

**STATE WATER RESOURCES CONTROL BOARD**  
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY

**DRAFT STAFF REPORT**

**2024 CALIFORNIA INTEGRATED REPORT:  
SURFACE WATER QUALITY ASSESSMENTS  
TO COMPLY WITH  
CLEAN WATER ACT SECTIONS 303(d) AND 305(b)**



**February 16, 2023**

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## List of Regulatory Acronyms, Initialisms, and Abbreviations

ATTAINS:	Assessment, Total Maximum Daily Load Tracking and Implementation System
Basin Plan:	Regional Water Quality Control Plan
CalWQA:	California Water Quality Assessment (Database)
CDPR:	California Department of Pesticide Regulation
CFR:	Code of Federal Regulations
CIWQS:	California Integrated Water Quality System
CSCI:	California Stream Condition Index
CWA:	Clean Water Act
ILRP:	Irrigated Lands Regulatory Program
ISWEBE Plan:	Inland Surface Waters, Enclosed Bays, and Estuaries Plan; more specifically the water quality control plan components previously adopted by the State Water Board for future incorporation into the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California
Listing Policy:	Water Quality Control Policy for Developing California's Section 303(d) List



LOE:	Line of Evidence
MS4	Municipal Separate Storm Sewer Systems
NOAA:	National Oceanic and Atmospheric Administration
OEHHA:	California Office of Environmental Health Hazard Assessment
QAPP:	Quality Assurance Project Plan
QC:	Quality Control
Regional Water Board:	Regional Water Quality Control Board
SFEI:	San Francisco Estuary Institute
SSO:	Site-specific Objective
State Water Board:	State Water Resources Control Board
SWAMP:	Surface Water Ambient Monitoring Program
TMDL:	Total Maximum Daily Load
U.S. EPA:	United States Environmental Protection Agency
USGS:	United States Geological Survey

## List of Scientific Acronyms, Initialisms, and Abbreviations

7DADM:	7-day Average of Daily Maximum Temperature
CFU:	Colony Forming Units
CSCI:	California Stream Condition Index
DDT:	Dichlorodiphenyltrichloroethane
DOC:	Dissolved Organic Carbon
Geomean:	30-day geometric mean
HSA:	Hydrologic Sub Area
IBI:	Index of Biological Integrity
mg/L:	Milligrams per Liter (parts per million)
PCB:	Polychlorinated Biphenyl
SSM:	Single Sample Maximum
STV:	Statistical Threshold Value

## Executive Summary

The goal of the Clean Water Act (“CWA”) is “to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.” (33 U.S.C § 1251(a).) Pursuant to Clean Water Act sections 303(d) and 305(b) (33 U.S.C. §§ 1313(d), 1315(b)), each state is required to report to the U.S. Environmental Protection Agency (“U.S. EPA”) on the overall quality of the waters within its boundaries. The U.S. EPA then compiles these reports into their “National Water Quality Inventory Report” to Congress.

CWA section 303(d) requires states to review, revise as necessary, and submit to U.S. EPA a list of waters not meeting water quality standards or not expected to meet water quality standards (i.e., impaired or threatened waters) and to identify the water quality parameter(s) (i.e., pollutant(s)) causing or suspected to be causing the violation of the water quality standard. (40 C.F.R. §§ 130.2(j), 130.7(b)(4).) This list of impaired or threatened waters is referred to as the “303(d) list”. States are required to include a priority ranking of such waters for the development of total maximum daily loads, accounting for the severity of the pollution and the uses to be made of such waters. (40 C.F.R. § 130.7(b)(4).) However, alternative pollution control requirements implemented by another regulatory program may obviate the need for a TMDL.

Under CWA section 305(b), each state is required to submit an informational report to the U.S. EPA on the water quality conditions of its surface waters, which is referred to as the “305(b) report”. States are required to submit their 303(d) lists and 305(b) reports every two years (commonly referred to as the “listing cycle”). (40 C.F.R. § 130.7(d).) In California, the State Water Board satisfies its 303(d) listing and 305(b) reporting obligations by compiling both in a single document called the “California Integrated Report.”

The [Water Quality Control Policy for Developing California’s Clean Water Act Section 303\(d\) List](#) (the “Listing Policy”) describes the methods and the process the State Water Board uses to develop and adopt the 303(d) list, ([https://www.waterboards.ca.gov/board\\_decisions/adopted\\_orders/resolutions/2015/020315\\_8\\_amendment\\_clean\\_version.pdf](https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2015/020315_8_amendment_clean_version.pdf).)

The State Water Board administers the development of the California Integrated Report so that each integrated report consists primarily of assessments from three Regional Water Quality Control Boards (“Regional Water Boards”) that are characterized as being “on-cycle” by a Notice of Public Solicitation of Water Quality Data. The other six Regional Water Boards are “off-cycle”; however, they may assess high-priority data, make listing or delisting recommendations or propose changes to the 305(b) report. Every two years, waterbodies within the boundaries of the Regional Water Boards characterized as “on-cycle” are rotated, and every region is fully assessed once every six years.

For the 2024 California Integrated Report, the San Francisco Bay, Los Angeles, and Santa Ana Regional Water Boards are conducting assessments for waters within those

regions and are “on-cycle.” All readily available data and information from waterbodies within these regional water boards received prior to the data solicitation cut-off date of October 16, 2020 were considered as outlined in the [Notice of Public Solicitation of Water Quality Data and Information for the 2024 California Integrated Report Cycle for the Clean Water Act Section 305\(b\) Surface Water Quality Assessment and the 303\(d\) List of Impaired Waters](https://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/docs/2024_solicitation_notice_final.pdf). ([https://www.waterboards.ca.gov/water\\_issues/programs/water\\_quality\\_assessment/docs/2024\\_solicitation\\_notice\\_final.pdf](https://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/docs/2024_solicitation_notice_final.pdf).)

In addition, readily available data and information from several waterbodies within the Central Coast and San Diego Regional Water Boards were considered as “off-cycle” assessments. Finally, all readily available data and information from waterbodies within the Sacramento River sub-area of the Central Valley Regional Water Board were considered for “off-cycle” assessments. The Sacramento River sub-area is defined as the Sacramento River watershed and includes the mainstem of the Sacramento River above the legal boundary of the Sacramento-San Joaquin Delta and all surface waters tributary to the mainstem.

As a result, for the 2024 California Integrated Report, assessments are being considered for waters within the San Francisco Bay, Los Angeles, Santa Ana, Central Valley, Central Coast, and San Diego regions, for waterbodies in a total of six regions.

The State Water Board is administering the listing process for all waters assessed during the listing cycle for the 2024 California Integrated Report, in accordance with section 6.2 of the Listing Policy. Still, the development of the California Integrated Report is a coordinated effort by staff at the State and Regional Water Boards.

Upon State Water Board approval of the 303(d) list portion of the 2024 California Integrated Report, the California Integrated Report is submitted to U.S. EPA for its independent review, which may include making changes to the 303(d) list before it approves and establishes the final 303(d) list for California. (33 U.S.C. § 1313 (d)(2).) Unlike the 303(d) list, neither the State Water Board nor the U.S. EPA takes formal approval action on the 305(b) report; rather, the U.S. EPA collects the states’ 305(b) reports and forwards them to Congress. (33 U.S.C. § 1315(b)(2).)

The 2024 California Integrated Report revises the 2020-2022 California Integrated Report. The revisions are based on data and information collected from surface waters (e.g., rivers, streams, lakes, bays, estuaries, enclosed lagoons, and coastal waters) located in the aforementioned regions. The revisions include changes to the 303(d) list and the 305(b) report and describes the extent to which surface waters in California are supporting beneficial uses.

This staff report provides background on the methods used to compile, evaluate, and assess data and information. Surface water data and information were downloaded from the California Environmental Data Exchange Network (“CEDEN”), the California Integrated Water Quality System (“CIWQS”), the National Water Quality Monitoring Portal (“WQP”), and the California Integrated Report Upload Portal. Data sources

include the Water Boards’ Surface Water Ambient Monitoring Program (“SWAMP”), Irrigated Lands Regulatory Programs (“ILRP”), and other monitoring programs; other state agencies such as the California Department of Fish and Wildlife and the California Department of Pesticide Regulation; federal agencies such as the U.S. Geological Service (“USGS”) and U.S. EPA; Tribes; and local watershed groups.

Based on assessments of these data and information, 832 new listings and 91 new delistings are recommended. A summary of new listings and delistings by Regional Water Board is outlined in the table, below. The complete recommended 2024 303(d) List of Impaired Waters is found in Appendix A: Recommended 2024 303(d) List of Impaired Waters. The specific waterbody-pollutant combination assessments are described in Appendix B: Statewide Waterbody Fact Sheets.

<b>Region</b>	<b>2020-2022 303(d) Listings</b>	<b>New Listings</b>	<b>New Delistings</b>	<b>2024 303(d) Listings</b>
North Coast	217	0	0	217
San Francisco Bay	348	137	0	481
Central Coast	1,177	29	1	1,204
Los Angeles	877	465	30	1,316
Central Valley	1,202	123	57	1,274
Lahontan	256	0	0	256
Colorado River Basin	110	0	0	110
Santa Ana	142	78	0	217
San Diego	844	0	3	839
<b>TOTALS</b>	<b>5,173</b>	<b>832</b>	<b>91</b>	<b>5,914</b>

*Count of 2024 303(d) listings may not equal the addition of new listings and removal of delistings from the 2020-2022 303(d) List due to waterbody splits, merges, or other miscellaneous changes.*

# 1 About the California Integrated Report

The State Water Board, along with the nine Regional Water Boards (collectively, “Water Boards”), protect and enhance the quality of California’s water resources through implementing the CWA as amended (33 U.S.C. § 1251 et seq.; CWA, § 101 et seq.), and California’s Porter-Cologne Water Quality Control Act (Wat. Code, § 13000 et seq.).

States that administer the CWA must submit the CWA section 303(d) list of impaired waters to the U.S. EPA. CWA section 305(b) requires each state to report biennially to U.S. EPA on the condition of its surface water quality. U.S. EPA guidance to the states recommends the two reports be integrated. For California, this report is called the “California Integrated Report” and combines the State Water Board’s Section 303(d) and 305(b) reporting requirements (U.S. EPA 2005).

In addition to requirements of federal statutes and regulations, the State Water Board follows a number of U.S. EPA guidance documents in structuring its compliance with the CWA. Though not strictly required by statute or regulation, the State Water Board develops and distributes its 305(b) report concurrently with its 303(d) list in a single “Integrated Report” pursuant to U.S. EPA guidance documents.

It is essential for the State Water Board to timely take action on the 303(d) lists and timely submit the California Integrated Reports to meet its responsibilities under the Clean Water Act. Such timely submissions of the California Integrated Report are critical in achieving the State Water Board’s and U.S. EPA’s important goals for restoring and maintaining the quality of the nation’s waters within California. Timely submittals also provide the public and other stakeholders with the most up to date information on the condition of the water quality of the waters within the state.

## 1.1 The 303(d) List of Impaired Waters

Federal regulation defines a “water quality-limited segment” as “any segment where it is known that water quality does not meet applicable water quality standards, and/or is not expected to meet applicable water quality standards, even after application of technology-based effluent limitations required by CWA sections 301(b) or 306.” (40 C.F.R. § 130.2(j).) Water segments are also known as waterbodies or waters, and water quality-limited segments are also known as “impaired waterbodies” or “impaired waters” or “303(d) listings.” Water quality standards consist of beneficial uses of water, water quality criteria or objectives set at levels to ensure the reasonable protection of beneficial uses, and antidegradation policies.

Under CWA section 303(d), states are required to review, revise as necessary, and submit to U.S. EPA a list of water quality-limited segments that are not meeting or are not expected to meet water quality standards. This submission is referred to as the 303(d) list of Impaired Waters, or the “303(d) list”. The 303(d) list must identify the pollutants causing lack of attainment of water quality standards and include a priority ranking of the water quality-limited segments considering the severity of the pollution and the uses to be made of the waters. (40 C.F.R. § 130.7(b)(4).) To restore water

quality, a total maximum daily load (“TMDL”) or other regulatory action must be developed to address the impaired waterbodies on the 303(d) list. This is in accordance with the State Water Board Resolution 2005-0050, “Water Quality Control Policy for Addressing Impaired Waters: Regulatory Structure and Options” (SWRCB 2005).

In 2013, the U.S. EPA released “[A Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303\(d\) Program](https://www.epa.gov/sites/default/files/2015-07/documents/vision_303d_program_dec_2013.pdf)” (“2013 Program Vision”) that provides a collaborative framework for implementing the Integrated Report program with states. ([https://www.epa.gov/sites/default/files/2015-07/documents/vision\\_303d\\_program\\_dec\\_2013.pdf](https://www.epa.gov/sites/default/files/2015-07/documents/vision_303d_program_dec_2013.pdf).) The 2013 Program Vision describes long-term visions and goals as well as implementation plans for achieving those visions and goals related to prioritization, assessment, protection, alternatives, engagement, and integration. In September 2022, the U.S. EPA released “[A New Long-Term Vision for Assessment, Restoration, and Protection under the Clean Water Act Section 303\(d\) Program](https://www.epa.gov/system/files/documents/2022-09/CWA_Section_303d_Vision_September_2022.pdf)” (“2022-2032 Program Vision”) which builds on the experience gained from implementing the 2013 Vision. ([https://www.epa.gov/system/files/documents/2022-09/CWA\\_Section\\_303d\\_Vision\\_September\\_2022.pdf](https://www.epa.gov/system/files/documents/2022-09/CWA_Section_303d_Vision_September_2022.pdf).) The 2022-2032 Program Vision outlines four new focus areas: environmental justice, climate change, tribal engagement, and program building capacity. California’s Integrated Report Program is dedicated to aligning the state’s program and practices with the U.S. EPA’s 2022-2032 Program Vision, as appropriate.

The 303(d) list (as well as the full California Integrated Report) is an informational document and does not by itself directly establish new regulatory requirements. By adopting the 303(d) list, the State Water Board provides recommendations to the U.S. EPA to list or delist waterbodies.

The listing of a waterbody as impaired on the 303(d) list and the supporting data can and has been used in several ways. The information can be used in national pollutant discharge elimination system permits and waste discharge requirement orders to determine reasonable potential and inclusion of effluent limitations. The information can also be used in permits to justify monitoring for the listed pollutant, source studies, or other actions. Additionally, as more customarily known, the information can be used to identify that a TMDL or other control action is needed to address the impairment and restore water quality.

In each of the above instances, the permitting or TMDL action involves public proceedings during which interested parties can fully participate, submit information, and seek review. These separate actions are the forum for consideration of environmental impacts, most environmental justice impacts, and, if applicable, rulemaking procedural requirements.

A regional water board has discretion in its response to a listing. For TMDLs, the regional water board can prioritize or de-prioritize TMDL development. Additionally, a listing does not conclusively mean a TMDL will be developed in the first instance. “A listing is only suggestive of impairment because the standard for listing has been set at a threshold low enough to ensure that all waters of concern are brought within the

TMDL regulatory structure.” (Water Board Order WQ 2001-006 (*Tosco*), p. 20.) In some cases, additional information may lead to a conclusion that standards are in fact being attained, either because the assumptions underlying the listing were incorrect (e.g., as more data are collected), or because the impairment has been corrected. In other cases, natural sources may be found to be the cause of the impairment and a TMDL is not needed.

For permits, a Regional Water Board or the State Water Board also has discretion in how to use the fact of a listing when determining reasonable potential and establishing effluent limitations. In State Water Board Order WQ 2001-16 (Napa Sanitation District), at pages 21-23, the board held:

[A] water body listing, without more, is an insufficient basis on which to conclude that the water lacks assimilative capacity for the impairing pollutant. The fact of a listing, however, is a sufficient basis on which to conclude that a pollutant should be limited in a permit. Further, the data on which the listing is based may very well justify mass limits for the pollutant.

The Board held in the *Tosco* order that a listing is suggestive of impairment but is not determinative. A listing is only suggestive of impairment because the standard for listing has been set at a threshold low enough to ensure that all waters of concern are brought within the TMDL regulatory structure. Indeed, EPA has instructed the states to rely on “all existing and readily available water quality-related data and information” in making listing decisions. In addition to sampling data, this information can include, for example, opinions from other agencies, anecdotal information from the public, and circumstantial evidence. Further, as we stated in the *Tosco* order, the information may not represent conditions throughout the entire water body or in all seasons.

Although a listing alone does not conclusively determine a water's capacity to assimilate an impairing pollutant, the listing does indicate that the water is of concern and deserves further scrutiny. In particular, a 303(d) listing for a priority pollutant may form the basis for a Regional Board determination that discharge of the pollutant has the reasonable potential to cause or contribute to a water quality standards violation and, therefore, that the pollutant could be limited.

Based on the foregoing, the fact of a listing alone does not require the establishment of an effluent limitation. The regional water board is required to evaluate all relevant, available, and valid information to assess whether water quality based effluent limits are required in a permit or order.



## 1.2 California's 305(b) Report Condition Categories

To meet CWA section 305(b) requirements of reporting on water quality conditions, the California Integrated Report places waterbodies into one of five "Condition Categories". This categorization is based on the assessment of all readily available data and information collected in a waterbody segment to inform that waterbody's ability to support beneficial use(s). The 303(d) list portion of the California Integrated Report consists of waterbody-pollutant combinations placed in Categories 4a, 4b, and 5. This is because, in California, a waterbody or segment of a waterbody may be considered impaired if standards are not met, regardless of whether a TMDL or another program of implementation is in place. Additionally, since there may be more than one pollutant causing lack of attainment of water quality standards for a given waterbody, each 303(d) listing is a specific waterbody-pollutant combination, and there may be multiple 303(d) listings for one waterbody.

The U.S. EPA considers only waterbody-pollutant combinations needing a TMDL when approving the 303(d) list. The U.S. EPA approves placement of waterbody-pollutant combinations in Categories 4a and 4b separately from the 303(d) list. Please see section 2.5 for more information about how California places waterbody-pollutant combinations into condition categories.

## 1.3 The Listing Policy

In accordance with Water Code section 13191.3, the State Water Board established the [Water Quality Control Policy for Developing California's Clean Water Act Section 303\(d\) List](https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2015/020315_8_amendment_clean_version.pdf), commonly referred to as the "Listing Policy" ([https://www.waterboards.ca.gov/board\\_decisions/adopted\\_orders/resolutions/2015/020315\\_8\\_amendment\\_clean\\_version.pdf](https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2015/020315_8_amendment_clean_version.pdf).) to specify the substantive and procedural elements to guide its 303(d) list submittals under the CWA. Recommendations to place a waterbody on the 303(d) list or to remove a waterbody from the 303(d) list are made in conformance with the Listing Policy.

The Listing Policy provides direction related to the:

1. Administration of the listing process including data solicitation and fact sheet preparation.
2. Definition of readily available data and information. Readily available data and information is defined as data and information that can be submitted to CEDEN, or if the type of data and information cannot be accepted by CEDEN, it is submitted directly to the State Water Board following a procedure established during the data solicitation process.
3. Application and interpretation of chemical-specific water quality standards; bacterial water quality standards; health advisories; bioaccumulation of chemicals in aquatic life tissues; nuisance such as trash, odor, and foam; nutrients; water and sediment toxicity; adverse biological response; and degradation of aquatic life populations and communities.



4. Evaluation of narrative water quality objectives using numeric evaluation guidelines.
5. Data quality evaluation conditions, including the requirement for data to be supported by a Quality Assurance Project Plan (“QAPP”).
6. Data quantity evaluation conditions including water segment specific information, data spatial and temporal representation, aggregation of data by segment, quantitation of chemical concentrations, evaluation of data consistent with the expression of water quality objectives or criteria, binomial model statistical evaluation, evaluation of bioassessment data, and evaluation of temperature data.
7. Water quality conditions, or listing or delisting factors, that reflect whether waterbody segments shall be placed on the 303(d) list or removed from the list based on exceedances of water quality standards for specific pollutants. The listing and delisting factors include a situation-specific weight of evidence approach that may be used (if the necessary conditions set forth thereunder are met) when all other factors do not result in a listing or delisting but where information suggests standards nonattainment or attainment, respectively.

#### **1.4 California Integrated Report Cycles**

In 2015, the State Water Board took steps to achieve timely biennial submittals to the U.S. EPA and ensure quality data by narrowing the universe of waterbodies and data it would evaluate by amending its Listing Policy. The amendments to the Listing Policy provided, first, for the use of a new database for assembling data on potential water quality limited standards, known as the California Environmental Data Exchange Network (CEDEN). (Listing Policy, p. 17, § 6.1.1.) To accommodate increases in data submittals and the ramping-up of CEDEN, the State Water Board adopted a regulatory definition of “readily available data and information” required to be evaluated under the Act as “data and information that can be submitted to CEDEN or its successor database, as directed in the notice of solicitation.” (*Ibid.*)

Additionally, to achieve timely biennially submittals to the U.S. EPA, the State Water Board develops the California Integrated Report each listing cycle primarily consisting of assessments of waterbodies within the regions of three Regional Water Boards. The three Regional Water Boards identified for conducting assessments for the listing cycle are characterized as being “on-cycle” by a notice of public solicitation of water quality data. The other six Regional Water Boards that are “off-cycle” may also assess high-priority data, make listing or delisting recommendations, or propose changes to the 305(b) report. Every two years, Regional Water Boards are rotated, and every region is fully assessed once every six years.

Each listing cycle builds on assessments from the previous listing cycle. The listings and 305(b) waterbody category assignments from the prior California Integrated Report for all waterbodies in the state are carried over into the current California Integrated

Report. All readily available data and information received during the data solicitation period for the current listing cycle are considered and the listings and categories are revised, as appropriate. Thus the 2024 California Integrated Report builds upon the 2020-2022 California Integrated Report and contains all prior assessments as well as any new or revised assessments based on the data received prior to the end of the 2024 California Integrated Report data solicitation period.

For the 2024 California Integrated Report, the San Francisco Bay, Los Angeles, and Santa Ana Regional Water Boards are “on-cycle.” All readily available data and information for these Regional Water Boards received prior to the data solicitation cut-off date of October 16, 2020, were considered. In addition, readily available data and information from several waterbodies within the Central Coast and San Diego Regional Water Boards were considered as “off-cycle” assessments. Finally, all readily available data and information from waterbodies within the Sacramento River sub-area of the Central Valley Regional Water Board were considered for “off-cycle” assessments. The Sacramento River sub-area is defined as the Sacramento River watershed and includes the mainstem of the Sacramento River above the legal boundary of the Sacramento-San Joaquin Delta and all surface waters tributary to the mainstem.

