormwater runoff as a potential pathogen source.
- Documentation of sanitary sewer overflows in Richardson Bay area municipalities suggests that sanitary sewer systems are a potential source of pathogens to the Bay.
- Consistently high coliform levels in houseboat and vessel marinas indicate that houseboat and vessel marinas' failing sewage collection systems are potential sources of pathogens.

Bacteria levels are low at monitoring sites that contain wildlife but are minimally impacted by human activities. This suggests that wildlife may not be a significant, widespread potential source of pathogens in Richardson Bay. Wildlife may be a significant source on an intermittent, localized basis.

Numeric Targets

The numeric targets (desired future long-term conditions) proposed for pathogen indicators in Richardson Bay are presented in Table 7-1.

Table 7-1. Numeric Targets for Richardson Bay^a	
Beneficial Use	Numeric Target
Shellfish Harvesting	Median fecal coliform density ^b < 14 (MPN ^c /100 mL) 90 th percentile fecal coliform density < 43 (MPN/100 mL)
Water Contact Recreation	Geometric mean fecal coliform density < 200 90 th percentile fecal coliform density < 400 Geometric mean Enterococci density < 35 CFU ^d /100 mL 90 th percentile Enterococci density < 104 CFU/100 mL
<p>a. Based on a minimum of five consecutive samples equally spaced over a 30-day period</p> <p>b. "Density" refers to the number of bacteria in a given volume of water (U.S. EPA, 1986, 2002, 2003). The term is analogous to "concentration," which refers to the mass of chemical pollutant in a given volume of water. "Bacterial density" and "bacterial concentration" are sometimes used interchangeably.</p> <p>c. Most Probable Number (MPN) is a statistical representation of the standard coliform test results.</p> <p>d. CFU stands for colony forming unit (e.g., as in number of bacterial colonies)</p>	

The bacterial density targets are based on the Basin Plan's shellfish harvesting and water contact recreation water quality objectives for fecal coliform and on U.S. EPA's recommended Enterococci criteria for water contact recreation in salt water.

Total Maximum Daily Load

Table 7-2 shows Richardson Bay's density-based pathogens TMDL, expressed as fecal coliform bacteria concentrations.

Table 7-2. Total maximum daily load for pathogen indicators (fecal coliforms) for Richardson Bay	
Indicator Parameter	TMDL
Fecal coliform	Median ^a < 14 MPN/100 mL 90 th Percentile ^b < 43 MPN/100 mL
<p>a. Based on a minimum five consecutive samples equally spaced over a 30-day period.</p> <p>b. No more than 10% of total samples during any 30-day period may exceed this number.</p>	

Load Allocations

Density-based fecal coliform allocations for each potential pathogen source category in Richardson Bay are presented in Table 7-3. Each discharger in the Richardson Bay

watershed is responsible for meeting its source category allocation. All potential dischargers are also responsible for complying with applicable waste discharge requirements, or waste discharge prohibitions (Table 4-1, Prohibitions 5, 15, and 18).

All discharges of raw or inadequately treated human waste, including sewage from vessels, are prohibited. All sources of untreated or inadequately treated human waste have an allocation of zero.

Table 7-3. Density-Based Pollutant Wasteload and Load Allocations^a for Richardson Bay		
Categorical Pollutant Source	Wasteload and Load Allocations Fecal Coliform (MPN/100 mL)	
	For Direct Discharges to the Bay	
	Median^b	90th Percentile^c
<i>Stormwater Runoff^d</i>	<14	< 43
<i>Wildlife^e</i>	<14	< 43
<i>Sanitary Sewer Systems</i>	0	0
<i>Houseboats</i>	0	0
<i>Vessels (Recreational, Live-aboard, Anchor-out Boats)</i>	0	0
<p><i>a. These allocations are applicable year-round. b. Based on a minimum of five consecutive samples equally spaced over a 30-day period.</i></p> <p><i>c. No more than 10% of total samples during any 30-day period may exceed this number.</i></p> <p><i>d. Wasteload allocation for discharges from municipal separate storm sewer systems (NPDES Permit Nos. CAS000004 and CAS000003).</i></p> <p><i>e. Wildlife is not believed to be a readily controllable source of pathogens; therefore, no management measures are required.</i></p>		