## 1.5 Racial Equity

The Water Board’s mission is to preserve, enhance, and restore the quality of California’s water resources and drinking water for the protection of the environment, public health, and all beneficial uses, and to ensure proper water resource allocation and efficient use for the benefit of present and future generations. In relation to this mission, the Water Boards accepts responsibility for confronting structural and institutional racism and advancing racial equity. On November 16, 2021, the State Water Board adopted a resolution titled, “Condemning Racism, Xenophobia, Bigotry, and Racial Injustice, and Strengthening Commitment to Racial Equity, Diversity, Inclusion, Access, and Anti-Racism” ([Resolution No. 2021-0050](https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2021/rs2021_0050.pdf)). ([https://www.waterboards.ca.gov/board\\_decisions/adopted\\_orders/resolutions/2021/rs2021\\_0050.pdf](https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2021/rs2021_0050.pdf)).

In response to Resolution No. 2021-0050, the Water Boards developed a draft Racial Equity Action Plan, which is a compilation of actions intended to set goals for the State Water Board to address racial inequities and identify metrics to measure progress. As part of the draft Racial Equity Action Plan, the State Water Board is considering a number of actions. For example, the California Integrated Report may be used to advance environmental justice by identifying impaired waters that are located in disadvantaged communities and identify where there’s insufficient data and information to inform if a waterbody is impaired.

While the Water Boards work to advance these efforts, the California Office of Environmental Health Hazard Assessment (“OEHHA”) provides the California Communities Environmental Health Screening Tool: CalEnviroScreen 4.0. CalEnviroScreen is an online mapping tool that helps identify California communities that are most affected by many sources of pollution and where people are often

especially vulnerable to pollution's effects. CalEnviroScreen uses environmental, health, and socioeconomic data and information to produce scores for every census tract in California. CalEnviroScreen 4.0 incorporates data and information from the 303(d) list to help inform the extent of environmental degradation within an area. For more information visit the [CalEnviroScreen webpage](https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40) at <https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40>.

## 2 California Integrated Report Development

This section describes the rationale, methods, and procedures employed to develop the 2024 California Integrated Report. Note that much of the rationale, methods, and procedures described in the sections below describe the functionality of the California Water Quality Assessment ("CalWQA") database.

### 2.1 Readily Available Data and Information

All readily available data and information received during California's 2024 Integrated Report data solicitation period were considered in the development of the California Integrated Report. As defined by section 6.1.1 of the Listing Policy, "data" are considered a subset of information that consists of reports detailing measurements of specific environmental characteristics (i.e., measurements of physical, chemical, or biological characteristics in aquatic environments) and "information" is any documentation, such as narrative or photographic evidence, describing the water quality condition of a surface water body.

For the 2024 California Integrated Report, the State Water Board solicited data and information from the public from June 29 to October 16, 2020. All readily available data and information submitted for the San Francisco Bay, Los Angeles, and Santa Ana Regional Water Boards, all readily available data and information from the Sacramento River watershed of the Central Valley Regional Water Board, and high priority data from the Central Coast and San Diego Regional Water Boards were considered. Data and information considered include:

- The 2020-2022 California Integrated Report and its supporting data and information.
- CEDEN data, which includes data from the SWAMP and other Water Board monitoring programs, ILRP, Southern California Coastal Water Research Project ("SCCWRP"), San Francisco Estuary Institute's ("SFEI") Regional Monitoring Program, citizen monitoring groups, academic institutions and other data providers.
- CIWQS data, which includes receiving water monitoring data from discharger monitoring reports.
- Data and information, including QAPPs, submitted through the California Integrated Report Upload Portal.
- WQP that includes federal USGS, U.S. EPA, and tribal data.

- Existing internal Water Board data and reports.
- Other sources of data and information that became readily available to Water Board staff, such as fish and shellfish advisories, beach postings, and closures; reports of fish kills, cancers, lesions or tumors; and reports of dog deaths associated with water contact.

## **2.2 Data Assembly and Evaluation**

All readily available data and information (as defined by section 6.1.1 of the Listing Policy) received during the 2024 California Integrated Report data solicitation period must be considered in the development of the 303(d) list. Data were assembled (e.g., gathered and organized) and evaluated to consider whether or how data and information were used to inform listing and delisting recommendations. The following subsections describe how data were assembled and evaluated.

### **2.2.1 Mapping**

Readily available data and information was reviewed to determine representative waterbody segments for further assessment. New monitoring stations were either associated with existing mapped waterbody segments or new waterbody segments were mapped to represent the new stations. Waterbody segments were mapped to account for hydrologic features or as described in the pertinent regional water quality control plans (“Basin Plans”).

In accordance with section 6.1.2.1 of the Listing Policy, if a waterbody segment could not be associated with a station, or the station did not include required sampling location information (i.e., latitude, longitude, and datum), the data or information from the station were not further considered. In accordance with sections 1 and 6.1.5.2 of the Listing Policy, effluent data (e.g., data collected from storm drain outfalls, wastewater treatment plant discharges, etc.) were not evaluated for California Integrated Report purposes.

Some waterbodies were re-segmented, split into additional segments, or renamed since the 2020-2022 California Integrated Report was approved. These and other mapping modifications are summarized in Appendix G: Miscellaneous Mapping Changes Report.

### **2.2.2 Data and Information Quality Review**

The Listing Policy provides that “[e]ven though all data and information must be considered, the quality of the data used in the development of the section 303(d) list shall be of sufficient high quality to make determinations of water quality standards attainment.” (Listing Policy, § 6.1.4.) Readily available data and information submitted during the data solicitation period are assembled (e.g., gathered and organized) and evaluated to consider whether or how the data and information will be used and, if appropriate, assessed to determine the condition of surface waters, identify impaired waters, and identify waters that are no longer impaired. Data and information were not considered further in developing the California Integrated Report nor used to make listing or delisting recommendations if the data and information did not meet data quality

requirements or were not spatially or temporally representative of a waterbody. (Listing Policy §§ 6.1.4, 6.1.5).

Data and information that met data quality conditions set forth in section 6.1.4 of the Listing Policy were used as primary lines of evidence (“LOE(s)”). A primary LOE is a phrase used to describe an LOE that meets Listing Policy data quality conditions and is used to make a listing or delisting recommendation. In some instances, data and information that did not meet Listing Policy quality conditions were used to develop ancillary LOEs. An ancillary LOE is a phrase used to describe a line of evidence that does not meet Listing Policy data quality conditions. An ancillary LOE cannot be used alone or in combination with another ancillary LOE to make a listing or delisting recommendation; however, one or more ancillary LOEs may be used as supporting evidence when utilizing the situation-specific weight of evidence approach for listing and delisting recommendations. (Listing Policy, §§ 3.11, 4.11.) Erroneous or inaccurate data and information were not further considered.

Quality review of data involved the application of filters to screen out data from stations with missing or inaccurate location information (latitude, longitude, and datum); data results that are less than the quantitation limit when the quantitation limit is greater than the water quality standard, objective, criterion, or evaluation guideline; data flagged by a laboratory as rejected during quality control (“QC”) review; data from a QC sample (laboratory duplicate, blank); and sample types that were not water quality-related data.

Data records that passed the screening filters were further evaluated based on available QC metadata and assigned estimated data quality tiers, as follows:

- Tier 0 – Metadata, QC record: Not a measurement of environmental conditions.
- Tier 1 – Passed QC: Data passed all QC checks.
- Tier 2 – Some review needed: Data did not pass minor QC checks; some effort needed to review and defend data if used.
- Tier 3 – Spatial Accuracy Unknown: Data missing spatial datum information, data should not be used for fine scale spatial analysis.
- Tier 4 – Extensive review needed: Data did not pass some critical QC checks; high level of effort needed to review and defend data if used.
- Tier 5 – Unknown Data Quality: Data were not reviewed by the monitoring program. Data will need review before use.
- Tier 6 – Reject Data: Data were rejected by the monitoring program or data did not pass all critical QC checks. Data deemed unusable.
- Tier 7 – Error in Data.

Data classified in Tier 1 were considered to meet Listing Policy data quality requirements for use as a primary LOE for listing recommendations. Data classified in Tiers 0, 6, and 7 were considered inapplicable, erroneous, or inaccurate and were not further considered. Data classified in Tiers 2 through 5 were evaluated on a case-by-case basis to determine compliance with Listing Policy quality requirements and

suitability for use as primary or ancillary lines of evidence to make listings or delisting recommendations based on determinations of water quality standards attainment.

Additionally, all datasets were associated with an approved QAPP, unless the dataset came from a monitoring program that is explicitly exempt from the QAPP requirement. Data from major monitoring programs in California and published U.S. Geological Survey reports are considered of adequate quality. The major monitoring programs include SWAMP, the Southern California Bight Projects of SCCWRP, U.S. EPA's Environmental Monitoring and Assessment Program, the SFEI's Regional Monitoring Program, and the Bay Protection Toxic Cleanup Program (Listing Policy section 6.1.4). Only data supported by an approved QAPP, or exempt from the QAPP requirement, were used as primary LOEs to make determinations of water quality standards attainment. In the absence of quality assurance documentation, data were used as ancillary evidence and not the basis of a listing or delisting recommendation. A list of the datasets and associated QAPPs from the 2024 data solicitation is available in Appendix H: References Report.

Data from receiving water monitoring stations in CIWQS were converted to CEDEN format and reviewed for acceptable quality. If an approved QAPP or QAPP-equivalent documentation that met Listing Policy requirements was unavailable, the data were not further considered for assessment. Receiving water monitoring stations shown not to be ambient samples were not further considered.

### **2.2.3 Data Averaging & Adjustments**

In accordance with section 6.1.5.6 of the Listing Policy, if the water quality objective, criteria, or guideline specifies an averaging period or mathematical transformation, the data are evaluated in the specified manner prior to conducting the statistical analysis for water quality standards attainment. Data were grouped to allow comparison of the data to water quality objectives, criteria, or guidelines that are expressed with a specified averaging period (e.g., annual, 30-day, weekly, four-day, etc.). For example, if the threshold is expressed as a 30-day geometric mean, data from samples collected within a 30-day timeframe were grouped and a geometric mean was calculated for comparison to the threshold. If only one data point was available during an averaging period, it was used to represent the average concentration for that period. If the averaging period is not stated in the water quality objective, criteria, or guideline, then data from samples collected less than 7 days apart were grouped into a weekly average value. (Listing Policy, § 6.1.5.6.)

Some data, such as metal concentrations, were adjusted based on the concentration of another constituent measured at the same time and location to allow for comparison to a threshold. For example, some metal data reported in the total fraction were converted to the dissolved fraction using hardness conversion factors before comparison to the threshold, which is expressed as a dissolved fraction. See section 3 of this Staff Report for additional detail regarding pollutant-specific data manipulation steps.



## **2.3 Data Analysis to Determine Water Quality Standards Attainment & Make Listing Recommendations**

All existing readily available data and information that met mapping and quality assurance requirements of the Listing Policy (as described above) were assessed using the listing or delisting factors identified in the Listing Policy to determine if water quality standards are exceeded or attained in a waterbody. Standards include beneficial uses of water, water quality objectives or criteria set at levels to ensure the reasonable protection of beneficial uses, and antidegradation policies. Data and information were compared to thresholds protective of beneficial uses, including water quality objectives, water quality criteria, and evaluation guidelines. These thresholds inform a waterbody's ability to support its beneficial uses and determine if the waterbody-pollutant combination should be listed, not listed, delisted, or remain on the 303(d) list (not delisted). The State Water Board submits these conclusions as recommendations to the U.S. EPA.

### **2.3.1 Selecting Beneficial Uses and Thresholds**

The beneficial uses for waters of California are identified in the Regional Water Boards' Basin Plans or statewide water quality control plans, including the Water Quality Control Plan for Ocean Waters of California ("Ocean Plan") and components of the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries ("ISWEBE Plan"). See Table 2-1 for a list of the most frequently used beneficial uses for the California Integrated Report with the most commonly used definitions. Some Basin Plans contain variations of the definitions.

If a beneficial use was not designated for a water segment in a Basin Plan or statewide water quality control plan, but it was determined that the beneficial use nonetheless actually exists in the water segment, the water segment was assessed using the existing beneficial use of the water.

Beneficial use support was determined by comparing the data to water quality objectives, water quality criteria, or other applicable evaluation guidelines (hereby referenced as "threshold(s)"). Thresholds are selected in accordance with the Listing Policy.

When available, numeric water quality objectives and criteria were used to evaluate beneficial use attainment. Numeric water quality objectives are established in Basin Plans or in statewide water quality control plans, including the ISWEBE Plan and the Ocean Plan. Objectives may apply statewide, apply across an entire region, or be site-specific to a watershed or waterbody reach. Additionally, numeric water quality objectives and criteria include:

- Numeric criteria for priority toxic pollutants contained in the California Toxics Rule or "CTR." (40 C.F.R. § 131.38)
- Maximum Contaminant Levels or "MCL(s)" (numeric objectives by reference in some Basin Plans) to the extent applicable. Examples include:

- Table 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of the California Code of Regulations, title 22, section 64431
- Table 64444-A (Organic Chemicals) of the California Code of Regulations, title 22, section 64444
- Tables 64449-A (Secondary Maximum Contaminant Levels-Consumer Acceptance Limits) and 64449-B (Secondary Maximum Contaminant Levels-Ranges) of the California Code of Regulations, title 22, section 64449

Numeric water quality objectives in the CTR were applied statewide unless a more stringent water quality objective is identified in Basin Plans. Maximum Contaminant Levels were applied differently depending on how they are incorporated in Basin Plans.

When evaluating narrative water quality objectives or beneficial use protection, evaluation guidelines were selected in conformance with section 6.1.3 of the Listing Policy. Section 6.1.3 of the Listing Policy describes the process to select evaluation guidelines for sediment quality, fish and shellfish consumption, aquatic life protection from bioaccumulation of toxic substances, as well as other parameters. Section 6.1.3 of the Listing Policy states “Regional Water Boards and State Water Boards shall identify evaluation guidelines that represent standards attainment or beneficial use protection.” The Listing Policy’s objective “is to establish a standardized approach for developing California’s Section 303(d) list in order to achieve the overall goal of achieving water quality standards and maintaining beneficial uses in all of California’s surface waters.” (Listing Policy, § 1.) To achieve that overarching goal, the Listing Policy requires narrative water quality objectives to be evaluated using evaluation guidelines. The evaluation guidelines to be used must represent standards attainment or beneficial use protection. (*Id.*, §6.1.3.) “The guidelines are not water quality objectives and shall only be used for the purpose of developing the Section 303(d) list.” (*Ibid.*)

The Listing Policy specifies that an evaluation guideline may be used if it is demonstrated that the evaluation guideline is: applicable and protective of the beneficial use, linked to the pollutant under consideration, scientifically based, peer reviewed, well described, and identify a range above which impacts occur and below which no or few impacts are predicted. All objectives, criteria and evaluation guidelines used for 2024 assessments are listed in Appendix B: Statewide Waterbody Fact Sheets.

Thresholds may have been revised since the last listing cycle in which the data were assessed, resulting in the need to reassess all previously assessed data and information. For these reassessments, all available previously assessed data were identified and compared with the revised/current threshold. The assessment was documented in a new LOE, and the previous LOE was retired and not used further. If data and information were unable to be reassessed (e.g., data and information were not readily available, as was the case for data used to make listing recommendations prior to 2006 because they are not available in CalWQA), the previous LOE with the previous threshold was retained and considered as part of the weight of the evidence for determining attainment of standards. LOEs retired during the listing cycle for the 2024 California Integrated Report are available in Appendix K: List of Retired Lines of Evidence.



**Table 2-1: Summary of Beneficial Uses and Common Definitions**

Beneficial Use Abbreviations	Definition
<b>AGR</b>	<b>Agricultural supply:</b> Uses of water for farming, horticulture or ranching including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.
<b>COLD</b>	<b>Cold Fresh Water Habitat:</b> Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
<b>COMM</b>	<b>Ocean Commercial and Sport Fishing:</b> Uses of water for commercial or recreational collection of fish and shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or bait purposes.
<b>CUL</b>	<b>Tribal Tradition and Culture:</b> Uses of water that support the cultural, spiritual, ceremonial, or traditional rights or lifeways of California Native American Tribes, including, but not limited to: navigation, ceremonies, or fishing, gathering, or consumption of natural aquatic resources, including fish, shellfish, vegetation, and materials.
<b>EST</b>	<b>Estuarine Habitat:</b> Uses of water that support estuarine ecosystems including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds).
<b>MAR</b>	<b>Marine Habitat:</b> Uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).
<b>MIGR</b>	<b>Migration of Aquatic Organisms:</b> Uses of water that support habitats necessary for migration or other temporary activities by aquatic organisms, such as anadromous fish.
<b>MUN</b>	<b>Municipal and Domestic Supply:</b> Uses of water for community, military, or individual water supply systems including, but not limited to, drinking water supply.
<b>RARE</b>	<b>Rare, Threatened, or Endangered Species:</b> Uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under state or federal law as rare, threatened or endangered.

<b>REC-1</b>	<b>Water Contact Recreation:</b> Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, white water activities, fishing, or use of natural hot springs.
<b>REC-2</b>	<b>Non-Contact Water Recreation:</b> Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tidepool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities
<b>SHELL</b>	<b>Shellfish Harvesting:</b> Uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters, abalone, and mussels) for human consumption, commercial or sport purposes.
<b>SUB</b>	<b>Subsistence Fishing:</b> Uses of water involving the non-commercial catching or gathering of natural aquatic resources, including fish and shellfish, for consumption by individuals, households, or communities, to meet needs for sustenance.
<b>T-SUB</b>	<b>Tribal Subsistence Fishing:</b> Uses of water involving the non-commercial catching or gathering of natural aquatic resources, including fish and shellfish, for consumption by individuals, households, or communities of California Native American Tribes to meet needs for sustenance.
<b>WARM</b>	<b>Warm Fresh Water Habitat:</b> Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.
<b>WILD</b>	<b>Wildlife Habitat:</b> Uses of water that support terrestrial ecosystems including, but not limited to, preservation or enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

### 2.3.2 Lines of Evidence

Data and information were organized into individual LOEs and compared to the applicable thresholds to determine the beneficial use support rating. An LOE was prepared for each unique combination of a waterbody, pollutant, matrix, fraction, beneficial use, and threshold. The term “matrix” refers to the sample medium used in an LOE, such as water, sediment, or tissue. The “fraction” is the analyzed portion of the sample medium. For example, if the matrix of a sample is water, then the fraction can be either the total constituent or the dissolved portion of the constituent.

Beneficial use support ratings are used to inform a recommendation to place a waterbody on the 303(d) list, and placement on the State Water Board’s overall Integrated Report Condition Category. Beneficial use support ratings were determined as follows. Each individual LOE identifies the number of samples and the number of exceedances of the applicable threshold. LOEs were grouped by beneficial use. The number of samples and exceedances of each LOE group were compared to the binomial tables in the Listing Policy. Each LOE group was assigned one of three possible beneficial use support ratings: Fully Supporting, Not Supporting, or Insufficient Information.

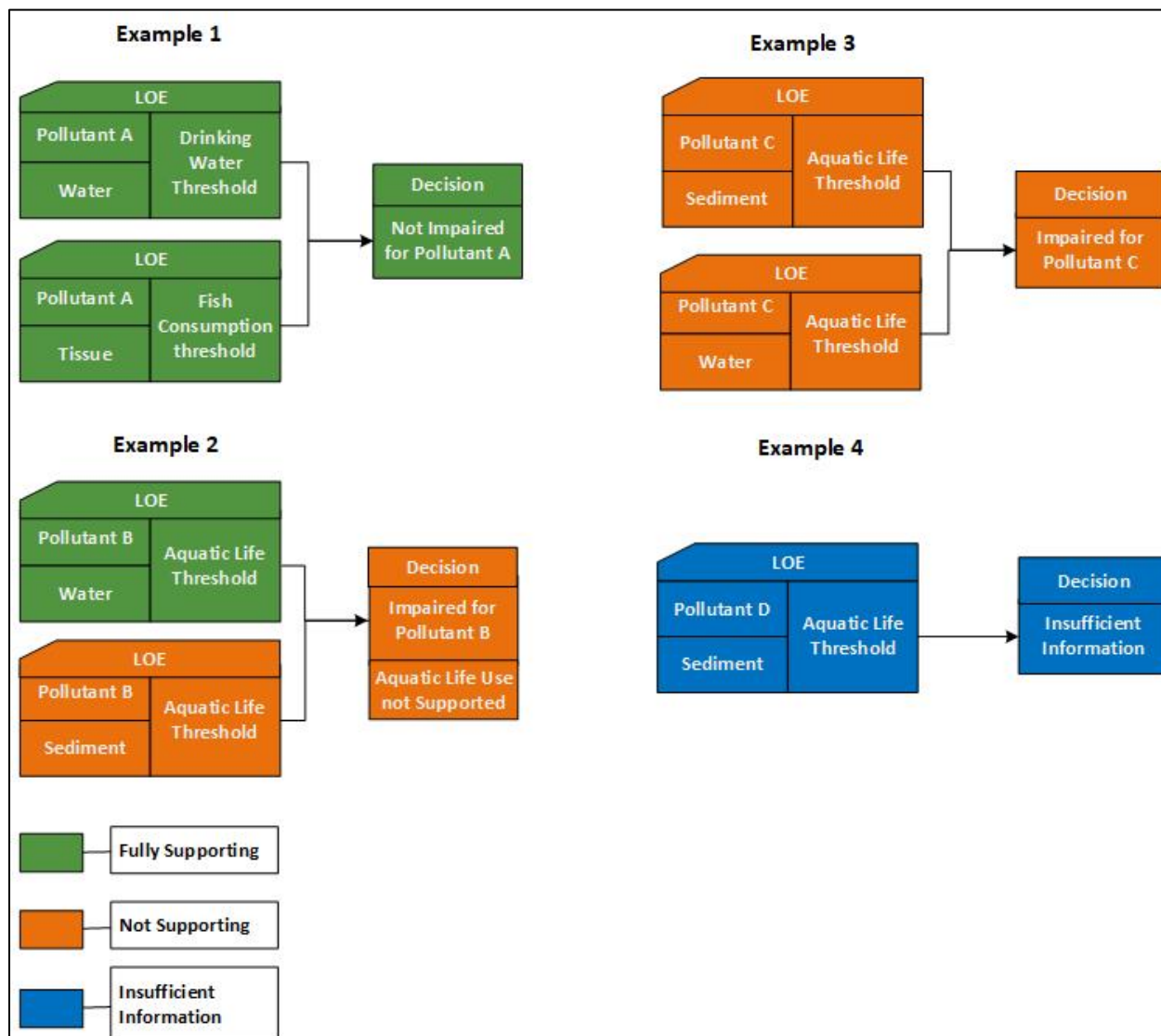
- Fully Supporting: Pollutants do not exceed thresholds with a frequency that cause a listing and the dataset consists of at least 16 samples for toxic pollutants per the Listing Policy Table 3.1 or at least 26 samples for conventional or other pollutants per the Listing Policy Table 3.2.
- Insufficient Information: It cannot be determined if a use is supported or not supported. This usually occurs when the data have poor quality assurance, there are not enough samples in a dataset, there is not an existing threshold, or the information alone cannot support a listing or delisting recommendation.
- Not Supporting: Pollutants exceed thresholds with a frequency that cause a listing.

All LOE groups were then aggregated into waterbody-pollutant combinations and a record was developed in CalWQA (“CalWQA Decision”). A CalWQA Decision includes a recommendation to list, not list, delist, or not delist for that waterbody-pollutant combination, depending on whether the waterbody is already listed. The State Water Board recommends that waterbodies with data or information that indicate one or more beneficial use is not supported be added to the 303(d) list.

Retirement of an LOE occurs when it is no longer included in the CalWQA Decision for a waterbody-pollutant combination. Generally, retired LOEs from previous listing cycles are replaced with updated LOEs when data are reassessed using a different threshold. LOEs retired during the listing cycle for the 2024 California Integrated Report are available in Appendix K: List of Retired Lines of Evidence.

See Figure 2-1: Example of Aggregation of Lines of Evidence into CalWQA Decisions and Use Support Ratings.

**Figure 2-1: Example of Aggregation of Lines of Evidence into CalWQA Decisions and Use Support Ratings**



### 2.3.3 CalWQA Decisions and Listing Recommendations

Each CalWQA Decision includes an assessment of one or more LOEs available for a specific waterbody-pollutant combination, as required by the Listing Policy, to determine whether a waterbody-pollutant combination is impaired (not supporting of beneficial uses) and should be placed on the 303(d) list. Section 3 of the Listing Policy consists of “listing factors” 3.1 through 3.11 used to determine whether waters should be added to the 303(d) list. Section 4 of the Listing Policy consists of “delisting factors” 4.1 through 4.11 used to evaluate whether waters should be removed from the 303(d) list. The listing and delisting factors are summarized below.

Listing a waterbody-pollutant combination is recommended if adequate data exist to show that any of the following conditions are met:

1. Numeric data exceed water quality objectives for toxic pollutants, including maximum contaminant levels where applicable, or California/National Toxics Rule water quality criteria more than the prescribed number of times. The number of times varies by the number of samples and is based on a binomial distribution. (Listing Policy, § 3.1.)
2. Numeric data exceed water quality objectives for conventional pollutants more than the prescribed number of times. The number of times varies by the number of samples and is based on a binomial distribution. (*Id.*, §3.2.)
3. Bacteria data exceeds water quality standards in California Code of Regulations, Basin Plans, or statewide plans based on a binomial distribution, site specific exceedance frequencies or a four percent exceedance frequency. (*Id.*, §3.3.)
4. A health advisory has been issued against the consumption of edible resident organisms or a shellfish harvest ban. (*Id.*, §3.4.)
5. Tissue pollutant levels in organisms exceed a pollutant-specific evaluation guideline. (*Id.*, § 3.5.)
6. Statistically significant water or sediment toxicity data exhibits statistically significant toxicity using the binomial distribution or narrative sediment quality objectives are exceeded. (*Id.*, §3.6.)
7. Nuisance condition data for odor, taste, excessive algae growth, foam, turbidity, oil, trash, litter, or color exceed evaluation guidelines or a significant nuisance condition exists when compared to reference conditions. (*Id.*, § 3.7.)
8. Adverse biological response is measured in resident individuals as compared to reference conditions and the impacts are associated with water or sediment concentrations of pollutants. (*Id.*, § 3.8.)
9. Significant degradation of biological populations and/or communities is exhibited as compared to reference sites and is associated with water or sediment concentrations of pollutants. (*Id.*, § 3.9.)
10. A trend of declining water quality standards attainment is exhibited. (*Id.*, § 3.10.)
11. The situation-specific weight of evidence listing factor may be applied when all other listing factors do not result in the listing of a waterbody segment, but information indicates non-attainment of standards. Specific justification must be provided, as per the Listing Policy, when the situation-specific weight of evidence listing factor is applied. (*Id.*, § 3.11.)

Delisting a waterbody-pollutant combination from the existing 303(d) list is recommended if adequate data exist to show that any of the following conditions are met:

1. Numeric data do not exceed water quality objectives for toxic pollutants, including maximum contaminant levels where applicable, or California/National Toxics Rule water quality criteria more than the prescribed number of times. The number of times varies by the number of samples and is based on a binomial distribution (Listing Policy, § 4.1.)
2. Numeric data do not exceed water quality objectives for conventional pollutants more than the prescribed number of times. The number of times varies by the number of samples and is based on a binomial distribution. (*Id.*, §4.2.)

3. A listing was based on faulty data, or objectives or standards have been revised. (*Id.*, § 4.)
4. Bacteria data do not exceed water quality standards in California Code of Regulations, Basin Plans, or statewide plans based on the binomial distribution, site specific exceedance frequencies or a four percent exceedance frequency. (*Id.*, § 4.3.)
5. A health advisory has been removed or the evaluation guideline is no longer exceeded. (*Id.*, § 4.4.)
6. Tissue pollutant levels in organisms do not exceed a pollutant-specific evaluation guideline. (*Id.*, § 4.5.)
7. Water or sediment toxicity or associated water data do not exceed water or sediment quality guidelines or narrative sediment quality objectives. (*Id.*, § 4.6.)
8. Nuisance condition data no longer exceed evaluation guidelines or there is no significant nuisance condition when compared to reference conditions. (*Id.*, § 4.7.)
9. Adverse biological response is no longer evident or associated water or sediment pollutants are no longer exceeded. (*Id.*, § 4.8.)
10. Degradation of biological populations and/or communities is no longer evident or associated water or sediment pollutants are no longer exceeded. (*Id.*, § 4.9.)
11. Trends in water quality are not substantiated or impacts are no longer observed. (*Id.*, § 4.10.)
12. The weight of evidence demonstrates that a water quality standard is attained. (*Id.*, § 4.11.)

The 303(d) list was developed per the following assumptions or requirements:

1. The 2020-2022 303(d) List (Appendix I: 2020-2022 303(d) List of Impaired Waters) formed the basis for the 2024 303(d) list recommendations.
2. The provisions of the Listing Policy directed recommendations.
3. Waterbody-pollutant listings are independent of the TMDLs that have been approved and are being implemented for the waterbody. If a waterbody-pollutant combination is removed from the list, the delisting has no effect on the validity or requirements for implementing an existing TMDL that was adopted and continues to have full force of law under California's Porter-Cologne authority. Changes to the 303(d) list do not result in a concurrent change to an existing Basin Plan. Any change to an existing Basin Plan would be made through a separate amendment process.
4. The Listing Policy provides guidance as to how to interpret data and information, as they are compared to water quality standards as they are written. Neither the Listing Policy nor the listing process may be used to "establish, revise, or refine any water quality objective or beneficial use." (Listing Policy, p. 1, § 1.)

As stated above, the 2020-2022 303(d) List was the basis for developing the listing recommendations for the 2024 303(d) List. If a waterbody-pollutant combination was listed on the 2020-2022 303(d) List, a recommendation was made to either keep it on the list or delist it. If the waterbody-pollutant combination was not listed on the 2020-2022 303(d) List, a recommendation was made to either list it or keep it as not listed.

The determination for each waterbody-pollutant combination along with a presentation of the data assessment and the recommended changes, when applicable, are documented in Appendix B: Statewide Waterbody Fact Sheets.

Potential pollutant sources were only identified in CalWQA Decisions when a specific source analysis has been performed as part of a TMDL or other regulatory process. Otherwise, the potential pollutant source is marked “Source Unknown” or “No Source Analysis Available.”

#### **2.3.4 Binomial Test for Determining Acceptable Exceedances**

Pollutants in water, sediment, and tissue matrices were assessed by comparing sampling results to thresholds. Per several listing factors set forth in the Listing Policy, the number of measured exceedances for toxic, conventional, and other pollutants were assessed using a statistical hypothesis testing approach to determine beneficial use attainment. The statistical test used for these listing factors is the “binomial test,” which identifies the critical number of exceedances for a given sample size needed to accept or reject the null hypothesis while quantifying statistical level of significance and power and controlling for errors (false positives and false negatives). Other Listing Policy listing factor approaches that are used to determine beneficial use attainment (e.g., use of health advisories, water quality trend, and situation-specific weight of evidence) are not described in this section.

The binomial test is used for dichotomous data (data with two possible analysis outcomes), and thus its application to listing and delisting recommendations is relevant for determining compliance with water quality standards (U.S. EPA 2002; Lin et al. 2000; Smith et al. 2001). For 303(d) assessment purposes, readily available data in raw numeric form must be transformed into nominal (“named”) information; specifically, “yes” the data attains the water quality threshold and will be counted towards the number of exceedances or “no” it does not and will not be counted towards the number of exceedances.

The binomial test set forth in the Listing Policy minimizes the difference between alpha error (potential for a false positive error, i.e., listing a water segment when the segment is not impaired) and beta error (potential for false negative error, i.e., not listing a water segment when the segment is impaired). Preference is not shown to either error. The potential to commit either of the errors is approximately equal, and as the sample size is increased, the probability to commit either error is progressively reduced. Establishing an effect size (the level of impact essential to detect) also contributes to the control of errors, mainly beta errors. Effect size represents the maximum deviation from the null hypothesis exceedance proportion that would be tolerated and still support the null hypothesis statement. In other words, effect size is the maximum magnitude of exceedance frequency that would be tolerated. In addition to reducing the potential for beta errors (false negatives), effect size increases the power of the analysis, which is the probability that the test correctly rejected the null hypothesis.

The Listing Policy includes binomial tables to use to determine if a waterbody is not meeting water quality thresholds and should be placed on the 303(d) list (Listing Policy Tables 3.1 and 3.2) or if a waterbody on the 303(d) list now meets standards and should be removed from the list (Listing Policy Tables 4.1 and 4.2). These tables identify the minimum number of exceedances allowed based on the number of samples assessed and the binomial test criteria. The binomial test criteria include the null and alternative hypotheses (which are informed by the acceptable exceedance proportion and the unacceptable exceedance proportion), the alpha error (potential for false positives) and the beta error (potential for false negatives), and the effect size.

Using the binomial test, a water segment is deemed impaired and placed on the 303(d) list if a minimum number of water samples exceed a certain specified water quality objective or, if a narrative water quality objective is being evaluated, an evaluation guideline. (Listing Policy, p. 9, table 3.1.) With a sample size of between 2 and 24, the minimum number of exceedances is 2; with a sample size of between 25 and 36, the minimum number of exceedances is 3; and so on. (Ibid.) In other words, if 5 water samples are taken from a particular water segment, and 2 or more of those water samples exceed certain numeric criteria, then the water segment from which the samples were taken is deemed impaired and placed on the section 303(d) list. More information on the application of the binomial test with balanced alpha and beta errors and the development of listing and delisting tables is available under Issue 6 Statistical Evaluation of Numeric Water Quality Data in the Functional Equivalent Document for the Water Quality Control Policy for Developing California's Clean Water Act Section 303(d) List ("Functional Equivalent Document") (SWRCB 2004).

#### **2.3.4.1 Binomial Test Criteria for Listing Recommendations**

For listing recommendations, the null hypothesis tests the statement that the actual exceedance proportion, given the data available, is less than the acceptable exceedance proportion for that pollutant type. The acceptable exceedance proportions are 0.03 for toxic pollutants and 0.10 for conventional and other pollutants. If evidence is sufficient to accept the null hypothesis, the recommendation would be to not list the waterbody for the pollutant. The alternative hypothesis states that exceedance proportion, given the data available, is greater than the unacceptable exceedance proportion for that pollutant type. The unacceptable exceedance proportions are 0.18 for toxic pollutants and 0.25 for conventional and other pollutants. If evidence is sufficient to reject the null hypothesis and thereby accept the alternative hypothesis, then the recommendation would be to list the waterbody for the pollutant.

Effect size is shown by a 0.15 difference between the acceptable and unacceptable exceedance proportions for the pollutant types. The use and value of the effect size selected is based on recommendations by U.S. EPA (U.S. EPA 2002). The binomial test for listing recommendations also maintains alpha error (false positive) and beta error (false negative) at or below a probability of 0.2 while minimizing the difference between these two errors so as not to show preference. The binomial test criteria used to establish the binomial tables for listing recommendations are provided in Table 2-2: Binomial Test Criteria Used to Determine Placement of 303(d) List, below.



Tables 3.1 and 3.2 of the Listing Policy show that the minimum sample size needed to make a listing recommendation is extended from 16 and 26 samples to two and five samples, respectively. This is done so data with small sample populations are not excluded from assessments. In these instances, the frequency of the observed exceedances is high enough to support reliable listing recommendations as long as the samples are spatially and temporally representative. For toxic pollutants, the minimum sample size of two with two exceedances is supported by a U.S. EPA interpretation of the California Toxics Rule (40 C.F.R. § 131.38(c)(2)(iii)) to mean that waters must be listed if there are two or more independent exceedances of acute or chronic water quality standards within any three consecutive year time frame (SWRCB 2004).

**Table 2-2: Binomial Test Criteria Used to Determine Placement on 303(d) List**

<b>Binomial Test Criteria</b>	<b>Toxic Pollutant (Table 3.1 of Listing Policy)</b>	<b>Conventional and Other Pollutant (Table 3.2 of Listing Policy)</b>
Null Hypothesis	Actual exceedance proportion <0.03 <i>If supported: "Do not list on 303(d) list"</i>	Actual exceedance proportion <0.10 <i>If supported: "Do not list on 303(d) list"</i>
Alternate Hypothesis	Actual exceedance proportion >0.18 <i>If supported: "List on 303(d) list"</i>	Actual exceedance proportion >0.25 <i>If supported: "List on 303(d) list"</i>
Effect Size <sup>1</sup>	0.15	0.15
Alpha Error	≤0.20	≤0.20
Beta Error	≤0.20	≤0.20

<sup>1</sup>: U.S. EPA guidance recommends using an effect size of 0.15 (U.S. EPA 2002).

#### **2.3.4.2 Binomial Test Criteria for Delisting Recommendations**

For delisting determinations, the null hypothesis tests the statement that the exceedance proportion, given the data available, is greater than the unacceptable exceedance proportion for the pollutant type. The unacceptable exceedance proportions are 0.18 for toxic pollutants and 0.25 for convention and other pollutants. If evidence is sufficient to accept the null hypothesis, the recommendation would be to not delist the waterbody for the pollutant type. The alternative hypothesis states that the exceedance proportion, given the data available, is less than the acceptable exceedance proportion for the pollutant. The acceptable exceedance proportions are 0.03 for toxic pollutants and 0.18 for conventional and other pollutants. If evidence is sufficient to reject the null hypothesis and thereby accept the alternative hypothesis, then the recommendation would be to delist the waterbody for the pollutant.

Similar to binomial test listing recommendations, delisting recommendation effect size is shown by a 0.15 difference between the acceptable exceedance proportion and the unacceptable exceedance proportion. Compared to the listing binomial test criteria, the delisting criteria reduce the acceptable alpha error (false positive) and beta error (false negative) potential from 0.2 to 0.1. By doing so, a higher degree of certainty is required when deciding if a waterbody should be delisted from the 303(d) list. The higher degree of certainty requires a larger sample size to support delisting; however, using this approach would reduce the chances for removing pollutants from the list before thresholds are truly achieved. The binomial test criteria used to establish the toxic pollutants and conventional and other pollutants for delisting determinations are provided in Table 2-3: Binomial Test Criteria used to Determine Removal from 303(d) List, below.

**Table 2-3: Binomial Test Criteria used to Determine Removal from 303(d) List**

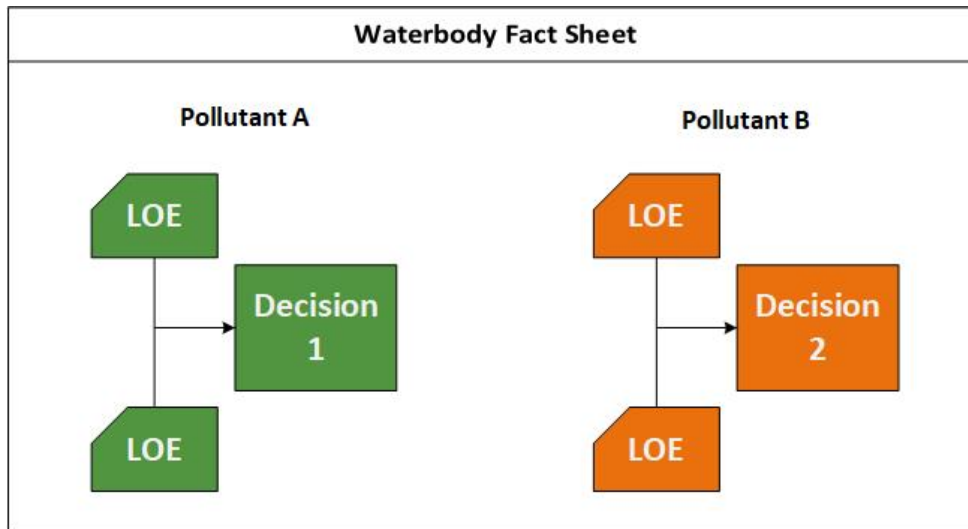
<b>Binomial Test Criteria</b>	<b>Toxic Pollutant (Table 4.1 of Listing Policy)</b>	<b>Conventional or Other Pollutant (Table 4.2 of Listing Policy)</b>
Null Hypothesis	Actual exceedance proportion >0.18 <i>If supported: "Do not delist from 303(d) list"</i>	Actual exceedance proportion >0.25 <i>If supported: "Do not delist from 303(d) list"</i>
Alternate Hypothesis	Actual exceedance proportion <0.03 <i>If supported: "Delist from 303(d) list"</i>	Actual exceedance proportion <0.10 <i>If supported: "Delist from 303(d) list"</i>
Effect Size <sup>1</sup>	0.15	0.15
Alpha Error	≤0.10	≤0.10
Beta Error	≤0.10	≤0.10

<sup>1</sup>. U.S. EPA guidance recommends using an effect size of 0.15 (U.S. EPA 2002).

## 2.4 Waterbody Fact Sheets

The LOEs and CalWQA Decisions for each waterbody are included in Waterbody Fact Sheets. Figure 2-2 shows the relationship between the three levels of detail. In each waterbody, data from multiple pollutants may be assessed, resulting in more than one waterbody-pollutant CalWQA Decision. Detailed Waterbody Fact Sheets for all waterbodies assessed for the 2024 California Integrated Report are available in Appendices B and B1. The binomial test for determining the number of allowable exceedances for Decisions is used in accordance with Listing Policy Sections 3.1, 3.2, 3.3, and 3.6. See Section 2.3.3 for a summary of all of the listing and delisting factors.

**Figure 2-2: Waterbody Fact Sheets – Information Summary**



## 2.5 Integrated Report Condition Categories

The California Integrated Report consists of assessed waterbodies placed into one of five “Integrated Report Condition Categories.” The State Water Board’s Integrated Report Condition Categories are assigned at the waterbody level. CalWQA aggregates the individual Waterbody-Pollutant CalWQA Decisions for all pollutants assessed in the waterbody and assigns a Condition Category to the waterbody as described in Figure 2-3 below.

For example, an individual CalWQA Decision for a waterbody-pollutant combination is placed in Category 3 if there is insufficient data and/or information to make a beneficial use support determination but data and/or information indicates beneficial uses may be potentially threatened. If there are no other CalWQA Decisions for the waterbody, the waterbody would be placed in Category 3. However, if there is another CalWQA Decision for a different pollutant, and data indicate standards are not attained, the waterbody would be placed in Category 5.

When the California Integrated Report is submitted to U.S. EPA via its online system called the Assessment, Total Maximum Daily Load Tracking and Implementation System (“ATTAINS”), waterbody categories are calculated by ATTAINS using the U.S. EPA’s categorization scheme. ATTAINS applies condition categories to each CalWQA Decision. CalWQA assigns condition categories at the waterbody level. (See Staff Report, section 2.4, Waterbody Fact Sheets, for information on how Integrated Report Condition Categories are applied to a waterbody.) A comparison of U.S. EPA’s and State Water Board’s 305(b) Integrated Report Condition Categories is outlined below in Figure 2-3.

**Figure 2-3: Comparison of U.S. EPA's and State Water Board's 305(b) Integrated Report Condition Categories**

<b>Category</b>	<b>U.S. EPA<sup>1</sup></b> <i>(waterbody-pollutant level)</i>	<b>State Water Board</b> <i>(waterbody level)</i>
<b>1</b>	All designated uses are supported, and no use is threatened.	At least one <b>core<sup>2</sup></b> beneficial use is supported, and no beneficial uses are known to be impaired.
<b>2</b>	Available data and/or information indicate that some, but not all of the designated uses are supported.	Insufficient data and/or information to determine core beneficial use support <sup>3</sup>
<b>3</b>	There is insufficient available data and/or information to make a use support determination.	Insufficient data and/or information to make a beneficial use support determination but data and/or information indicates beneficial uses may be potentially threatened.
<b>4</b>	At least one designated use is not being supported or is threatened, but a TMDL is not needed.  <b>4a:</b> A TMDL has been developed and approved by U.S. EPA for any waterbody-pollutant combination, and the state's approved implementation plan is expected to result in full attainment of the water	At least one beneficial use is not supported but a TMDL is not needed.  <b>4a:</b> A TMDL has been developed and approved by U.S. EPA for at least one waterbody-pollutant combination listing, and the approved implementation plan is expected to result in full attainment

<sup>1</sup> U.S. EPA 2005.

<sup>2</sup> Core beneficial uses include drinking water supply, water contact recreation such as swimming, non-contact water recreation, fish consumption, shellfish harvesting, and aquatic life support. (SWRCB 2010.)

<sup>3</sup> Reasons for insufficient data and/or information may be due to poor quality assurance, not enough samples in dataset, or another reason that the information alone cannot support an assessment recommendation. The State Water Board's Category 2 does not include beneficial uses that are not assessed, while the U.S. EPA Category 2 does include beneficial uses that are not assessed.