Implementation Plan

The Richardson Bay Pathogens TMDL Implementation Plan builds upon previous and ongoing successful efforts to reduce potential pathogen loads in Richardson Bay and its tributaries. The plan requires actions consistent with the California Water Code (CWC 13000 et seq.), the state’s Nonpoint Source Pollution Control Program Plan (CWC Section 13369), the Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program, and human waste discharge prohibitions (Table 4-1, Prohibitions 5, 15, and 18).

Table 7-4 lists the required implementation measures for the source categories listed in Table 7-3. These measures include evaluation of operating practices, identification of comprehensive, site-specific pathogens control measures and an associated

implementation schedule, and submittal of progress reports to the Water Board documenting actions taken.

Table 7-4. Trackable implementation measures for the Richardson Bay pathogens TMDL

Source Category	Implementing Party	Action	Completion Dates
Sanitary Sewer Systems	Marin County Sanitary District No. 5, Sewerage Agency of Southern Marin, Tamalpais Community Services District, City of Mill Valley, Homestead Valley Sanitary District, Alto Sanitary District, Almonte Sanitary District, City of Sausalito, Sausalito Marin City Sanitary District, Richardson Bay Sanitary District	1. Comply with the Statewide General Waste Discharge Requirements for Sanitary Sewer Systems.	As specified in applicable WDR permit
Stormwater Runoff	Marin County, City of Sausalito, City of Mill Valley, City of Tiburon, City of Belvedere, Caltrans	1. Implement applicable stormwater management plan.	As specified in approved stormwater management plan and in applicable NPDES permit
		2. Update/amend applicable stormwater management plans, as appropriate, to include specific measures to reduce pathogen loading, including additional education and outreach efforts, and installation of additional pet waste receptacles.	
		3. Report progress on implementation of pathogen reduction measures to Water Board.	

Table 7-4. Trackable implementation measures for the Richardson Bay pathogens TMDL

Source Category	Implementing Party	Action	Completion Dates
Houseboats	RBRA; Marin County; local cities	1. Submit to the Executive Officer for approval a plan and schedule for 1) evaluating adequacy and performance of sewage collection systems (onboard sewage systems, pumps, sewer lines, etc.) for all houseboats in Richardson Bay, 2) biennial evaluation of sewage collection system operation and maintenance for all houseboats once they have been repaired/upgraded such that they do not discharge any sewage into the Bay.	July 2009
		2. Conduct evaluation per submitted plan.	July 2010
		3. Report progress on implementation of the plan to Water Board.	Annually
	Houseboat marina owners	1. Submit to the Executive Officer for approval a plan and schedule for 1) repairing/upgrading identified substandard/malfunctioning sewage collection systems (onboard sewage systems, pumps, sewer lines, etc.) such that they do not discharge any sewage into the Bay, 2) long-term operation and maintenance of the systems.	July 2011
		2. Report progress on implementation of the plan to Water Board.	Annually
	Houseboat owners, houseboat marina owners	1. Repair/Upgrade identified substandard/malfunctioning sewage collection systems (onboard sewage systems, pumps, sewer lines, etc.) such that they do not discharge any sewage into the Bay.	July 2013
		2. Operate and maintain sewage collection systems such that they do not discharge any sewage into the Bay.	Ongoing