<b>Category</b>	<b>U.S. EPA<sup>1</sup></b> <i>(waterbody-pollutant level)</i>	<b>State Water Board</b> <i>(waterbody level)</i>
	<p>quality standard within a reasonable, specified time frame.</p> <p><b>4b:</b> Another regulatory program is reasonably expected to result in attainment of the water quality standard within a reasonable, specified time frame.</p> <p><b>4c:</b> The non-attainment of any applicable water quality standard for the waterbody segment is the result of pollution and is not caused by a pollutant.</p>	<p>of the water quality standard within a reasonable, specified time frame. All other listings in the waterbody are being addressed.</p> <p><b>4b:</b> Another regulatory program is reasonably expected to result in attainment of the water quality standard within a reasonable, specified time frame. All other listings in the waterbody are being addressed by action(s) other than a TMDL.</p> <p><b>4c:</b> The non-attainment of any applicable water quality standard for the waterbody is the result of pollution and is not caused by a pollutant.</p>
<b>5</b>	<p><b>5:</b> At least one designated use is not supported or is threatened, and a TMDL is needed.</p> <p><b>5-alt:</b> At least one designated use is not supported and a TMDL is needed, but assigned a low priority for TMDL development because an alternative restoration approach is being pursued<sup>4</sup>.</p>	<p><b>5:</b> At least one beneficial use is not supported and a TMDL is needed.</p> <p>Note that CalWQA also applies a TMDL requirement status for each waterbody-pollutant combination. Please see below for more details.</p>

Waterbodies that are placed in Category 1 are those that had no existing or proposed impairment and at least one core beneficial use was fully supported. If use support could not be determined for any beneficial uses, the waterbody was placed into Category 2.

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<sup>4</sup> U.S. EPA 2015c.

If there was indication of impairment but there were insufficient data to determine beneficial use support (i.e., monitoring data have poor quality assurance, not enough samples in the dataset, the information alone cannot support an assessment), the waterbody was placed in Category 3. This approach was taken to prevent waterbodies with insufficient data from being classified as fully attaining standards and to indicate the need for a more thorough assessment in future monitoring programs and listing cycles.

Waterbodies that are placed in Category 4a are those where the conditions of the listing policy are met (i.e., listing factors 3.1 through 3.11) and U.S. EPA has approved a TMDL and the approved implementation plan is expected to result in full attainment of the standard within a specified timeframe. (Listing Policy, § 2.2.) The TMDL adoption process is a separate and distinct process than that of the development of the Integrated Report. However, the California Integrated Report reflects the most recent information on adopted and approved TMDLs as well as Regional Water Board prioritization and scheduling of TMDLs which is a requirement of the CWA. (40 C.F.R § 130.7(b).).

Waterbodies that are placed in Category 4b are those where the conditions of the listing policy are met (i.e., listing factors 3.1 through 3.11) but an existing regulatory program is reasonably expected to result in the attainment of the water quality standard within a reasonable, specified timeframe. (Listing Policy, § 2.2). U.S. EPA regulations recognize that alternative pollution control requirements implemented by another regulatory program may obviate the need for a TMDL. The justification to place a waterbody-pollutant combination into Category 4b is provided in a “4b Demonstration” that is included in the CalWQA Decision. A Category 4b Demonstration addresses the following six specific elements:

1. Identification of the segment and statement of the problem causing the impairment.
2. Description of pollution controls and how they will achieve water quality standards.
3. An estimate or projection of the time when water quality standards will be met.
4. Schedule for implementing pollution controls.
5. Monitoring plan to track effectiveness of pollution controls.
6. Commitment to revise pollution controls, as necessary.

Waterbodies where the water quality standard is not attained as a result of pollution<sup>5</sup> rather than a pollutant<sup>6</sup> (e.g., the aquatic life beneficial use is not supported due to

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<sup>5</sup> “Pollution” is defined as “the man-made or man-induced alteration of the chemical, physical, biological, and radiological integrity of water.” (40 C.F.R §130.2(c).)

<sup>6</sup> “Pollutant” is defined as “dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, sewage sludge, munitions, chemical wasters, biological

hydrologic alteration or habitat alteration) are placed in Category 4c.

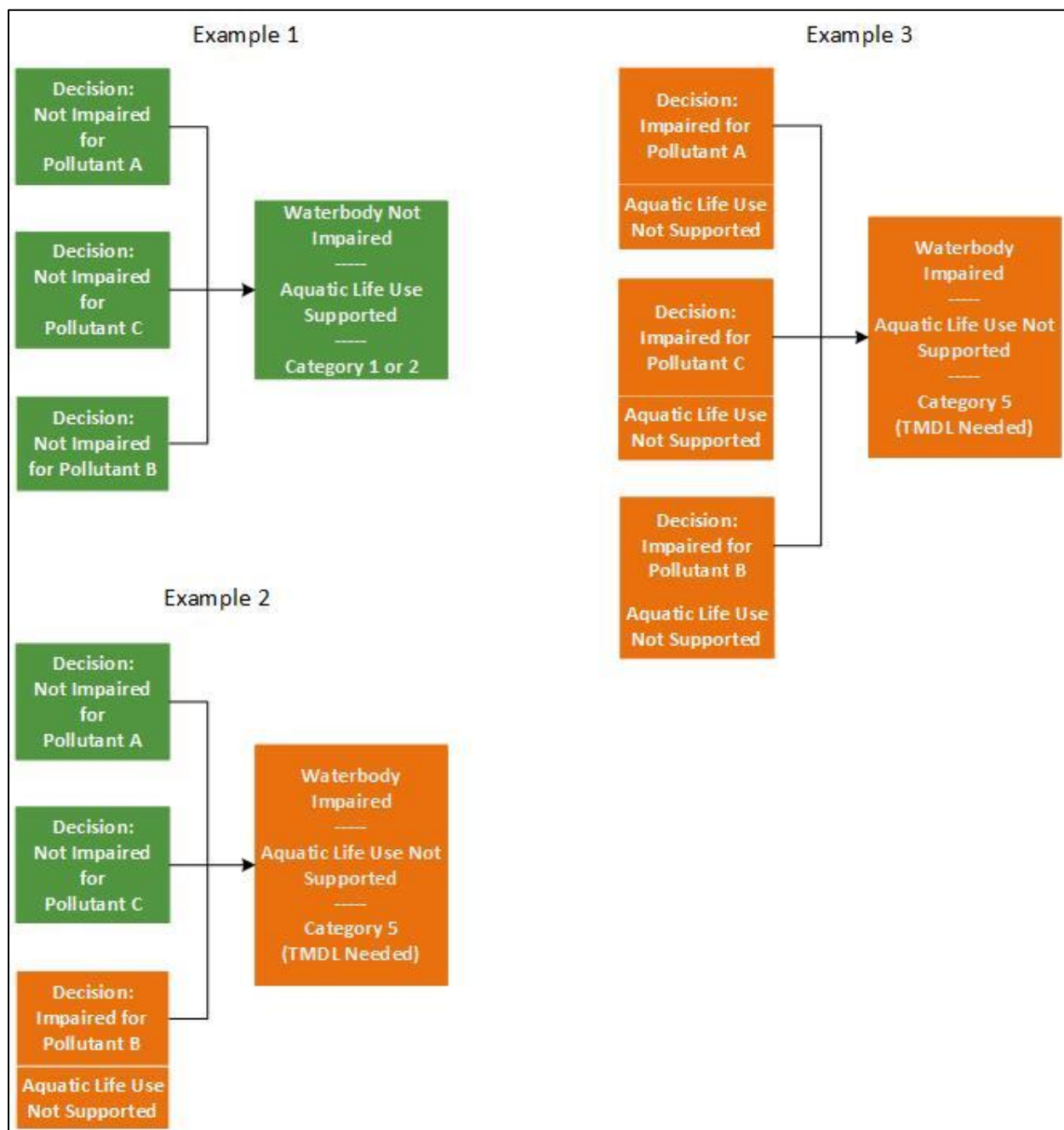
Waterbodies placed in Category 5 are those for which the water quality standard is not attained for at least one waterbody-pollutant combination and a TMDL is required. While the Category 5 condition category is applied at the waterbody level, a TMDL requirement status is applied at the waterbody-pollutant level to track the TMDL requirement status of each waterbody-pollutant combination. The TMDL requirement status options are 5A, 5B, 5C, and 5ALT and are listed in Appendix C5: Category 5 Waterbody Segments. A TMDL requirement status of 5A applies to a waterbody-pollutant combination where water quality standard is not attained and a TMDL is still required. In some circumstances, TMDLs have been adopted by the Water Boards but approval from U.S. EPA is pending. In these cases, the waterbody-pollutant combination remains in Category 5A. A status of 5B applies to a waterbody-pollutant combination that is not attaining standards yet, but the listing is being addressed by a U.S. EPA-approved TMDL. A status of 5C applies to a waterbody-pollutant combination that is not attaining standards yet, but the listing is being addressed by actions other than a TMDL (such as a 4b determination). A status of 5ALT applies to a waterbody-pollutant combination that is being addressed by a TMDL alternative. (The TMDL requirement status of ALT is synonymous with the U.S. EPA condition subcategory 5-alt, as described below.)

Additionally, U.S. EPA has created an optional subcategory under Category 5 – subcategory 5-alternative (“5-alt”) or 5ALT. This subcategory is used to organize, and clearly articulate, which waterbody-pollutants combinations are listed as impaired but are being addressed by an alternative restoration approach. This subcategorization process provides transparency to the public and facilitates tracking of alternative restoration projects that are consistent with the U.S. EPA’s 2018 Program Vision. The 2018 Program Vision states that while TMDLs are the dominant analytic and informational tool for addressing impaired waters, there are other tools that may be more immediately beneficial or practicable to achieving water quality standards under certain circumstances. If a waterbody is categorized under 5-alt, the legal obligation to develop a TMDL is not eliminated; however, states may justify deprioritizing the development of a TMDL should an alternative restoration project be implemented for that waterbody. Should an alternative restoration project result in attainment of water quality standards, a waterbody could be removed from the 303(d) list without the need to develop a TMDL. Finally, because waters for which alternative restoration approaches are pursued remain on the 303(d) list, the U.S. EPA will not take action to approve or disapprove a state’s alternative restoration approach. See Figure 2-4 for Examples of Integrated Report Condition Categories.

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materials, radioactive materials (except those regulated under the Atomic Energy Act of 1954, and as amended, heat wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water). (40 C.F.R § 122.2.)

**Figure 2-4: Examples of Integrated Report Condition Category Determination**



## 2.6 Prioritization of TMDLs and Other Efforts to Address Impaired Waters

The Regional Water Boards undertake a prioritization process to develop TMDLs or other regulatory programs of implementation to address and remedy impaired waterbody-pollutant combinations. Each Regional Water Board reviews its listings and prioritizes TMDLs or other control efforts for completion based on, but not limited to, the following factors from section 5 of the Listing Policy:



- Waterbody significance (such as importance and extent of beneficial uses, threatened and endangered species concerns, and size of waterbody);
- Degree that water quality objectives are not met or beneficial uses are not attained or threatened (such as the severity of the pollution or number of pollutants/stressors of concern) (40 CFR 130.7(b)(4));
- Degree of impairment;
- Potential threat to human health and the environment;
- Water quality benefits of activities ongoing in the watershed;
- Potential for beneficial use protection and recovery;
- Degree of public concern;
- Availability of funding; and
- Availability of data and information to address the water quality problem

Since 2009, Regional Water Boards have adopted a total of 117 TMDL projects to address water quality impairments. A summary table of TMDL projects adopted by each of the nine Regional Water Boards since 2009 can be found in Appendix E: TMDLs Adopted by Regional Water Boards since January 2009.

Additionally, the Regional Water Boards may implement actions other than TMDLs for their impaired waterbody-pollutant combinations. These actions may be sufficient to place a waterbody in Category 4b (when a non-TMDL regulatory program is reasonably expected to result in attainment of the water quality standard within a reasonable, specified time frame, and a TMDL is not required) or Category 5-alt (when a non-TMDL restoration project or action may result in attainment of standards, and the TMDL requirement remains). See section 2.5 for additional information on Category 4b and 5-alt.

CalWQA assigns a default 13-year schedule date for the development of a TMDL or alternative restoration project. However, development of a TMDL or alternative may take longer than 13 years and each Regional Water Board prioritizes its own TMDL development. The TMDL completion date is defined as the date the Regional Water Board adopts the TMDL. The TMDL or alternative restoration approach generally requires subsequent approval by the State Water Board and the U.S. EPA prior to taking effect.

For more on TMDL prioritization and scheduling information for on-cycle Regional Water Board's, see sections 5 through 8.

### **3 Pollutant Assessment Methods**

This section explains how data and information were assessed for selected complex or significant pollutants that applied to waters statewide or in multiple regions. Region-specific assessments or assessments using site-specific objectives ("SSOs"), are described in sections 5 through 10 of the staff report.

### 3.1 Aluminum

Aluminum data from waterbodies with the Warm Fresh Water Habitat (“WARM”), and Cold Fresh Water Habitat (“COLD”) beneficial use were assessed using the 2018 U.S. EPA Final Aquatic Life Criteria for Aluminum in Freshwater (“2018 Criteria”), in accordance with the following narrative water quality objective for toxicity:

All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.

Each Regional Water Board basin plan has a narrative water quality objective for toxicity similar to the above. The narrative water quality objective is evaluated by selecting an appropriate numeric evaluation guideline, in accordance with section 6.1.3 of the Listing Policy.

The 2018 Criteria recognize that the toxicity of aluminum is dependent on water chemistry conditions. The 2018 Criteria takes into account three water chemistry parameters – pH, total hardness, and dissolved organic carbon (“DOC”) – known to alter the toxicity of aluminum by affecting the bioavailability<sup>7</sup> of aluminum in the water column (i.e., some forms of aluminum are more bioavailable than others). The more bioavailable the aluminum is, the more likely it is to cause a toxic effect to aquatic life.

To determine the appropriate aluminum numeric threshold for a waterbody that reflects water quality standards attainment, the measurements for data for pH, total hardness, and DOC were inputted for a given site into a calculator created by U.S. EPA: [Aluminum Criteria Calculator V.2.0.xlsm](https://www.epa.gov/wqc/aquatic-life-criteria-aluminum#2018) (<https://www.epa.gov/wqc/aquatic-life-criteria-aluminum#2018>). Accordingly, the 2018 Criteria were adopted in the form of a criteria calculator dependent on inputs of the three parameters and were not adopted in the form of a specific numeric value.

The 2018 Criteria has both a chronic and acute range of acceptable thresholds:

- Chronic: 0.63 – 3,200 ug/L (4-day average, total recoverable aluminum) to protect against long-term effects on survival, growth, and reproduction due to longer-term exposure;
- Acute: 1 – 4,800 ug/L (1-hour average, total recoverable aluminum) to protect against mortality due to short-term exposure.

For chronic and acute criteria, the recommended numeric values are not to be exceeded more than once every three years on average.

The chronic criterion was used to determine beneficial use attainment because it is based on the survival, growth, and reproduction due to longer-term exposure of tested

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<sup>7</sup> The term bioavailability is the measure of whether a substance in the environment is available to affect living organisms like fish (U.S. EPA 2018).

aquatic organisms and provides a way to assess for long-term impacts of aluminum on organisms. The exceedance frequency for toxicants specified in Table 3.1 and Table 4.1 of the Listing Policy was used when applying the 2018 Criteria.

As discussed in the following sections, in most instances, listing factor 3.1 and delisting factor 4.1 of the Listing Policy, as applicable, were used to assess aluminum data. However, when there were insufficient pH data, the situation-specific weight of evidence listing factor is applied (Listing Policy sections 3.11 or 4.11) and a default pH value is used to apply the 2018 Criteria as described below.

### **3.1.1 Insufficient Total Hardness and DOC data**

Ideally, site-specific measurements of total hardness and DOC should be used to apply the 2018 Criteria in U.S. EPA's Aluminum Criteria calculator, when available. However, it is not uncommon for there to be insufficient total hardness and DOC data to apply the 2018 Criteria.

For 2024 aluminum assessments, when there were insufficient total hardness or DOC data to input into the calculator used for the 2018 Criteria, total hardness and DOC default values provided by U.S. EPA were used. As discussed in U.S. EPA's Draft Technical Support Document: Implementing the 2018 Recommended Aquatic Life Water Quality Criteria for Aluminum, when site-specific total hardness and DOC data are not available, U.S. EPA provided default values for total hardness and DOC based on U.S. EPA's Level III Ecoregions (Table 3-1: Total Hardness, DOC, and pH Default Values for each Level III Ecoregion). The default values have been provided by U.S. EPA to use in the calculator in the following document - [Draft Technical Support Document: Recommended Estimates for Missing Water Quality Parameters for Application in EPA's Biotic Ligand Model](https://archive.epa.gov/epa/sites/production/files/2016-02/documents/draft-tsd-recommended-blm-parameters.pdf) (<https://archive.epa.gov/epa/sites/production/files/2016-02/documents/draft-tsd-recommended-blm-parameters.pdf>).

### **3.1.2 Insufficient pH data**

Similar to total hardness and DOC, site-specific measurements of pH should be used to assess aluminum data, when available. However, there are instances where there are insufficient pH data to apply the 2018 Criteria. Currently, and unlike for total hardness and DOC, the U.S. EPA does not provide default values for pH for input into the calculator. In the absence of pH data or an established default value, the calculator upon which the 2018 Criteria is based cannot be used in accordance with (de)listing factors 3.1 or 4.1.

As a result, if pH data were not available, the waterbody was assessed in accordance with the situation-specific weight of evidence factor per section 3.11 or 4.11 of the Listing Policy using the exceedance frequency for toxicants in Table 3.1 or Table 4.1 of the Listing Policy. Additionally, a default pH value per Level III Ecoregion developed by the State Water Board was used to calculate the 2018 Criteria (Table 3-1). This default pH value was developed by assigning a Level III Ecoregion to each station with pH data

and an approved QAPP. The pH data were then converted to the H<sup>+</sup> concentrations before the median value was calculated for each Level III Ecoregion. The median value was used as the default value in the 2018 Criteria to reduce the effect of outliers and skewed data.

**Table 3-1: Total Hardness, DOC, and pH Default Values for each Level III Ecoregion**

Ecoregion Number	Ecoregion Name	Total Hardness (mg/L as CaCO <sub>3</sub> )	DOC (mg/L)	pH
1	Coast Range	34.12	0.7	8
4	Cascades	28.39	0.3	8.1
5	Sierra Nevada	40.02	0.5	7.7
6	Central California Foothills and Coastal Mountains	203.4	0.8	7.4
7	Central California Valley	118.1	1.1	7.6
8	Southern California Mountains	260	0.7	8.2
9	Eastern Cascades Slopes and Foothills	36.08	0.5	8
13	Central Basin and Range	173.1	0.7	7.9
14	Mojave Basin and Range	283.2	0.8	7.6
78	Klamath Mountains and California High North Coast Ranges	40.61	0.6	7.8
80	Northern Basin and Range	98.62	1	7.9
81	Sonoran Basin and Range	258.4	1	7.9
85	Southern California/Northern Baja Coast	203.4	0.8	7.8

### 3.1.3 Aluminum Reassessment

In accordance with Resolution No. 2022-0006, which adopted the 303(d) list for the 2020-2022 California Integrated Report, aluminum data from waterbodies in Regional Water Boards that were on-cycle for the 2020-2022 California Integrated Report (Central Coast, Central Valley, and San Diego) were reassessed using the 2018 Criteria. Additionally, aluminum data from waterbodies in Regional Water Boards that

are on-cycle for the 2024 California Integrated Report (San Francisco Bay, Los Angeles, and Santa Ana) were reassessed using the 2018 Criteria. In some instances, LOEs from previous listing cycles were retired. For more information on retiring lines of evidence, see section 2.3.2 and Appendix K: List of Retired Lines of Evidence. Aluminum data from waterbodies in the North Coast, Lahontan, and Colorado River Basin Regional Water Boards will be reassessed during the listing cycle for the 2026 California Integrated Report.

## **3.2 Pesticides, Other Organic Chemicals, and Metals**

Data with pollutant concentrations for pesticides, other organic chemicals, and metals in water, sediment, and tissue were assessed based on applicable thresholds. Most assessments were a direct comparison of the data result with the threshold, while some assessments included data manipulation before comparison with the threshold (e.g., pollutants summing, organic carbon normalization). Evaluation guideline selection and data manipulation strategies are explained in more detail in the subtopics below.

### **3.2.1 Water Matrix**

Pesticides, organic chemicals, and metals data from water column samples were assessed using thresholds from the CTR, U.S. EPA national recommended water quality criteria<sup>8</sup> (U.S. EPA 2016b), maximum contaminant levels, U.S. EPA aquatic life benchmarks (“benchmarks”) (U.S. EPA 2021), U.S. EPA Office of Pesticide Programs’ Pesticide Ecotoxicity Database (“Ecotoxicity Database”) (U.S. EPA 2012a), or other sources. Evaluation guidelines were selected that meet requirements of Section 6.1.3 of the Listing Policy. Narrative water quality objectives may be general or may reference a specific pollutant type and each regional board has slightly different objective language.

All waters shall be maintained free of toxic substances in concentrations that are toxic to, or that produce detrimental physiological responses in human, plant, animal, or aquatic life.

No individual pesticide or combination of pesticides shall be present in concentrations that adversely affect beneficial uses.

An explanation is provided below on thresholds specific to a type of pollutant or a pollutant that required data manipulation.

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<sup>8</sup> The 2016 NRWQC is the most recent comprehensive list of recommended criteria. Depending on the pollutants assessed, previous versions of the NRWQC or a pollutant specific criterion report may have been used for assessments. Please see LOE for the criterion used for an assessment.

### 3.2.1.1 Pesticides

Many legacy pollutants, such as dichloro-diphenyl-trichloroethane (“DDT”) and other organochlorine pesticides, were assessed using criteria from the CTR or the national recommended water quality criteria.

Frequently, sources provided one chronic threshold e.g., CTR) for aquatic life assessments; however, the aquatic life benchmarks provided multiple thresholds based on organism type and the Ecotoxicity Database provided multiple thresholds from various toxicity studies. The lowest (i.e., most stringent) aquatic life benchmark reported for a pesticide was selected as the threshold to use for assessments. A threshold from the Ecotoxicity Database may be based on a single study or on multiple studies combined as a geomean or maximum acceptable toxicant concentration. Studies from the Ecotoxicity Database must meet the following parameters for their results to be used as a threshold:

- The study was classified as a core study
- The study was conducted on freshwater
- The chemical used in the study was greater than 80% pure
- The endpoint in the study was linked to survival, growth, or reproduction
- The species studied was in a family that resides in North America
- The acceptable standard or equivalent method was used
- The toxicity values were calculated or were calculable (i.e., LC50)

Multiple methods were available for the assessment of pyrethroids in water. The total or freely dissolved pyrethroid concentration was used for either of the following:

1) comparison with the individual chronic pyrethroid threshold, or 2) comparison of multiple pyrethroids in an additive manner with one concentration goal unit (“CGU”). The additive effects were assessed by calculating the sum of individually measured pyrethroid concentration-to-chronic-concentration-goal ratios and using one CGU according to the following equation:

$$CGU_{chronic} = \frac{C_1}{CCG_1} + \frac{C_2}{CCG_2} + \frac{C_n}{CCG_n}$$

Where,

$C_1$  = Concentration of pyrethroid 1

$CCG_1$  = Chronic Concentration Goal of pyrethroid 1

$C_2$  = Concentration of pyrethroid 2

$CCG_2$  = Chronic Concentration Goal of pyrethroid 2

The additive CGU approach was developed as part of the Amendment to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Pyrethroid Pesticide Discharges (R5-2017-0057) by the Central Valley Regional Water Board (Central Valley Pyrethroid Amendment). Data from Regional

Water Boards on-cycle for the 2024 California Integrated Report were assessed consistent with the additive CGU approach.

When appropriate, certain pollutants were added together and assessed using an evaluation guideline for the sum. For example, the following pollutants were summed and compared to the evaluation guideline for chlordane: Nonachlor, cis-; Nonachlor, trans-; Chlordane, cis-; Chlordane, trans-; and Oxychlordane. Another example includes polychlorinated biphenyls (“PCBs”), which were evaluated based on CTR guidance to sum the PCB Aroclors<sup>9</sup> for aquatic life and either congeners, or Aroclors for human health for comparison to criteria protective of human health and aquatic life. A list of the pollutants referred to as “summing pollutants” can be found in Appendix L: List of Summing Pollutants.

### **3.2.1.2 Pesticide Aquatic Life Benchmark Reassessments**

In previous listing cycles, water matrix pesticide data were generally assessed based on thresholds selected from the Ecotoxicity Database. For the 2024 California Integrated Report, on-cycle regions assessed these data and new data using thresholds selected from the aquatic life benchmarks. Aquatic life benchmarks are based on toxicity values from scientific studies reviewed by the U.S. EPA and a risk assessment process for pesticides. Aquatic life benchmarks are an estimate of a pesticide concentration below which there is not expected to be a risk of concern to aquatic life. Chronic and acute benchmarks were available for nonvascular and vascular plants, invertebrates, and fish. The lowest of available thresholds for a pesticide was selected as the threshold for assessment of pesticide data. In some instances, LOEs from previous listing cycles were retired. For more information on retiring LOEs, see section 2.3.2 and Appendix K: List of Retired Lines of Evidence.

### **3.2.1.3 Other Organic Chemicals**

Water matrix PCBs data were evaluated based on CTR guidance as the sum of seven PCB Aroclors for aquatic life and as the sum of either all congeners or all Aroclors for human health for comparison to the corresponding aquatic life and human health criteria. CTR guidance was followed to derive aquatic life criteria dependent on pH for the organochlorine pentachlorophenol.

### **3.2.1.4 Metals**

The CTR includes hardness-adjusted aquatic life criteria for cadmium, copper, chromium III, lead, nickel, silver, and zinc (freshwater only). The criteria were calculated based on the equations provided in the CTR, using hardness data collected at the same sample location, day, and time. If no hardness data were available, a

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<sup>9</sup> The trade name for a mixture of PCB congeners.



default value of 100 mg/L was used in the equation, as specified in the CTR. The calculated criteria were then compared with the data result.

The CTR aquatic life criteria for arsenic, cadmium, chromium III, chromium VI (freshwater only), copper, lead, nickel, selenium (saltwater only), silver, and zinc are for the dissolved fraction. Data results from these constituents that were reported as “total” were converted to dissolved using the CTR conversion factor before comparison with the corresponding criteria. Conversion factors for cadmium and lead were also hardness-adjusted using a CTR formula.

### **3.2.2 Sediment Matrix**

Evaluation guidelines to evaluate narrative water quality objectives for assessment of pollutant concentration data in sediment were selected in accordance with section 6.1.3 of the Listing Policy. See below for an explanation of pesticide assessments that required data manipulation.

#### **3.2.2.1 Pesticides**

The toxicity of some pesticides in sediment is dependent on the amount of organic carbon within the sediment. If the threshold selected for assessment was based on organic carbon normalization, the pesticide data were also organic carbon-normalized (using the organic carbon content from the same sample) for comparison of the data with the threshold. Data for the following pesticides (when measured in sediment samples) were organic carbon-normalized: pyrethroids, fipronil, fipronil metabolites, and the organophosphates chlorpyrifos, diazinon, and methyl parathion.

These pesticide thresholds are based on the geomean of multiple LC50 values normalized for the organic carbon content of the soil. The geomean is the preferred statistic to calculate a singular threshold since the distribution of toxicity test results is generally not normally distributed and is more likely to follow a lognormal distribution (U.S. EPA 1985). This methodology was applied statewide with the exception of assessments conducted for Central Valley Region waterbodies, which use one-tenth of the LC50 in accordance with the Central Valley Water Quality Control Plan (2018).

Calculations of additive toxicity, or toxic units, were used to assess impairment based on the cumulative impact of individual organophosphate and pyrethroids pesticides. The evaluation guideline for the protection of aquatic life is one toxic unit equivalent (Amweg et al. 2006 for pyrethroid pesticides and Bailey et al. 1997 for organophosphate pesticides). A toxic unit equivalent is equal to the sum of all individual pyrethroids concentrations from a single sample, each having their reported concentration divided by their respective evaluation guideline prior to being summed. If this calculation results in a value greater than one, the sample is counted as an exceedance of the water quality objective. Toxic units for pyrethroids were used for 2024 on-cycle Regional Water Boards.



### 3.2.3 Tissue Matrix - Fish and Shellfish

Pesticides, other organic chemicals, and metals (except mercury) in fish and shellfish tissue were assessed based on a modified version of the Fish Contaminant Goals (“FCG”) developed by OEHHA (OEHHA 2008) in accordance with a narrative water quality objective. The narrative water quality objective is evaluated by selecting an appropriate numeric evaluation guideline, in accordance with section 6.1.3 of the Listing Policy. Narrative water quality objectives may be general, or reference aquatic life and each regional board has slightly different objective language. The following are examples of narrative objective language:

Controllable water quality factors shall not cause a detrimental increase in concentrations of toxic substances found in bottom sediments or aquatic life. Effects on aquatic organisms, wildlife, and human health will be considered.

All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.

The FCG were modified by replacing the 0.7 cooking reduction factor with a value of 1.0. A cooking reduction factor is a numeric value that approximates the amount of contaminant removed from tissue by cooking. A cooking reduction factor of 1.0 implies there is no reduction in contaminant concentration from cooking. U.S. EPA guidance recommends conservative assumptions be used where actual exposure data are unknown, such as the cooking and preparation methods. (U.S. EPA 2000). Tissue sample fractions were reported as either "whole organism" or "fish fillet." The modified OEHHA FCGs were used for assessment (with the exception of mercury) of both whole organism and fish fillet data. Information related to assessment of specific pollutants is provided in the below subtopics.

#### 3.2.3.1 Mercury Assessments

Statewide numeric mercury water quality objectives for fish tissue were established in Part 2 of the ISWEBE Plan in 2017 (SWRCB 2017). For the 2024 California Integrated Report, all available data for the San Francisco Bay, Los Angeles, and Santa Ana on-cycle regions were reassessed in accordance with the mercury objectives adopted in 2017.

Mercury concentrations in fish tissue were reported in terms of individual fish or multiple fish per composite sample. Annual composite averages were weighted when composites had an unequal number of fish or samples were a mix of composites and individuals. Fork lengths were used in place of total lengths when the total length was unknown. The total length of a fish was assumed to be at least as long as the fork length. In addition, data from fish with lengths smaller or larger than the California Department of Fish and Wildlife’s fishing regulation legal size limits were not used to determine attainment with the Commercial and Sport Fishing beneficial use.

For comparison with the mercury objectives, mercury data were assessed as datasets. Each dataset grouped all fish tissue data collected in a waterbody for a calendar year by trophic level<sup>10</sup> (“TL”) and an annual average value was calculated. Each annual average was considered one sample.

The mercury annual average value was then compared to the appropriate water quality objective applied to the beneficial use for a waterbody. Three mercury water quality objectives were used to evaluate applicable beneficial uses: the sport fish objective, the prey fish objective, and the California least tern objective. The water quality objectives were established to protect one or more beneficial uses and reflect the applicable consumption pattern (which includes consumption rate, fish size, and species) by individuals and wildlife. The sport fish objective applies to waters with the beneficial uses of Commercial and Sport Fishing (“COMM”), Wildlife Habitat (“WILD”), Marine Habitat (“MAR”), or Tribal Tradition and Culture (“CUL”). The prey fish objective applies to waters with the beneficial uses of WILD or MAR. The California least tern objective applies to waters with the beneficial uses of WILD, MAR, or Rare, Threatened, or Endangered Species (“RARE”) and where the least tern or least tern habitat exists, including but not limited to the water bodies identified in Attachment D of Part 2 of the ISWEBE (SWRCB 2017). Additional information on trophic levels and fish lengths is located in Tables C-1 and C-2 of Part 2 of the ISWEBE Plan (SWRCB 2017). See Table 3-2: Mercury Water Quality Objectives by Category, Beneficial Uses, and Fish Size.

**Table 3-2: Mercury Water Quality Objectives by Category, Beneficial Uses, and Fish Size**

<b>Mercury Objective Category</b>	<b>Beneficial Use</b>	<b>Fish Length (total length in mm)</b>	<b>Mercury Objective (mg/kg)</b>
Sport Fish TL4	COMM, WILD, MAR, CUL	200-500	0.2
Sport Fish TL3	COMM, WILD, MAR, CUL	150-500	0.2
Prey Fish (any species)	WILD, MAR	50-150	0.05
California Least Tern	RARE, WILD, MAR where least tern habitat exists	<50	0.03

<sup>10</sup> Trophic level is a functional classification of taxa within a community that is based on feeding relationships (e.g., aquatic and terrestrial green plants make up the first trophic level and herbivores make up the second).

The water quality objectives are interpreted as an absolute value and are not assigned a designated number of significant figures.

For the sport fish water quality objective, data from TL3 and TL4 fish species were used for assessment of the COMM beneficial use.

Assessment of data from TL4 fish were used to evaluate whether all species are supported with respect to the WILD and MAR beneficial uses. If data from just TL3 fish were used, protection of all species within the WILD and MAR beneficial uses is not ensured. Therefore, if data from TL3 fish were used, then the prey fish water quality objective was used instead of the sport fish water quality objective. If the waterbody is habitat for the California least tern, then the least tern water quality objective was used. However, if the data from TL3 fish indicate non-attainment of the sport fish water quality objective, there is sufficient evidence to indicate that the prey fish water quality objective (or the least tern objective, if applicable) is not attained. Exceedance of the prey fish water quality objective indicates impairment of the WILD and MAR beneficial uses. Non-exceeding TL3 fish provide insufficient information for the assessment of the WILD and MAR beneficial uses.

For the prey fish objective, data from any fish species and trophic level were used for assessment of the WILD or MAR beneficial use. The prey fish water quality objective applies during the breeding season, which is February 1 through July 31 unless site-specific information indicates another appropriate breeding period. For the purpose of the 2024 California Integrated Report, data from all prey fish sample results collected throughout the year were compared to the prey fish objective due to the lack of a better threshold in the non-breeding period.

The conditions for which a waterbody is placed on the 303(d) list based on tissue is described in sections 3.4 and 3.5 of the Listing Policy. Listing Policy section 3.11 (the situation specific weight of evidence listing factor) may be utilized to determine placement on the 303(d) list if information indicates non-attainment of standards. For a flow chart illustrating fish tissue mercury assessments for the 2024 California Integrated Report, see Appendix F: Generalized Flow Chart for Fish Tissue Mercury Assessments for the 2024 California Integrated Report.

### **3.2.3.2 Polycyclic Aromatic Hydrocarbons (PAHs)**

Polycyclic aromatic hydrocarbons (“PAHs”) in fish and shellfish tissue were assessed for human health by comparing a potency-weighted total concentration of PAHs with the threshold for benzo(a)pyrene. The potency-weighted concentration was calculated for each PAH by multiplying the concentration of the PAH by a toxicity equivalency factor (“TEF”). The TEF is the toxicity of each PAH relative to benzo(a)pyrene. The potency-weighted concentrations for all PAHs were summed to create the potency-weighted total concentration for total PAH. The potency-weighted total concentration was then compared with the threshold for benzo(a)pyrene.

### 3.3 Aquatic Toxicity

Aquatic toxicity tests are conducted in a laboratory by exposing test organisms (vertebrate, invertebrate, and plant species) to water or sediment samples collected in the field and are assessed in accordance with the following narrative objective:

All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.

Each Regional Water Board basin plan has a narrative water quality objective for toxicity similar to the above. The narrative water quality objective is evaluated by selecting an appropriate numeric evaluation guideline, in accordance with section 6.1.3 of the Listing Policy.

Test and control organism responses (e.g., mortality, growth, reproduction) are measured and results are evaluated to determine if there is a statistically significant difference in responses between the test and the control organisms. Each sample tested that has at least one species and response (either sub-lethal or lethal) that was determined to be significantly toxic compared to the control by the Test of Significant Toxicity (“TST”) or other statistical approach would be considered to have a toxic effect and thereby an exceedance. Each sample with an exceedance is counted only once even if more than one species for that sample shows a significant difference from the control. One LOE may summarize the results for multiple test species. Determination of waterbody placement on the 303(d) list based on toxicity is described in section 3.6 of the Listing Policy.

Toxicity data were assessed based on the format of the data using either the significant effects categories or the TST statistical approach. New non-TST data were assessed using the significant effects categories approach.

Toxicity data were assessed using one of the two following processes:

1. A direct comparison between the control and sample organism’s response using a statistical approach. In addition, the percent effect to the test organisms in the sample was calculated. The percent effect is a measure of the similarity between the response of the organisms in the sample matrix and the control organisms.
2. An assessment of pass or fail results using the TST statistical approach, in which the organism’s response from exposure to the sample water is compared to the organism’s response from exposure to the control water using a Welch’s t-test for analysis, a null hypothesis, and regulatory management decisions. The test results in a pass or fail of the sample.

Acute and chronic aquatic toxicity data results were grouped into one of four categories based on the occurrence of a significant effect between the test and the control organisms, and the percent of the effect. The four significant effect categories are shown in Table 3-3: Aquatic Toxicity Significant Effect Categories.

Samples with a Significant Effect Code of significant, Less Similarity (“SL”) were considered an exceedance. Toxicity of any one or more test species of a sample, as noted by application of the SL to the data, is an exceedance. The SL code is applied when:

- There is a statistically significant difference between the response of the organism in the sample matrix and the control organism.
- There is less similarity between the organism in the sample matrix and the control organism, as determined by the percent effect of the sample. The percent effect evaluation threshold is set at 20 percent for both chronic and acute toxicity for data associated with the Water Board SWAMP program. Some non-SWAMP data were evaluated using other percent effect evaluation thresholds.

**Table 3-3: Aquatic Toxicity Significant Effect Categories**

Code	Definition	Explanation
“Not Significant, Greater Similarity” (NSG)	The test result is not statistically significant and shows a greater similarity to the control (i.e., the percent effect is below a 20% threshold).	The result indicates that the sample is not toxic. These data can be used with confidence.
“Not Significant, Less Similarity” (NSL)	The test result is not statistically significant but shows less similarity to the control (i.e., the percent effect is equal to or greater than a 20% threshold).	The result indicates that the sample may or may not be toxic, and that further investigation is necessary.
“Significant, Greater Similarity” (SG)	The test result is statistically significant but shows greater similarity to the control (i.e., the percent effect is below a 20% threshold).	The result indicates that the sample may or may not be toxic, and that further investigation is necessary.
“Significant, Less Similarity” (SL)	The test result is statistically significant and shows less similarity to the control (i.e., the percent effect is equal to or greater than a 20% threshold).	The result indicates that the sample is toxic. These data can be used with confidence.

The TST assessment approach includes a null hypothesis stating that the sample is “toxic”, and an alternative hypothesis stating that the sample is “not toxic”. The null hypothesis was tested using the Welch’s t-test and resulted in a “pass” or “fail”. Attainment of the objective is demonstrated by conducting aquatic toxicity testing, analyzing the data using the Welch’s t-test, and rejecting the null hypothesis leading to

a “pass” or non-toxic sample. Acceptance of the null hypothesis leads to a “fail” or toxic sample and is an exceedance. For chronic toxicity, acceptance of the null hypothesis and an exceedance occurs when the ambient water is toxic because the response (e.g., survival, reproduction, growth) of the test organisms in the ambient water sample is less than or equal to 75 percent of the test organisms’ response in the control water sample. For acute toxicity, acceptance of the null hypothesis and an exceedance occurs when the ambient water is toxic because the response (e.g., survival) of the test organisms in the ambient water sample is less than or equal to 80 percent of the test organisms’ response in the control water sample. Both chronic and acute tests were assessed towards a single toxicity exceedance for the California Integrated Report.

The TST approach was only used for toxicity data expressed as TST results from aquatic toxicity testing using the toxicity test methods, regulatory management decision, beta error, and alpha error listed in Table 3-4: Toxicity Test Methods, Regulatory Management Decision (RMD),  $\beta$  Error, and  $\alpha$  Error, below.

**Table 3-4: Toxicity Test Methods, Regulatory Management Decision (RMD),  $\beta$  Error, and  $\alpha$  Error**

U.S. EPA Toxicity Test Method	Tier	RMD (b)	$\beta$ Error	$\alpha$ Error
<b>Chronic Freshwater Methods</b>				
<i>Ceriodaphnia dubia</i> (water flea) Survival and reproduction	I	0.75	0.05	0.20
<i>Pimephales promelas</i> (fathead minnow) Survival and growth	I	0.75	0.05	0.25
<i>Selenastrum capricornutum</i> (green alga) Growth	I	0.75	0.05	0.25
<b>Chronic West Coast Marine Methods</b>				
<i>Atherinops affinis</i> (topsmelt) Survival and growth	I	0.75	0.05	0.25
<i>Dendraster excentricus</i> (sand dollar); <i>Strongylocentrotus purpuratus</i> (purple urchin) Fertilization	I	0.75	0.05	0.05
<i>Dendraster excentricus</i> (sand dollar); <i>Strongylocentrotus purpuratus</i> (purple urchin) Larval development	I	0.75	0.05	0.05
<i>Haliotis rufescens</i> (red abalone) Larval development	I	0.75	0.05	0.05
<i>Mytilus sp.</i> (mussels); <i>Crassostrea gigas</i> (oyster) Larval development	I	0.75	0.05	0.05
<i>Macrocystis pyrifera</i> (giant kelp) Germination and germ-tube length	I	0.75	0.05	0.05
<b>Chronic East Coast Marine Methods</b>				
<i>Menidia beryllina</i> (inland silverside) Survival and growth	II	0.75	0.05	0.25
<i>Americamysis bahia</i> (mysid) Survival and growth	II	0.75	0.05	0.15

<b>Acute Freshwater Methods</b>				
<i>Ceriodaphnia dubia</i> (water flea); Survival	I	0.80	0.05	0.10
<i>Daphnia magna</i> (water flea); <i>Daphnia pulex</i> (water flea); Survival	I	0.80	0.05	0.10
<i>Hyalella azteca</i> (amphipod) Survival	I	0.80	0.05	0.10
<i>Pimephales promelas</i> (fathead minnow); Survival	I	0.80	0.05	0.10
<i>Oncorhynchus mykiss</i> (rainbow trout); <i>Salvelinus fontinalis</i> (brook trout) Survival	I	0.80	0.05	0.10
<b>Acute Marine Methods</b>				
<i>Atherinops affinis</i> (topsmelt) Survival	I	0.80	0.05	0.10
<i>Americamysis bahia</i> (mysid) Survival	II	0.80	0.05	0.10
<i>Menidia berylina</i> (inland silverside) Survival	II	0.80	0.05	0.10

### 3.4 Benthic Community Effects

Chemical-specific analyses and water column toxicity tests can measure the health of aquatic biological communities indirectly. Such measures assess the suitability of a water to support a healthy biological community, but do not directly assess the community's health itself. Bioassessments are an effective tool for evaluating ecosystem health because biological assemblages (e.g., macroinvertebrates, fish, etc.) integrate relevant chemical, physical, and biological factors in the environment. Bioassessment of natural communities directly assesses the status of a waterbody relative to the primary goal of measuring the biological integrity of waters within the state.

The goal of the CWA is "to restore and maintain the chemical, physical, and *biological integrity* of the Nation's waters." (33 U.S.C § 1251(a) (*italics added*)). Further, U.S. EPA has stated, "biological assessments should be fully integrated in state and tribal water quality programs and used together with whole effluent and ambient toxicity testing, and with chemical-specific analyses, to assess attainment of designated aquatic life uses in WQS (U.S. EPA 1991b). Each of these methods can be used to provide a valid assessment of aquatic life use impairment. Biological assessments complement chemical-specific, physical, and whole effluent toxicity measures of stress and exposure by directly assessing the response of the community in the field (U.S. EPA 1991a)" (U.S. EPA 2011).

Section 3.9 of the Listing Policy provides that "a water segment shall be placed on the section 303(d) list if the water segment exhibits significant degradation in biological populations and/or communities as compared to reference site(s) and is associated with water or sediment concentrations of pollutants including but not limited to chemical concentrations, temperature, dissolved oxygen, and trash."



Benthic macroinvertebrates are ubiquitous, relatively stationary and their large species diversity provides a range of responses to environmental pressures. The California Stream Condition Index (“CSCI”) is used to “score” biological condition of benthic macroinvertebrates at sampled sites. The CSCI is a tool which translates species taxa data about benthic macroinvertebrates (aquatic insects, crustaceans, mollusks, and worms that live at the bottom of rivers and streams) found living in a stream into an overall measure of stream health (Mazor et al. 2016). The CSCI is applicable to rivers and streams that are wadeable and sampleable. The CSCI score is calculated by comparing the expected condition (i.e., the reference site) with actual, observed results. CSCI scores range from 0 (highly degraded) to greater than 1 (equivalent to reference condition). See Table 3-5: CSCI Score Ranges and Biological Conditions.

**Table 3-5: CSCI Score Ranges and Biological Conditions**

CSCI Score Range	Condition
≥ 0.92	Likely intact
0.80 - 0.91	Possibly altered
0.63 - 0.79	Likely altered
≤ 0.62	Very likely altered

*Adapted from Mazor et al. 2016*

Section 3.9 of the Listing Policy requires that “the analysis should rely on measurements from at least two stations.” The waterbody is considered to exhibit significant degradation in a receiving water where CSCI scores show degradation at one or more stations during one sampling season or at one station over multiple sampling seasons. This requirement ensures the assessment is based on temporally and spatially representative data.