Source Category	Implementing Party	Action	Completion Dates
Vessels	RBRA; Marin County; local cities	1. Submit to the Executive Officer for approval a plan and implementation schedule for 1) evaluating adequacy and performance of sewage collection systems (sewage dump stations, sewage pumpout stations, onboard sewage systems, sewer lines, etc.) for all vessel marinas and vessels with toilet facilities in Richardson Bay, 2) biennial evaluation of sewage collection system operation and maintenance for all vessel marinas and vessels once they have been repaired/upgraded such that they do not discharge any sewage into the Bay.	July 2009
		2. Conduct evaluation per submitted plan.	July 2010
		3. Report progress on implementation of the plan to Water Board.	Annually
	Vessel marina owners	1. Submit to the Executive Officer for approval a plan and schedule for 1) installing, as needed, an adequate number of sewage pumpout and dump stations. If no new sewage pumpout and dump stations are needed, provide an explanation as why they are not needed, 2) repairing/upgrading identified leaky/malfunctioning sewage collection systems (sewage dump stations, sewage pumpout stations, onboard sewage systems, sewer lines, etc.) such that they do not discharge any sewage into the Bay, 3) long-term operation and maintenance of the systems such that they do not discharge any sewage into the Bay.	July 2011
		2. Report progress on implementation of the plan to Water Board.	Annually
	Vessel owners, vessel marina owners	1. Repair/upgrade identified leaky/malfunctioning sewage collection systems (sewage dump stations, sewage pumpout stations, onboard sewage systems, sewer lines, etc.) such that they do not discharge any sewage into the Bay.	July 2013
		2. Operate and maintain sewage collection systems such that they do not discharge any sewage into the Bay.	Ongoing
		3. Enroll in RBRA's mobile sewage collection and disposal service for all live-aboards (both anchor-outs and marina-berthed vessels).	July 2010

Regulatory Framework

The state’s Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program requires that current and proposed nonpoint source discharges be regulated under waste discharge requirements, waivers of waste discharge requirements, Basin Plan discharge prohibitions, or some combination of these tools. Municipal and highway stormwater runoffs are regulated under NPDES permits. Table 7-5 describes the regulatory mechanism by which dischargers in each source category will be regulated.

Table 7-5. Regulatory Framework	
Source Category	Regulatory Tool
Sanitary Sewer Systems	General WDR permit
Stormwater Runoff	NPDES permit
Houseboats	Existing prohibition of human waste discharge (Table 4-1, Prohibitions 5 and 15)
Vessels	Existing prohibition of human waste discharge (Table 4-1, Prohibitions 5, 15, and 18)

Ongoing Water Quality Monitoring in Richardson Bay

Water quality monitoring will be conducted to assess water quality improvements and obtain additional information for further refinement of the TMDL. The main objectives of the ongoing monitoring program are to:

- Assess attainment of TMDL targets
- Evaluate spatial and temporal water quality trends in the Bay
- Obtain additional information about significant potential pathogen source areas
- Collect sufficient data to prioritize implementation efforts and assess the effectiveness of source control actions

All water quality monitoring (including Quality Assurance and Quality Control procedures) will be performed pursuant to the State Water Board’s Quality Assurance Management Plan for the Surface Water Ambient Monitoring Program.

Adaptive Implementation

In 2013, the Water Board will evaluate monitoring results and assess progress toward attaining TMDL targets (Table 7-1) and load allocations (Table 7-3). The Water Board will also evaluate compliance with the trackable implementation measures specified in Table 7-4, as documented by submitted progress reports.

If evaluation and monitoring show that source control actions have been fully implemented throughout the watershed, but the TMDL targets (water quality objectives) are not attained, the Water Board may re-evaluate the attainability/applicability of designated water quality objectives.

The Water Board will review the Richardson Bay Pathogens TMDL and evaluate new and relevant information from monitoring, special studies, and scientific literature. At a minimum, these reviews will aim to find answers to the following questions. Additional questions may be developed in collaboration with stakeholders.

1. Is Richardson Bay progressing toward TMDL targets? If progress is unclear, how can monitoring efforts be modified to detect trends? If there has not been adequate progress, how might the implementation actions be modified?
2. What are the pollutant contributions for the various source categories? How have these contributions changed over time? How do they vary seasonally? How might source control measures be modified to improve load reduction? If the answers to these questions are not clear, how can monitoring efforts be modified to answer these questions?
3. Is there new, reliable, and widely accepted scientific information that suggests modifications to targets, or implementation actions? If so, how should the TMDL be modified?

Modifications to the targets or implementation plan will be incorporated into the Basin Plan via an amendment process.