The CSCI score of 0.79 was used as an evaluation guideline for beneficial use attainment and was selected in conformance with sections 3.9 and 6.1.5.8 of the Listing Policy. Section 3.9 allows the use of reference site or sites to compare degradation in biological populations and/or communities. Section 6.1.5.8 requires a method of selecting reference sites and applying them to develop an Index of Biological Integrity (“IBI”), which has been done and validated by the CSCI threshold study authored by Mazor et al. (2016).

As stated above, under Listing Policy section 3.9, a waterbody segment shall be placed on the 303(d) list if the waterbody exhibits significant degradation in biological populations and the degradation is associated with water or sediment concentrations of pollutants in accordance with one or more other listing factors, such as exceedances of chemical concentrations, temperature, dissolved oxygen, trash, or other pollutants using sections 3.1, 3.2, 3.6, 3.7, 6.1.5.9, or other applicable sections (e.g., toxicity under



section 3.6). Additionally, if the waterbody exhibits significant degradation in biological populations related to sedimentation, the waterbody shall be placed on the 303(d) list for population or community degradation if the waterbody also meets the thresholds for listing due to excessive sedimentation. Determining whether the degradation of biological populations is “associated” with listed pollutants involves some judgment, because not all listed pollutants are necessarily a potential cause of the degraded biological population.

In previous integrated report cycles, a new waterbody-pollutant combination was placed on the 303(d) list when the waterbody exhibited significant degraded biology and there was at least one pollutant impairment of an aquatic life beneficial use, without always evaluating whether the pollutant was a potential cause of the degraded biology. Section 3.9 of the Listing Policy does not explain how to determine if the degraded biology is associated with the pollutant impairment. There is a need to clarify the appropriate approach for associating pollutant impairments with degraded biological populations under section 3.9, including the consideration of site-specific data and information, when determining biological community effects impairments. Doing so will help ensure section 3.9 is applied uniformly.

For the 2024 California Integrated Report, there are 44 waterbodies where new data and information indicate degraded benthic macroinvertebrate communities and the waterbody has at least one pollutant impairment (not involving sedimentation). However, because the methodology to associate the pollutant impairment with the degraded biology is not yet developed, the waterbodies are recommended for placement in Category 3 on an interim basis. The expectation is that the methodology will be developed and used to make listing recommendations in the 2026 California Integrated Report. During the 2026 listing cycle, staff intends to evaluate the waterbodies placed in Category 3 during the 2024 listing cycle, along with any additional waterbodies subject to section 3.9, consistent with the methodology that is developed.

### Use of CSCI Scores

The CSCI is a biological scoring tool that helps translate multiple taxa and species indices about benthic macroinvertebrates identified in a stream into an overall measure of stream health (Mazor et al. 2016). Living organisms integrate the effects of multiple stressors, such as chemicals, sedimentation, nutrient enrichment, and riparian disturbance, over both space and time. The CSCI score indicates whether, and to what degree, the ecology of a stream is altered from a healthy state as indicated by the aquatic insect larvae and other macroinvertebrates living in, on, or near the bottom, or benthic zone, of a wadable stream or river.

More specifically, the CSCI score is a measure of how well a site’s observed condition matches its predicted, or expected, healthy (i.e., reference) condition. Expected values for a set of ecological measures are predicted using statistical models developed from reference sites, which are healthy stream reaches that set a benchmark of ecological conditions when human disturbance in the upstream watershed is absent or minimal. Predictions are based on natural environmental variables (i.e., site elevation, catchment

or watershed size, climate and geology) resulting in a site-specific prediction for each site; greater deviations from this expectation indicate a greater likelihood of degradation relative to reference conditions. The CSCI is made up of two types of indices: (1) observed (“O”) to expected (“E”) (the “O/E index”), which measures taxonomic completeness which is the proportion of expected native macroinvertebrate species that are observed at a site, and (2) multi-metric index (“MMI”) that measures macroinvertebrate ecological structure (e.g., diversity) and function (e.g., nutrient cycling).

The O/E index is created through predictive modeling where taxa that are expected at a monitoring and assessment site are predicted by modeling relationships between macroinvertebrate taxonomic composition and natural environmental variables at reference sites. Benthic community condition at a site is then measured as the number of expected benthic macroinvertebrate taxa (i.e., “E”) compared to the number that are actually observed (i.e., “O”), and degradation is measured as the loss of expected native taxa.

The MMI combines six measures of the benthic macroinvertebrates assemblage, or “metrics”, into a single measure of biological condition. Each of the metrics represent different aspects of assemblage composition, or the various species living within the benthic aquatic ecosystem. They were chosen based on their ability to differentiate between reference and high activity/disturbance sites and by their lack of bias among Perennial Streams Assessment regions (i.e., the metrics performed consistently across different ecoregions in California). Finally, all of the six metrics are “decreasers” as their values all decrease as human disturbance increases. That is, higher values indicate better conditions for all six metrics. A brief description of the six MMI metrics and their relevance to biological conditions are listed below:

- 1. Percent Clinger Taxa** - percent of species present that are clingers. Clingers are a category of benthic macroinvertebrates based on their ‘clinging’ behavior and broadly include several different types of aquatic species such as stoneflies, dragonflies, and others. They typically require fast-flowing water and coarse streambed material to cling to, so they are very sensitive to hydromodification and altered sediment regimes.
- 2. Percent Coleoptera Taxa** - percent of species present that are Coleoptera (i.e., beetles). Beetles are a diverse group of insects that includes both sensitive and pollution-tolerant species. More species (especially sensitive species, like riffle beetles) tend to be found in streams with better water quality.
- 3. Taxonomic Richness** - or species richness, is the total count of different species present and represents aquatic biodiversity. Biodiversity is critical to maintaining stability in aquatic ecosystems, including the various ecosystem services provided (e.g., clean water, food, recreation, climate change resilience).
- 4. Percent EPT Taxa** - percent of species present that are mayflies (Ephemeroptera), stoneflies (Plecoptera), or caddisflies (Trichoptera). EPT are

sensitive to environmental stress/disturbance and are used as bioindicators of condition. Most EPT species breathe through sensitive gills that can absorb contaminants. High percentage of EPT indicates low environmental stress/disturbance and vice versa.

5. **Shredder Taxa Richness** - count, or number, of different shredder species present. 'Shredders' are a category of aquatic macroinvertebrate functional feeding groups (e.g., shredders, collectors, grazers, and predators). Shredders are responsible for processing leaf litter and help to make dissolved organic matter available, which is a primary food source for aquatic food webs. They require intact riparian corridors to provide their food.
6. **Percent Intolerant Individuals** - percent of individuals with high pollution-sensitivity ratings. Many benthic macroinvertebrate species have been assigned pollution-sensitivity ratings based on studies of their life-histories, observations at polluted and clean sites, and lab-based experiments.

### 3.4.1 Selection of the 0.79 Threshold

The CSCI threshold of 0.79 is described in Mazor et al. (2016), which was independently peer reviewed. CSCI scores range from 0 (highly degraded) to greater than 1 (equivalent to reference). The 0.79 threshold is based on the selection of the 10th percentile of the distribution of benthic macroinvertebrate community composition scores from 473 reference sites across California.

Reference sites were located in healthy stream reaches that set a benchmark of ecological conditions as human disturbance in the stream watershed was absent or minimal. These reference sites were calibrated to have a mean value of 1. Based on an average of the 473 calibrated reference sites, 0.79 represents the 10<sup>th</sup> percentile of reference waterbody scores. In other words, use of the 0.79 score reflects the bottom 10 percent (most degraded) of the aggregated reference waterbody conditions. Waterbodies with CSCI scores below 0.79 indicate the waterbody's condition is either likely altered or very likely altered and, therefore, the benthic macroinvertebrate community that is part of several aquatic life beneficial uses is not being supported. In addition, analysis of statewide CSCI results identified sites below the 10th percentile threshold of 0.79 as being in poor condition (Rehn 2016).

The CSCI relies on quantile regressions to evaluate biological responses to stress gradients. Most biological response measures, including the CSCI, show wedge-shaped relationships with stress gradients. At high levels of a stressor (e.g., high chloride concentration), CSCI scores are low. At low levels of a stressor, CSCI scores may be high, but can be low due to unidentified factors (e.g., presence of an unmeasured contaminant, or habitat degradation). In these situations, traditional linear regression underestimates the strength of the relationship between biological responses and stressors because it only attempts to predict the average response value. In contrast, quantile regression can focus on the "top" of the wedge by predicting a high-

value quantile (e.g., the 90th percentile) which better estimates biological responses in most of the population to stressors.

Section 6.1.3 of the Listing Policy states that “narrative water quality objectives shall be evaluated using evaluation guidelines” and provides guidance for selection of numeric evaluation guidelines. The requirements specify that the evaluation guidelines must be applicable and protective of the beneficial use, linked to the pollutant under consideration, scientifically based and peer reviewed, well described, and identify a range above which impacts occur and below which no or few impacts are predicted. As discussed above, the CSCI threshold of 0.79 as described by Mazor et al. (2016) meets the Listing Policy requirements; therefore, it is appropriate to use as an evaluation guideline to interpret the narrative water quality objective, which is typically the narrative toxicity water quality objective.

In developing the Listing Policy, the Water Board prepared the Functional Equivalent Document to serve as an environmental review equivalent to a California Environmental Quality Act document with alternatives, options, recommendations, and an analysis of environmental impacts of the Listing Policy (SWRCB 2004). The Functional Equivalent Document supports the use of the CSCI threshold, as stated in the recommended approach for determining degradation of biological populations or communities. The CSCI score and threshold are based on a modeled extrapolation of expected biology at a site based on reference conditions that are minimally impacted by anthropogenic activities. The recommended approach in Issue 5G Degradation of Biological Populations or Communities, Bioassessment Guidelines of the Functional Equivalent Document states:

A reference condition, an empirical model of expectations that may include knowledge of historical conditions, or a model extrapolated from ecological principles can be derived from reference sites. A reference site may be natural, minimally impaired (somewhat natural), or best available (altered system). Actual sites that represent best attainable conditions of a water body should be used. (SWRCB 2004.)

### **3.5 Bacteria and REC-1 Beneficial Use**

Bacteria data from waterbodies involving recreational activities involving body contact with water (i.e., REC-1) beneficial use were assessed in accordance with the statewide bacteria water quality objectives or site-specific water quality objectives, as applicable. Statewide bacteria objectives have been established for inland surface waters, enclosed bays, estuaries with the REC-1 beneficial use, and for ocean waters with the REC-1 and SHELL beneficial uses. The REC-1 bacteria water quality objectives applicable to inland surface waters, enclosed bays and estuaries are described in Part 3 of the ISWEBE Plan (SWRCB 2019a) and the REC-1 and SHELL bacteria water quality objectives for ocean waters are described in the Ocean Plan (SWRCB 2019c).

For all waters covered under the ISWEBE Plan, the bacteria water quality objective indicators for assessment depend on the salinity of the water to allow for more precise

results. Saline waters are defined as waters where the salinity is greater than one part per thousand (“ppt”) more than five percent of the time, whereas freshwaters include all waters where the salinity is equal to or less than one part per thousand 95 percent or more of the time. *Escherichia coli* (“*E. coli*”) is the bacteria indicator for freshwater and enterococci is the indicator for inland saline waters, estuaries, and enclosed bays. Enterococci and fecal coliform are the indicators for the REC-1 beneficial use in ocean waters. See Table 3-6: Summary of Water Quality Thresholds used for Bacteria and REC-1, below.

Statewide bacteria objectives for REC-1 waters include two numeric values for each indicator, one based on a six-week or 30-day geometric mean (“geomean”) and another based on a statistical threshold value (“STV”) or single sample maximum (“SSM”) calculated on a monthly basis. The *E.coli* bacteria objective includes a six-week rolling geomean not to exceed 100 colony forming units (“cfu”) per 100 milliliters (“mL”), calculated weekly, and a STV of 320 cfu per 100 mL not to be exceeded by more than 10 percent of the samples collected in a calendar month, calculated in a static manner. The enterococci bacteria objective includes a six-week, rolling geomean of 30 cfu per 100mL calculated weekly, and a STV of 110 cfu per 100mL not to be exceeded by more than 10 percent of samples in a calendar month. The fecal coliform bacteria objective includes a 30-day geomean not to exceed 200 per 100 mL, calculated based on the five most recent samples from each site, and an SSM not to exceed 400 per 100 mL.

The geomean was applied only if a statistically sufficient number of samples was available (generally not less than five samples collected over the specified averaging period) and attainment of the bacteria objective was determined per Listing Policy sections 3.3 and 4.3. In waterbodies where a statistically sufficient number of geomean samples were not available, then attainment of the bacteria objective was determined based only on the STV or SSM per the situation-specific weight of evidence approach outlined in sections 3.11 and 4.11 of the Listing Policy. Beach notification information, if available, was also used in the situation-specific weight of evidence evaluations.

**Table 3-6: Summary of Water Quality Objectives Used for Bacteria and REC-1**

Beneficial Use	Waterbody Type	Threshold(s)	Reference
REC-1	Inland saline surface waters, enclosed bays and estuaries (salinity > 1 ppt, > 5% of the time)	Enterococci (Geomean preferred, STV)	ISWEBE Plan
REC-1	Inland fresh surface waters (salinity ≤ 1 ppt, ≥ 95% of the time)	<i>E. coli</i> (Geomean preferred, STV)	ISWEBE Plan
REC-1	Ocean	Fecal coliform (Geomean, SSM) Enterococci (GM preferred, STV)	Ocean Plan

For waterbodies covered under the ISWEBE Plan’s bacteria water quality objectives, the 2020-2022 California Integrated Report was the first listing cycle for which fecal coliform was no longer considered a valid indicator for assessing support of the REC-1 beneficial use, and fecal coliform LOEs from prior listing cycles were not used to make listing recommendations. This same process was used for the 2024 California Integrated Report. Additionally, past assessments did not distinguish between inland freshwater and inland saline water. All inland saline water assessments included all indicator bacteria data available (i.e., total coliform, fecal coliform, *E. coli*, enterococci), gave equal preference to geomean and STV metrics, and used water quality thresholds from various references. The updated bacteria objectives in the ISWEBE Plan, adopted in 2019, supersede most other water quality objectives associated with the REC-1 use.

The 2019 Amendment to the Ocean Plan eliminated the REC-1 threshold for total coliform. As a result, no new total coliform data were assessed for REC-1 in ocean waters. All past REC-1 LOEs based solely on total coliform were retired. Listing recommendations were based on the updated objective for enterococci and the objective for fecal coliform.

Indicator bacteria (total coliform, fecal coliform, *E. coli*, enterococci) populations may fluctuate substantially on a daily, seasonal, or yearly basis. Lacking constant inputs, they do not persist in the environment for a long period and effects are of relatively short duration. As a result, the historical levels of indicator bacteria in the waterbody may be a poor indicator of current risks to human health, particularly when more recent data are available to sufficiently assess the water quality standard. Additionally, water quality conditions in waterbodies have changed as a result of management actions that have been implemented to address bacteria sources. Unrepresentative data may result in

incorrectly placing or not placing a waterbody segment on the 303(d) list. This could result in the unnecessary expenditure of public resources or missing a problem completely. Therefore, historical indicator bacteria data collected prior to 2010 were evaluated pursuant to these considerations and were not used to assess water quality standards attainment so long as more recent data were available sufficient to make a listing recommendation.

Additionally, historical LOEs may have used *E. coli* as a proxy for fecal coliform in ocean waters. All past *E. coli* LOEs were retired and not used in the 2024 California Integrated Report for ocean waters so long as enterococci or fecal coliform data collected since 2010 were available in the waterbody to determine standard attainment.

Bacteria data from the Beach Program's BeachWatch database with results of zero were excluded and not used to determine standards attainment. The zero result may have been an actual result of zero bacteria or may have been used to indicate a non-detect level of bacteria; however, metadata or other information were not provided to make that determination. According to section 6.1.5.5 (Quantitation of Chemical Concentrations) of the Listing Policy, which applies to non-detects, data results that are less than or equal to the quantitation limit when the quantitation limit is greater than the water quality standard shall not be used in the analysis. Additionally, see section 2.2.2 for additional detail on how data are screened during the quality review. Furthermore, during the evaluation of data for the 2024 California Integrated Report, data reporting inconsistencies and the use of non-ELAP accredited testing methods among BeachWatch data collectors were discovered. The State Water Board is preparing a Quality Assurance Program Plan for the Beach Program which will establish program-wide quality assurance policies and procedures for monitoring activities. All local agencies will be required to revise their QAPPs, which document the monitoring activities within their respective jurisdictions, to conform with the quality assurance policies and procedures in the Quality Assurance Program Plan.

### **3.6 Bacteria and SHELL Beneficial Use**

Bacteria data from waterbodies with the shellfish harvesting (i.e., SHELL) beneficial use were assessed in accordance with the statewide bacteria objectives or SSOs, as applicable. The statewide bacteria objectives apply to ocean waters. As described in the Ocean Plan, ocean waters are the territorial marine waters of the state as defined by California law to the extent these waters are outside of enclosed bays, estuaries, and coastal lagoons (SWRCB 2019c). Total coliform is the indicator used to assess the SHELL objective in the Ocean Plan.

The statewide bacteria objectives for SHELL waters are in two parts, a 30-day median total coliform density ("median"), not to exceed 70 per 100mL, and an objective that states that not more than 10 percent of the samples in a 30-day period shall exceed 230 per 100 mL. Both the median and 10 percent exceedance rate objectives were used to assess water quality standards attainment. Assessment of samples were conducted using the binomial tables in Listing Policy sections 3.2 and 4.2. Additionally, historical total coliform data collected prior to 2010 were not used to assess water quality



standards attainment so long as more recent data were available and sufficient to make a listing recommendation.

During the 2019 triennial review of the Ocean Plan, the State Water Board expressed the need to consider revising, as a high priority planning project, the total coliform water quality objectives associated with the protection of the SHELL beneficial use for Ocean Waters in California, citing public comments that the objectives are unattainable (SWRCB 2019b). Stakeholders and staff at the San Diego Regional Water Board have also expressed concerns regarding the unattainability of the water quality objectives, as research has shown a high incidence of exceedances of the objectives in coastal waters throughout California that are considered reference with little to no anthropogenic bacteria sources, including at State Water Quality Protected Areas (2020-2022 California Integrated Report Final Staff Report, Figure 6-1). Additionally, comments received during the 2020-2022 California Integrated Report public comment period noted that the current beneficial use designation for SHELL may not be an appropriate indicator for recreational harvesting of shellfish as the use does not take into account the human health risks from viral pathogens in the water. Thus, the State Water Board prioritized, as a high priority, a future project to consider revising the SHELL use to distinguish between recreational, commercial, or tribal types of harvesting, and to consider revising the bacterial objectives applied to areas where shellfish are harvested. Should the total coliform objectives be revised in the future, previously assessed data will be reassessed and compared to the new objectives in a subsequent listing cycle. (SWRCB 2022, finding 13.)

As stated in Resolution 2022-0006, which is the adopting resolution of the 2020-2022 California Integrated Report, the State Water Board expects that any ocean waterbody segment listed as impaired by indicator bacteria for the protection of shellfish harvesting would not be scheduled for TMDL development until after the State Water Board completes the planning project. In addition, the State Water Board encourages the Regional Water Boards to use their discretion where appropriate in establishing permitting, monitoring, and other data collection requirements. (*Ibid.*)

### **3.7 Cyanotoxins**

For the 2024 California Integrated Report, microcystins, anatoxin, cylindrospermopsin, and saxitoxin data were assessed. All are types of cyanotoxins and are often associated with harmful algal blooms. Cyanotoxin data were compared to OEHHA Cyanotoxin Action Levels (OEHHA 2012), California Cyanobacteria and Harmful Algal Bloom Network (“CCHAB”) Trigger Levels (California Water Quality Monitoring Council, 2016), U.S. EPA Drinking Water Health Advisories for Microcystins (U.S. EPA 2015a) and Cylindrospermopsin (U.S. EPA 2015b), and the Oregon Health Authority’s (“OHA”) public health advisory guidelines (OHA 2019). These thresholds were utilized as evaluation guidelines to assess attainment of the primary contact recreation (REC-1), Wildlife Habitat (WILD), and Municipal and Domestic Supply (MUN) beneficial uses in accordance with the following narrative water quality objective for toxicity:



All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.

Each Regional Water Board basin plan has a narrative water quality objective for toxicity similar to the above. The narrative water quality objective is evaluated by selecting an appropriate numeric evaluation guideline, in accordance with section 6.1.3 of the Listing Policy. See Table 3-7: Summary of Evaluation Guidelines used for Cyanotoxins, below.

To evaluate attainment of the REC-1 beneficial use, multiple evaluation guidelines were considered for microcystins, anatoxin, and cylindrospermopsin. The CCHAB Network Trigger Levels are divided into three risk-based tiers: Caution (Tier 1), Warning (Tier 2), and Danger (Tier 3). Swimming is prohibited at the Warning level. For anatoxin and cylindrospermopsin, the CCHAB Warning levels were used as evaluation guidelines to determine impairment. As an additional level of review, cyanotoxin data were also compared to the CCHAB Caution levels. Waterbodies where the cyanotoxin levels exceeded the Caution levels but were below the Warning levels were further evaluated to determine if additional data or information for the waterbody were available that would warrant an impairment recommendation, per section 3.11 of the Listing Policy. Waterbodies where cyanotoxin levels were below the CCHAB Caution levels were not determined to be impaired. Saxitoxin data were not evaluated for REC-1 beneficial use attainment due to the lack of an applicable evaluation guideline; however, saxitoxin data were evaluated for MUN beneficial use attainment as described below.

To evaluate attainment of the MUN beneficial use, the U.S. EPA 10-day Drinking Water Health Advisory for Infants and Young Children thresholds were utilized as evaluation guidelines for microcystins and cylindrospermopsin data. The OHA Drinking Water Guidance Value for children 5 and under were used as evaluation guidelines for anatoxin and saxitoxin. The U.S. EPA has not released drinking water thresholds for anatoxin or saxitoxin; therefore, OHA's anatoxin and saxitoxin thresholds were chosen for the MUN use because they meet the requirements of Listing Policy section 6.1.3 as an evaluation guideline. And OHA followed the U.S. EPA methodology to derive the thresholds.

For the 2024 California Integrated Report, use of waters by dogs was evaluated using the WILD beneficial use designation using the OEHHA subchronic water intake action level for dogs as the evaluation guideline for microcystin data. While the WILD beneficial use definition does not explicitly include domestic animals, it is the use which most closely corresponds to the uses made of surface waters by dogs. The WILD beneficial use reflects the goal of achieving and protecting resources, habitat, and water quality to support the use of water by terrestrial animals, which include dogs. Given the increase in the occurrence of dog deaths from impacts of cyanotoxins throughout the state, evaluating the suitability of waters that are, and may be, used by dogs is even more important. Until such time as a beneficial use classification is established that more closely encompasses the use of surface waters by dogs, evaluation of attainment

of that use will correspond with the WILD beneficial use designation for purposes of developing the 303(d) list.

**Table 3-7: Summary of Evaluation Guidelines used for Cyanotoxins**

<b>Beneficial Use</b>	<b>Microcystin (µg/L)</b>	<b>Anatoxin (µg/L)</b>	<b>Cylindrospermopsin (µg/L)</b>	<b>Saxitoxin (µg/L)</b>
<b>REC-1 Evaluation Guideline</b>	6 CCHAB Network Warning Trigger Level	20 CCHAB Network Warning Trigger Level	4 CCHAB Network Warning Trigger Level	N/A
<b>REC-1 Weight of Evidence or Watch List Evaluation</b>	0.8 CCHAB Network Caution Trigger Level	Detection CCHAB Network Caution Trigger Level	1 CCHAB Network Caution Trigger Level	N/A
<b>WILD Evaluation Guideline</b>	2 OEHHA Action Level Dog Subchronic Water Intake	N/A	N/A	N/A
<b>MUN Evaluation Guideline</b>	0.3 U.S. EPA 10-day Health Advisory (infants and young children)	0.7 Oregon Health Authority Drinking Water Guidance Value (children 5 and younger)	0.7 U.S. EPA 10-day Health Advisory (infants and young children)	0.3 Oregon Health Authority Drinking Water Guidance Value (children 5 and younger)

### 3.8 Pyrethroids in Sediment Organic Carbon Normalization Error

During the 2020-2022 California Integrated Report, a miscalculation of the organic carbon normalization equations was discovered for two pyrethroids (permethrin and cypermethrin) in the sediment matrix. Since then, data for a third pyrethroid pesticide (deltamethrin) also was determined to have been affected by the organic carbon normalization error. CalWQA Decisions from previous listing cycles affected by the miscalculation, including the Central Coast, Central Valley, and San Diego Regional Water Boards (off-cycle for the 2024 California Integrated Report), were corrected and

the corrections are included in the 2024 California Integrated Report. Table 3-8, below, provides a summary of the number of CalWQA Decisions fixed for each waterbody-pollutant combination by region. For the majority of these, the listing status of the waterbody for pyrethroids remained unchanged. A total of 25 CalWQA Decisions were retired during the 2024 California Integrated Report since carbon data were not available to normalize associated pyrethroid pesticide data. The calculation was also corrected for data assessed for Regional Water Boards that are on-cycle for the 2024 California Integrated Report. However, errors have been discovered for data in the North Coast and Colorado River Basin Regional Water Boards and those will be corrected during the listing cycle for the 2026 California Integrated Report. For specific updates on CalWQA Decisions, reference Appendix M: List of Decisions with Corrections Made to Pyrethroids in Sediment Organic Carbon Normalization Errors.

**Table 3-8: Number of CalWQA Decisions Affected by Pyrethroid Pesticide Miscalculated Organic Carbon Normalization**

Decision Pollutant	Central Coast Region	Central Valley Region	San Diego Region
Pyrethroids	26	18	11
Permethrin	17	7	1
Cypermethrin	29	43	18
Deltamethrin	5	40	11
Benthic Community Effects	3	None	3
Total	80	108	44

### 3.9 Sediment Quality Objectives

Statewide sediment quality objectives (“SQOs”) were adopted by the State Water Board under Resolutions No. 2018-0028 and 2011-0017 as part of a compressive program to protect beneficial uses and benthic communities from direct exposure to pollutants in sediment. To date, data that can be compared to SQOs have not been evaluated in the California Integrated Report. To be comparable to the SQOs, data for each sampled station location must include concurrent measurements of sediment chemistry, toxicity, and benthic community condition (often referred to as “triad” or multiple line of evidence monitoring). Multiple line of evidence data collected by the San Diego Regional Water Board Harbor Monitoring Program, SCCWRP’s Southern California Bight Regional Monitoring Program, historical site investigations, and past cleanup orders were not

available via CEDEN. Those datasets available via CEDEN were missing toxicity or taxonomy data, calculated station assessment scores, or station locations. Entities that collected the data did not express an interest in voluntarily uploading missing data to CEDEN. Therefore, the data were not considered readily available for California Integrated Report purposes.

Effort was made to remedy the data discrepancies so the data could be included in the 2024 California Integrated Report; however, some datasets were inconsistent, unavailable, or inadequate for assessment this listing cycle.

In the effort to evaluate the data sets to assess for SQOs, the data sets necessary to conduct SQO assessments were identified. The Los Angeles, Santa Ana, and San Diego Regional Water Boards are actively assembling data and resolving data discrepancies. The efforts will provide an evaluation of the station data submitted, including quality assurance checks on the raw data and station scores generated, and if applicable and appropriate, resolve data discrepancies, and map the results. Further, coordination with data providers is actively occurring to resolve data inconsistencies. Results will also be screened to identify sites where cleanup actions have occurred to ensure data are appropriately assessed. These efforts will allow for assessments to be conducted in future listing cycles by consistently comparing data to the SQOs.

### **3.10 Ocean Acidification**

For the 2024 California Integrated Report, data from some ocean waters in the regions for the San Francisco Bay, Los Angeles, Santa Ana, and Central Coast Regional Water Boards were evaluated to determine if the waterways were impaired due to ocean acidification ("OA"). The OA data was assessed using section 3.11 of the Listing Policy, the situation-specific weight of evidence listing factor, to determine support of the Marine Habitat beneficial use. Assessment of beneficial use attainment rather than objective attainment was selected as no current objective in the Ocean Plan is applicable for aragonite saturation data. A biological characteristic water quality objective for the degradation of marine species in the Ocean Plan notes that the degradation would be from discharge. Impairment due to ocean acidification has not been determined to be solely from discharges into the waterways.

Ultimately, the requisite conditions under section 3.11 could not all be satisfied to support a listing decision. Rather, data was used to make a recommendation to place a waterbody in Category 3, indicating insufficient data and/or information to make a beneficial use support determination but data and/or information indicates beneficial uses may be potentially threatened, because it is not clear the number of days marine life would need to be exposed to the aragonite saturation state threshold described below for severe shell dissolution to occur. Additional uncertainties are described below.

### 3.10.1 Threshold

Aragonite saturation state is an indicator for OA impairment as it measures acidity-related impacts on marine life. In Bednaršek 2014, it is noted that “ocean acidification results in the lowering of aragonite saturation levels in the surface layers, and several incubation studies have shown that rates of calcification in these organisms decrease as a result” (Bednaršek 2014). When rates of calcification decrease, there is reduced growth of shell species (pteropods), shell dissolution and thinning, and an increase in pteropod deaths. Thus, the aragonite saturation state of a waterbody can be used as an indicator for marine habitat impacts due to OA.

Aragonite saturation state is not measured by a unit, but rather represented by the metric omega aragonite, notated as  $\Omega_{ar}$ . The mean omega aragonite saturation state is calculated by the product of the concentrations of dissolved calcium and carbonate ions in ocean water divided by their product at equilibrium (equation below) (Zeebe, 2003).

$$\Omega_{ar} = ([Ca^{2+}] \times [CO_3^{2-}]) / [CaCO_3]$$

A mean omega aragonite saturation state threshold of 1.4 was used to evaluate data based off research from SCCWRP, including a paper by Nina Bednaršek in 2019 (Bednaršek 2019) and a study from Oregon State University (McLaughlin, 2015). A threshold below 1.4 in a waterbody would indicate potential impairment due to OA.

In Bednaršek 2019, thresholds between 0.9 and 1.5 were found to indicate severe to mild shell dissolution of pteropods, with potential impairment indicated at approximately  $1.2 \pm 0.1$  (for an overall threshold of 1.3) or below. Severe shell dissolution of pteropods indicates an impairment to the overall marine habitat. Continued studies at various stages within the pteropod life cycle have demonstrated dissolution at 1.0, 1.2, 1.25, and 1.5. Waterbodies with aragonite saturation state levels  $<1.0$  are considered undersaturated and may have severe dissolution (Mekkes, 2021). In future listing cycles, defining thresholds for likely impairment versus potential impairment with the varying aragonite saturation states will be considered.

An additional study conducted by Oregon State University concluded that the “maximum uncertainty of  $\pm 0.2$  in the calculation of mean omega aragonite saturation state is required to adequately link changes in ocean chemistry to changes in ecosystem function” (McLaughlin 2015). Thus, the mean omega aragonite saturation state of 1.4, ( $1.2 \pm 0.2$ ) is considered to be a more accurate reflection of potential OA impairment.

Data collected from a depth range of 0-200 m were used to evaluate aragonite saturation state data per analyses conducted by SCCWRP and the National Oceanic and Atmospheric Administration (“NOAA”) (Bednaršek 2014).

### 3.10.2 Data Assessed

Only data within the territorial marine waters of the State as defined by law (i.e., three nautical miles off the continental and island coastlines) were assessed. (Govt. Code, § 170.) Data and information were submitted by stakeholders for OA in the 2018 and

2020-2022 California Integrated Reports. The mean omega aragonite saturation state raw data submitted by the Center for Biological Diversity for the 2020-2022 California Integrated Report were also evaluated. However, there were data corruptions of the mean omega aragonite saturation state raw data and errors in dates and saturation state levels resulting in data quality concerns. Therefore, the data were not used to make listing recommendations for the 2020-2022 California Integrated Report as they did not meet the data quality requirements for the Listing Policy. Additionally, the spatial and temporal availability of the data led to concerns that the data received did not reflect current waterbody conditions. For more information on data quality concerns, please see the responses to Letter #7 in the 2020-2022 Summary of Comments and Responses document.

Insufficient data and information were submitted during the data solicitation period for the 2024 California Integrated Report. The information submitted did not include new aragonite saturation data and the aragonite saturation data that was re-submitted by the Center for Biological Diversity from the 2020-2022 California Integrated Report contained the same data concerns as the previous submittal. Therefore, the 2024 California Integrated Report assessments utilized OA data that was gathered independently from what was submitted during the data solicitation period to ensure verifiable data quality and encapsulate the ocean conditions across the state. Water Board staff consulted with researchers at SCCWRP to acquire mean omega aragonite saturation state data from several sources for varying geographic locations along California's coastline.

This includes data from the following sources:

- West Coast Ocean Acidification NOAA Cruise
- California Cooperative Oceanic Fisheries Investigations
- Applied California Current Ecosystem Studies

Southern California Bight Regional Monitoring Program Data were evaluated using the following several steps:

1. Continuous mean omega aragonite saturation state data from the same day at each station were averaged to a single sample point.
2. Samples from the same station within 7-days are averaged per section 6.1.5.6 of the Listing Policy.
3. Exceedances of a waterbody segment were noted if averaged samples were less than or equal to the mean omega aragonite saturation state threshold of 1.4.
4. Mean omega aragonite saturation state samples and exceedances were evaluated using the Binomial Table for Conventional Pollutants in Listing Policy section 3.2.
5. Within CalWQA, the pollutant name for the mean omega aragonite saturation state calculation was identified as "Omega Aragonite".

### 3.10.3 Data Gaps and Future Assessments

Before making recommendations to list an ocean segment as impaired for OA using aragonite saturation state as an evaluation guideline using section 3.11 of the Listing Policy, further research is needed to increase confidence that data assessed reflects waterbody conditions. Water Board staff is coordinating with SCCWRP, NOAA, and an interstate workgroup on OA with Oregon and Washington to answer the following questions that will inform future OA assessments.

1. Depth in relation to aragonite saturation state: Should there be differing aragonite saturation thresholds depending on the depth in the water column? Within the 0-200 m, do specific depth ranges (i.e., 0-50m) illustrate higher dissolution rates than others?
2. Timing in relation to data collection: Determining the number of days at a certain threshold for pteropod life stages.
3. Understanding natural aragonite saturation state levels in an upwelling state.
4. Seasonal variation and shift in dissolution rates.

Further, additional metrics and data sources are being considered for the OA assessments in future listing cycles. These include model outputs from SCCWRP using the Regional Ocean Modeling System + Biogeochemical Elemental Cycling (“ROMS-BEC”), which may be used in the future once peer reviewed. The ROMS-BEC model output results are expected to improve the understanding of waterbody conditions estimating acidity, hypoxia, and habitat compression. Additional ROMS-BEC model outputs may also illustrate the pre-industrial baseline for aragonite saturation state to compare against modern levels.

## 4 Summary of 303(d) Listing Recommendations

This section summarizes the recommended listings, delistings, and placements in the 305(b) condition categories for the 2024 California Integrated Report. Sections 5 through 10 outline specific information for individual regions.

For the 2024 California Integrated Report, the San Francisco Bay, Los Angeles, and Santa Ana Regional Water Boards are “on-cycle” for assessment. All readily available data and information for these Regional Water Boards received prior to the data solicitation cut-off date of October 16, 2020 were considered. In addition, readily available data and information for several waterbodies within the Central Coast and San Diego Regional Water Board regions were considered as “off-cycle” assessments. Finally, all readily available data and information from waterbodies within the Sacramento River sub-area of the Central Valley Regional Water Board were considered for “off-cycle” assessments. The Sacramento River sub-area is defined as the Sacramento River watershed and includes the mainstem of the Sacramento River above the legal boundary of the Sacramento-San Joaquin Delta and all surface waters tributary to the mainstem.

The State Water Board is administering the listing process for all “on-cycle” and “off-cycle” regions, consistent with section 6.2 of the Listing Policy. The State Water Board will receive oral comments on waterbodies proposed for addition or deletion from the 303(d) list at a public hearing. The State Water Board will respond to timely written and oral comments and, if needed, will distribute a revised staff report prior to the meeting during which the State Water Board will consider adopting the proposed 303(d) list.

Table 4-1 below summarizes new waterbody-pollutant combination listings and delistings for the 2024 California Integrated Report. A summary of the recommended new listings and delistings, in comparison to the 2020-2022 California Integrated Report is presented in Table 11-1. Additionally, Appendix D: Visualization Tool for the 2024 California Integrated Report is a web mapping application developed to graphically display waterbodies assessed in the 2024 California Integrated Report. Layers used in the mapping application can be downloaded as shapefiles.

**Table 4-1: Number of New Waterbody-Pollutant Combination 303(d) Listings and Delistings**

<b>Regional Water Board</b>	<b>Proposed New Listings</b>	<b>Proposed New Delistings</b>
San Francisco Bay	137	0
Los Angeles	465	30
Santa Ana	78	0
Central Valley	123	57
Central Coast	29	1
San Diego	0	3
<b>TOTALS</b>	<b>832</b>	<b>91</b>

## 5 San Francisco Bay Region 303(d) List

The San Francisco Bay Regional Water Quality Control Board is “on-cycle” for the 2024 California Integrated Report. Staff assessed data from a total of 369 waterbodies, containing 5,035 waterbody-pollutant combinations. Based on these assessments 137 waterbody-pollutant combinations are recommended to be added to the 303(d) list.

### 5.1 San Francisco Bay Region-Specific Assessments

Selected assessments specific to the San Francisco Bay Regional Water Board are described in the following subsections.



### 5.1.1 Microplastics

Microplastics data were submitted during the public comment period for the 2020-2022 California Integrated Report. The data were collected by SFEI in San Francisco Bay Regional Water Board's jurisdiction. Manta trawl surface water microplastic data were evaluated for San Francisco Bay (Lower, Central, South), San Pablo Bay, Suisun Bay, San Leandro Bay, and a segment of the Pacific Ocean off the coast of Marin County. Per California Government Code §170, only data within the 3-mile jurisdictional boundary for California were evaluated. As described below, data were analyzed then compared to a five percent hazard concentration ("HC5") threshold to assess water quality.

The State Water Board recommends placing three waterbodies (San Francisco Bay [Lower and Central] and San Leandro Bay) in Category 3 as there are insufficient data and/or information to make a beneficial use support determination but data and/or information indicates beneficial uses may be potentially threatened. The State Water Board recommends placing the remaining four waterbodies in Category 2 as there are insufficient data and/or information to determine core beneficial use support.

#### 5.1.1.1 Threshold

The threshold used to evaluate microplastic data is 5 microplastic particles per liter, which is an HC5 threshold for food dilution effects based on organismal and population scale toxicity test endpoints that was developed by an expert group as described in Mehinto et al. (2022). This threshold is derived from species sensitivity distributions ("SSD") for chronic no-observed-adverse-effect concentrations from 14-16 freshwater and marine species. The HC5 is a common aquatic life threshold often used to develop water quality criteria that represents a concentration at or above which five percent of the species with biological effect data will experience effects, which, for the purposes of this HC5 threshold, were specifically food dilution effects (Fox et al. 2020). Food dilution effect is an adverse health effect that develops when aquatic organisms ingest microplastics, diminishing nutritional intake and organismal biological function (de Ruijter et al. 2020).

#### 5.1.1.2 Data Analyzed

Manta trawl data were evaluated in accordance with the methodologies and procedures reported in Coffin et al. (2022). Coffin et al. (2022) rescaled and corrected SFEI's manta trawl data to account for biases in sampling and analysis procedures and to enable the comparison of microplastic concentrations (microplastic particles/L) with the threshold described above (i.e., the threshold derived in Mehinto et al (2022)). Uncertainties introduced from corrections were propagated probabilistically using best available practices and are reported in Coffin et al. (2022). The following corrections were made to the manta trawl data:

- **Size Rescaling:** The manta trawl collects microplastic particles above 355 microns (1 millionth of a meter); however, most microplastics in the environment

are found in the smaller size range (below 355 microns). Coffin et al. (2022) used matrix-specific size distributions and applied a size-correction factor as described in Koelmans et al. (2020) to rescale the data to a common size range (1 micron – 5,000 microns) to allow more direct comparison to the available microplastic threshold (5 particles/L).

- **Manta Trawl Fiber Bias:** Microplastics are present in various morphologies (e.g., fibers, fragments, foams, films, and spheres), with fibers being the most common morphology found in the environment. Microplastic fibers can slip through the net of the manta trawl lengthwise leading to the undercounting of microplastics during sampling procedures. To account for fiber bias, Coffin et al. (2022) applied a fiber correction factor expressed as the inverse of one minus the median fraction of particles that were fibers based on a subset of manta trawl samples in which all fibers were counted as reported in Hung et al. (2020).
- **Spectroscopy subsampling:** Microplastic sampling captures all microparticles in the environment; therefore, State Water Board staff solely used microparticles that were confirmed to be microplastics using Fourier transform infrared/Raman spectroscopy. SFEI spectroscopically confirmed a subsample of particles in each sample (Zhu et al. 2021). To estimate the proportion of spectroscopically confirmed particles based on the spectroscopic subsampling data, Coffin et al. (2022) divided the proportion of polymer subtypes meeting the State Water Board’s definition of microplastics (State Water Board Resolution No. 2020-0021) (e.g., polyester, polyethylene, etc.) by the total number of spectroscopically characterized microparticles for each site in the San Francisco Bay and sample media (i.e., stormwater, wastewater, fish tissue, sediment, and surface water). Additionally, microplastic particles were omitted if the particle classification was unconfirmed [e.g., anthropogenic (synthetic) and anthropogenic (unknown base)].

### 5.1.1.3 Data Gaps and Future Assessments

The HC5 threshold presented in Mehinto et al. (2022) is not suitable for assessing beneficial use support for listing a waterbody as impaired on the 303(d) list as it does not meet the evaluation guideline requirements outlined in section 6.1.3 of the Listing Policy. However, there is a scientific basis to use this threshold to inform CWA 305(b) water quality condition reporting for the 2024 California Integrated Report as the threshold, despite the uncertainty regarding input data as described below, provides a valuable general estimate of the point at which aquatic life may experience adverse impacts.

The expert group that developed the HC5 threshold expressed low to moderate confidence in the actual estimates generated through this methodology due to data insufficiencies. Mehinto et al. (2022) states that a reason for this reduced confidence “stemmed from the limited data of sufficient quality and environmental relevance used to develop the threshold.” Data insufficiencies included lack of dose-response data for sensitive species and inadequate particle characterization of available data. Additionally, most of the studies used to develop the threshold used microplastic

spheres or fragments data despite the prevalence of fibers as one of the morphologies most frequently detected in the environment and the potential for fibers to generate more detrimental responses (Athey and Erdle 2021; Stienbarger et al., 2021; Mehinto et al., 2022). Mehinto et al. (2022) described that aligning the underlying data for the SSD reduced some of the uncertainties in the threshold, but the remaining points of uncertainty surrounding the data resulted in diminished expert confidence in the estimate generated by the HC5 methodology.

Before considering assessment of microplastics for estuarine or marine beneficial use for the 303(d) list, the development of an applicable, relevant, and environmentally representative threshold is necessary. The HC5 threshold presented in Mehinto et al. (2022) was developed using a scientifically sound methodology and should the threshold be revised using more environmentally relevant and sufficient quality data, the threshold may meet evaluation guideline requirements per section 6.1.3 of the Listing Policy and could inform California Integrated Report assessments in future listing cycles. In particular, studies characterizing dose-response relationships of environmentally realistic mixtures of microplastics that meet the quality standards detailed in de Ruijter et al. (2020) are desired to improve confidence in a future threshold. To obtain these data, Water Board staff, along with microplastic experts from the Southern California Coastal Water Research Project and a global network are organizing efforts to gather and organize data from peer reviewed publications and to derive higher resolution microplastic thresholds.

### **5.1.2 Temperature in Northern San Francisco Bay Segments**

As discussed below, the Water Board recommends placing three estuarine waterbodies in Category 3: Suisun Bay, Carquinez Strait, and Sacramento/San Joaquin Delta, as there are insufficient data and/or information to make a beneficial use support determination but data and/or information indicates beneficial uses may be potentially threatened.

The Water Board also recommends placing two freshwater waterbodies in Category 5: Suisun Slough and Montezuma/Nurse Slough Complex in Suisun Marsh, as data indicate impairment of the MIGR beneficial use. It should be noted that the Montezuma/Nurse Slough Complex is a smaller geographic area with the Suisun Marsh waterbody segment and the recommended temperature listing only applies to the Montezuma/Nurse Slough Complex. These waterbodies will be remapped in a future listing cycle to more accurately reflect the migration of salmonid species, and how data informs temperature impairments.

#### **5.1.2.1 Temperature Data**

Continuous temperature data collected in the San Francisco Bay/Sacramento – San Joaquin Delta were submitted for the 2024 California Integrated Report by the U.S. EPA. Data were obtained from the California Data Exchange Center (“CDEC”) and compiled by the Interagency Ecological Program (“IEP”). Data were integrated and

standardized to hourly water temperature data in degrees Celsius. Temperature data were assessed for Suisun Marsh Sloughs, Suisun Bay, Carquinez Strait, and the portion of the Sacramento/San Joaquin Delta in San Francisco Bay Regional Water Board's jurisdiction. State Water Board staff assessed temperature data using sections 3.2, 6.1.5.1 through 6.1.5.7, and 6.1.5.9 of the Listing Policy to determine support of the Migration ("MIGR") beneficial use, specifically migration of Fall Run Chinook. Fall run chinook are likely the most sensitive aquatic life species to temperature impacts, and migration is likely the most sensitive life stage in these water bodies.

Temperature data were collected by several state and federal agencies in the San Francisco Bay Estuary and Sacramento San Joaquin Delta. The IEP compiled the continuous temperature data and associated metadata from CDEC to generate an integrated and usable dataset of hourly temperature data from 1986-2019.

Data that were collected at the bottom of the water column or from back-end sloughs and channels were not used in this assessment. The data were filtered this way to specifically assess the main tributaries used for fall run chinook migration. As stated above, only data collected during the spring downstream migration and fall upstream migration timeframes were assessed.

#### **5.1.2.2 Narrative Water Quality Objectives**

There are two narrative temperature water quality objectives in the San Francisco Bay Basin plan applicable to the MIGR beneficial use:

1. The natural receiving water temperature of inland surface waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Board that such alteration in temperature does not adversely affect beneficial uses.
2. The temperature of any cold or warm freshwater habitat shall not be increased by more than 5°F (2.8°C) above natural receiving water temperature.

#### **5.1.2.3 Evaluation of Natural Receiving Water Temperature**

Natural water temperature data do not exist to interpret the narrative temperature water quality objective. While model results are available to provide insights as concerning temperature changes over the last 50 years, this information is not sufficient to determine whether or not natural receiving water temperature conditions have been altered or increased by more than 5°F (2.8°C) above the natural receiving water temperature.

One model developed by Bashevkin et al. (2022) estimated an overall warming trend for the water temperatures of the upper San Francisco Estuary of 0.017 degrees Celsius/year over the last 50 years. If the overall trend were applied from today to the previous 100 years, temperatures overall may have been 1.7 degrees Celsius cooler on

average 100 years ago, which is less than the 2.8 degrees Celsius increase prohibited by the Basin Plan's temperature objective. However, the application of the model to a 100-year timeframe has not been peer reviewed.

The results from the model developed by Bashevkin et al. also provide insights on the temperature changes in some areas of the Western Delta, which is the area closest to the assessed waterbodies. The modeling results for the month of September suggest that some areas of the Western Delta had no statistically significant temperature increase and other portions only small temperature increases (~ 0.01 degrees Celsius a year) over the fifty-year period. The month with the highest proportion of seven-day average of daily maximum temperature ("7DADM") exceedances is September, with over 80 percent of the exceedances at the Mallard Island monitoring station exceeding 20 degrees Celsius. The modeling also suggests that there was no statistically significant temperature increase at all in the Western Delta during the month of October, a month during which fall run Chinook migrate upstream and for which approximately 10 percent of the 7DADM exceedances occur.

The modeling indicates that, in the Western Delta, historical temperatures from fifty years ago were likely even closer to current temperatures than in other parts of the San Francisco Estuary. Additionally, staff performed regression analyses to investigate trends in maximum and average monthly temperature computed from the hourly temperature data assessed to compute 7DADMs. This analysis was performed for stations that have at least 20 years of data. For example, the Mallard Island station in Carquinez Strait has hourly temperature data going back to 1987. There were no statistically significant trends in the average monthly temperature at this station. There was a statistically significant decreasing trend during for the maximum monthly temperature for August, and the other months had no significant trends in maximum monthly temperature. The modeling results and regression analysis create uncertainty as to whether the water temperatures in Suisun Bay, Carquinez Strait, and the Western portion of the Sacramento/San Joaquin Delta are substantially altered from natural receiving water temperatures. However, the information does not, at this time, indicate that natural temperature conditions have been altered.

#### **5.1.2.4 Evaluation of Aquatic Life Temperature Requirements**

Because natural water temperature data do not exist to interpret the narrative temperature water quality objective and modeling results are insufficient to determine whether or not natural temperature conditions have been altered, recent temperature data were compared to the temperature requirements of aquatic life (specifically Chinook migration) in the waterbody as informed by the evaluation guidelines pursuant to section 6.1.3 of the Listing Policy and in accordance with sections 6.1.5.1 through 6.1.5.7 of the Listing Policy as required by section 6.1.5.9 of the Listing Policy.

### **5.1.2.5 Numeric Threshold for Freshwater Waterbodies**

For freshwater streams and rivers, State Water Board staff assessed available hourly temperature data against the above narrative water quality objective by computing the 7DADM and comparing the results of this calculation to a numeric threshold of 20 degrees Celsius. The use of the 7DADM metric and a threshold of 20 degrees Celsius is supported in the U.S. EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality (U.S. EPA 2003b) and is intended to protect salmonid migration and the MIGR beneficial use. The migration period evaluated was the combination of the spring downstream migration (March 15 through June 15) and fall upstream migration (September 1 through December 15) periods for Fall Run Chinook.

The 7DADM is a 7-day moving average of maximum daily temperatures computed for the contiguous 7-day periods available during the migration timeframe. This applies to the MIGR beneficial use in the support of habitats necessary for migration during a critical migratory period. Because this metric assesses daily maximum temperatures without being overly influenced by a single day, it is an appropriate measure of protecting against the chronic effects of conditions that block migration (U.S. EPA, 2003b).

### **5.1.2.6 Numeric Threshold for Estuarine Waterbodies**

A threshold for estuarine waters is not currently available. The 7DADM 20 degrees Celsius threshold from the 2003 U.S. EPA guidance document for temperature standards for the Pacific Northwest relied almost exclusively on temperature studies conducted in freshwater streams. None of the studies were conducted in estuaries, so there is uncertainty in applying the threshold to a large estuary like San Francisco Bay and to salmonids as they transition from saltwater to freshwater ecosystems. There is insufficient information available to make a beneficial use support determination for temperature data in Suisun Bay, Carquinez Strait, and the portion of the Sacramento/San Joaquin Delta in the San Francisco Bay Region, which are all estuarine waterbodies.

However, comparing temperature data from the three estuarine waterbodies to the 20 degree Celsius threshold provides an indication that Chinook migration may be potentially threatened. Therefore, Suisun Bay, Carquinez Strait, and the portion of the Sacramento/San Joaquin Delta in the San Francisco Bay Region are recommended to be placed in Category 3.

## **5.2 San Francisco Bay Region 303(d) List Recommendations**

There are 137 new waterbody-pollutant combinations recommended for listing in the San Francisco Bay Region. If approved by the U.S. EPA as recommended, the San Francisco Bay Region's 303(d) list would be revised to have a total of 481 waterbody-pollutant combinations on the 303(d) list. Table 5-1 below summarize new listing recommendations by pollutant category for the San Francisco Bay Region for the



2024 California Integrated Report. A list of individual recommendations can be found in Appendix A: Recommended 2024 303(d) List of Impaired Waters.

**Table 5-1: Summary of San Francisco Bay Region Waterbody Pollutant Combination Listing Recommendations by Pollutant Category**

<b>Pollutant Category</b>	<b>Number of New Listing Recommendations<sup>11</sup></b>	<b>Number of New Listing Recommendations Changed from Previous Listing Cycle<sup>12</sup></b>	<b>Total</b>
Metals	5	1	6
Nutrients	8	0	8
Dissolved Oxygen	10	3	13
Other Cause	3	2	5
Pathogens/Bacteria	34	13	47
Pesticides	20	10	30
Salinity/Total Dissolved Solids/Chlorides/Sulfates	1	0	1
Sediment	1	0	1
Total Toxics	12	8	20
Toxic Organics	5	1	6

### **5.2.1 San Francisco Bay Region Scheduling of TMDLs and Other Efforts to Address Impaired Waters**

Efforts to address impaired waterbodies identified on the CWA section 303(d) list can include TMDLs, individual permits, or other programs of implementation, which are sometimes known as TMDL alternative projects. Most TMDL projects, and other efforts to address impaired waters, are identified, assessed, and ranked during the San Francisco Bay Basin Plan triennial review process. The proposed ranking of

<sup>11</sup> Listing recommendations based on new assessments.

<sup>12</sup> Updated listing recommendations include decisions that were previously assessed as “do not list” or “delist” and updated to “list.”



projects identified during the triennial review is based on the factors required by the Listing Policy (described in section 2.6, above) and consideration of several other factors, which are:

#### **5.2.1.1 Water Quality Impacts**

- The impairment is impacting multiple beneficial uses or several pollutants impact the waterbody, or there are acute impacts (e.g., fish kills).
- Human health is threatened as a result of the impairment.
- The impaired waterbody is designated for RARE.
- Likely implementation actions to address impairment would result in a restoration of a waterbody and/or watershed processes/functions.

#### **5.2.1.2 Public Interest, External and Internal Resources Committed**

- There is a high level of public interest or support for the project such as input from the public, including the regulated community, EPA, citizens, and environmental groups.
- External resources have already been expended or will be dedicated to the project in the future. These resources may include grant funding or funding provided by affected parties to assist the Water Board in coordinating technical information and stakeholder outreach for Basin Plan amendments.
- The Water Board has already invested resources in the project and/or has made commitments to address the impairment.

#### **5.2.1.3 Feasibility**

- The project involves a relatively low level of technical complexity, and a technical approach already exists.
- Current impairment analysis is available, no new data are required, or SWAMP can collect analytes to allow for impairment analysis.
- A relevant implementation approach exists in other watersheds.
- There is a high probability of implementation being successful (e.g., responsible parties capable to implement, cooperative parties like watershed councils are available to assist, existing regulatory programs as implementation vehicle, etc.).
- The project goals can likely be attained in the short or medium term.
- Staff expertise is available to develop and implement project.

Projects with a 2024 or 2025 estimated TMDL completion date are currently under development (Table 5-2: Schedule for San Francisco Bay Region TMDLs and Other Efforts to Address Impaired Waters).

**Table 5-2: Schedule for San Francisco Bay Region TMDLs and Other Efforts to Address Impaired Waters**

Project	Projected Completion Date
San Francisco Bay Beaches Bacteria TMDL (Erckenbrack Park, Gull Park, Marlin Park, Kiteboard Beach (San Francisco Bay, Lower), Oyster Point Marina (San Francisco Bay, Lower)	2024
Pescadero Marsh Dissolved Oxygen TMDL	2025
Regional Mercury Control Program in Reservoirs	2025

#### 5.2.1.4 Assigning Waterbodies to Existing TMDLs

There are 64 impaired waterbodies recommended for placement in Category 4a for which existing watershed based TMDLs have been approved by U.S. EPA to address the impaired waterbodies. These waterbodies have been identified in CalWQA with the adopted TMDLs. For example, eight segments are now identified as being addressed by the Petaluma River Bacteria TMDL approved by the U.S. EPA on May 10, 2021. Many of these waterbodies are tributaries to larger rivers and creeks for which there already is an U.S. EPA approved TMDL that were mapped for the first time after TMDL development, and these individual waterbody segments were not created in CalWQA until this cycle. In those cases, the watershed based TMDLs clearly apply to these impaired tributary segments so the Integrated Report is now more accurately representing the extent of these watershed based TMDLs.

#### 5.2.2 Impairments Being Addressed by Existing Pollutant Control Requirements Other than a TMDL (TMDL alternative)

The San Francisco Bay Regional Water Board has adopted two formal TMDL alternatives since the 2014-2016 California Integrated Report. The [San Vicente Creek Bacteria Water Quality Improvement Plan](https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/san_vicente_fitzgerald_pathogens.html) ([https://www.waterboards.ca.gov/sanfranciscobay/water\\_issues/programs/TMDLs/san\\_vicente\\_fitzgerald\\_pathogens.html](https://www.waterboards.ca.gov/sanfranciscobay/water_issues/programs/TMDLs/san_vicente_fitzgerald_pathogens.html)) was adopted by the San Francisco Regional Water Board on May 11, 2016. The implementation plan describes how reduction of bacteria loads from known sources would result in attainment of water quality standards in the creek, which will also protect water quality at Fitzgerald Marine Reserve, which is located at the creek mouth. Implementation actions have focused on managing animal waste from two horse ranch facilities, inspecting onsite wastewater treatment systems, inspecting public sewer lines near Fitzgerald Marine Reserve, and controlling pet waste along walking trails and urban areas.

The [San Gregorio Creek Sediment Water Quality Improvement Plan](https://www.waterboards.ca.gov/rwqcb2/water_issues/programs/TMDLs/sangregoriotm) ([https://www.waterboards.ca.gov/rwqcb2/water\\_issues/programs/TMDLs/sangregoriotm](https://www.waterboards.ca.gov/rwqcb2/water_issues/programs/TMDLs/sangregoriotm))

[dl.html](#)) TMDL alternative is also a Water Quality Improvement Plan and was adopted by the San Francisco Regional Water Board on October 14, 2021. The plan's main goal is to facilitate the recovery of listed populations of coho salmon (*Oncorhynchus kisutch*) and steelhead in the San Gregorio Creek watershed. The plan identifies significant sources of sediment within the watershed and proposes implementation actions and mechanisms for implementation to achieve water quality objectives for sediment and habitat conditions in San Gregorio Creek. Implementation actions to reduce sediment loading focus on roads and trails, and on agricultural lands. Recommended actions to improve aquatic habitat for listed species focus on increasing channel complexity by restoring floodplain connectivity, increasing large woody debris volumes, increasing base flow in the creek, removing barriers to fish passage, and reducing human disturbance in the San Gregorio Creek lagoon. Both these TMDL alternatives were received by the U.S. EPA.

## 6 Central Valley Region 303(d) List

Watersheds in the Central Valley region will be assessed each listing cycle in successive order, regardless as to whether the region is “on cycle” or “off cycle” for the particular listing cycle. The Central Valley Regional Water Board was “off-cycle” for the 2024 California Integrated Report, yet assessments were conducted for waters within the Sacramento River watershed. The Sacramento River watershed includes the mainstem of the Sacramento River above the legal boundary of the Sacramento-San Joaquin Delta and all surface waters tributary to the mainstem. The other watersheds in the Central Valley Region will be assessed in subsequent listing cycles through a rotating basin approach. The San Joaquin River watershed will be assessed for the 2026 California Integrated Report, the Sacramento-San Joaquin River Delta (“Delta”) and the Tulare Lake Basin will be assessed for the 2028 California Integrated Report.

For the 2024 Integrated Report, staff assessed data from a total of 562 waterbodies, containing 6,100 waterbody-pollutant combinations. Based on these assessments, 123 waterbody-pollutant combinations are recommended to be added to and 57 waterbody-pollutant combinations are recommended to be removed from the 303(d) list.

### 6.1 Central Valley Region-Specific Assessments

Selected assessments specific to the Central Valley Regional Water Board are described in the following subsections.

#### 6.1.1 Delta Remapping

Delta waterbodies are being remapped and reassessed throughout multiple listing cycles to ensure that the California Integrated Report best reflects water quality conditions and current water quality objectives, and to ensure data from a monitoring site are appropriately used to represent conditions in a mapped waterbody segment. Previous listing cycles included geographically broad assessments of the Delta, known as subareas. Some waterbodies within these large subareas were previously

remapped to ensure data are grouped within a smaller, more similar waterbody segment. However, many individual waterbodies are still grouped within subareas of the Delta. Secondly, many waterbodies that cross from outside to inside the legal Delta boundary are subject to SSOs and the rotating basin approach, which complicates the data evaluation on these waterbodies.

For the first phase of the Delta Remapping project, staff reviewed waterbodies that cross the legal Delta boundary. This resulted in new and revised segments that reflect the spatial and temporal nature of the waterbody and will allow for more accurate Delta assessments. The process for both types of waterways included station reassociation and revised LOEs and CalWQA Decisions. The majority of tasks associated with the first phase of the Delta remapping project were completed concurrently with the development of the 2024 California Integrated Report. The remapping exercise is ongoing, and the subarea remapping will continue in future listing cycles.

## **6.2 Central Valley Region Data Reassessments**

The following describes data reassessments conducted in response to comments received during the listing cycle for the 2020-2022 California Integrated Report. For additional documentation of data reassessments, please reference the Summary of Comments and Responses for the 2020-2022 California Integrated Report<sup>13</sup> for Clean Water Act 303(d) list and 305(b) report. In some instances, LOEs from previous listing cycles were retired. For more information, see section 2.3.2 and Appendix K: List of Retired Lines of Evidence.

### **6.2.1 Remediating Mis-Mapped Stations**

In the 2020-2022 California Integrated Report, a station association error with the WQP database was reported. Staff revised CalWQA Decisions associated to specific stations in response to comments and committed to fixing the rest of the CalWQA Decisions in the 2024 California Integrated Report.

For the 2024 California Integrated Report, staff reassigned the monitoring station(s) to the correct waterbody, made modifications to the lines of evidence, and revised over 750 listing recommendations for waterbodies. Details regarding the revisions made to correct mapping errors are in Appendix P: List of Central Valley Water Board Decisions Corrected Due to Mis-Mapped Stations.

### **6.2.2 Chloride Objectives**

During the listing cycle for the 2020-2022 California Integrated Report, a commenter identified an error with the application of the chloride water quality objective in the Delta.

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[https://www.waterboards.ca.gov/water\\_issues/programs/tmdl/2020\\_2022state\\_ir\\_report\\_s\\_revised\\_final/2020-2022-ir-final-revised-summary-of-responses-and-comments.pdf](https://www.waterboards.ca.gov/water_issues/programs/tmdl/2020_2022state_ir_report_s_revised_final/2020-2022-ir-final-revised-summary-of-responses-and-comments.pdf)

Historically, the secondary MCL was used to assess “MUN in the legal Delta.” In the 2020-2022 California Integrated Report it was determined that the only points where chloride objectives should be evaluated are at the two compliance points identified in the Bay-Delta Water Quality Control Plan. In the 2020-2022 California Integrated Report Response to Comments, the State Water Board committed to revising assessments that incorrectly applied the secondary MCL for the protection of MUN in the Delta during the listing cycle for the 2024 California Integrated Report.

During the listing cycle for the 2024 California Integrated Report, staff began but did not complete the reassessment due to the need to first remap Delta waterbodies, as described above. The Delta chloride CalWQA Decisions will be revised for the 2026 California Integrated Report once the Delta mapping work has been completed. It is expected that a TMDL for any chloride-impaired waterbody in the Delta would not be prioritized for development until after the Water Board corrects these CalWQA Decisions. Further, the Central Valley Regional Water Board is encouraged to use their discretion, where appropriate, in establishing permitting, monitoring, and other data collection requirements for chloride in the Delta.

### **6.2.3 Westside San Joaquin Coalition Pesticide Data Reassessments**

Data from the Westside San Joaquin Water Quality Coalition from years 2004-2009 were submitted for the 2012 California Integrated Report. Data associated with these CalWQA Decisions were re-assessed using aquatic life benchmarks for the 2020-2022 California Integrated Report. The reporting limit was mistakenly omitted from the data and resulted in incorrect samples and/or exceedances reported for 143 waterbody pollutant combinations in the 2020-2022 California Integrated Report. The data were re-evaluated for the 2024 California Integrated Report. No new listing or delisting recommendations are expected as a result of these reassessments. Additional issues, listed below, were discovered and will require additional reassessments in a future listing cycles:

- The range of dates for the replacement LOEs are larger than the original LOEs which resulted in duplicative assessments.
- The data used reference code does not correspond to the data being reassessed.
- There is no data reference in CalWQA corresponding to the reassessed data.
- The data used in the reassessments came from a different source than the data on file.

### **6.2.4 Assessment of Salinity in the Lower San Joaquin River According to New Water Quality Objectives**

On June 9, 2017, the Central Valley Water Board adopted Resolution R5-2017-0062 amending the Basin Plan to add specific conductivity (“SC”) water quality objectives in the San Joaquin River between the mouth of the Merced River and the Airport Way Bridge near Vernalis. The amendment was approved in December 2018 by the US EPA. The amendment sets an SC water quality objective of 1,550 micro-Siemens per

centimeter ( $\mu\text{S}/\text{cm}$ ) except during extended dry periods when the water quality objective will be 2,470  $\mu\text{S}/\text{cm}$ . Compliance with these objectives is to be determined at two locations: Crows Landing for the segment “San Joaquin River (Merced River to Tuolumne River)” and Maze Road for the segment ‘San Joaquin River (Tuolumne River to Stanislaus River)’. These objectives were adopted and approved late in the listing cycle for the 2020-2022 California Integrated Report and, since work had already begun to assess data during that cycle, application of these objectives was deferred to the listing cycle for the 2024 California Integrated Report as “off-cycle” assessments along with the scheduled assessment of readily available data in the Sacramento River watershed.

Assessment of salinity data using these new objectives was limited to the period after January 1, 2020, to assess salinity levels representative of current conditions as salinity inputs to the San Joaquin River have changed with implementation of the Grasslands Bypass Project. Beginning in 2002, management practices implemented under the Grasslands Bypass Project and associated waste discharge requirements gradually reduced discharges into the San Joaquin River and as of January 1, 2020, discharges of irrigation return flows to the San Joaquin River were eliminated entirely. Irrigation return flows were a significant contributor to salinity in the lower San Joaquin River and due to changes in the water quality resulting from management practices implemented under the Grasslands Bypass project data collected prior to 2020 are no longer representative of current conditions in the river. Data collected before 2020 were not used to making listing recommendations per section 6.1.5.3 of the Listing Policy.

At the time of the data pull for the 2024 California Integrated Report, there was only one sample available in CEDEN on or after January 1, 2020. One sample is insufficient to determine beneficial use support under the new salinity objectives per section 3.2 of the Listing Policy. Therefore, listings for the two segments that were approved as part of the 2020-2022 California Integrated Report remain in place until additional data are available: San Joaquin River (Merced River to Tuolumne River) and San Joaquin River (Tuolumne River to Stanislaus River).

Since the data cutoff date for the 2024 California Integrated Report, additional salinity data were uploaded in CEDEN for the two listed waterbody segments. These data will be available for the 2026 California Integrated Report and data will be reassessed using the applicable objectives at that time.

### **6.2.5 California Department of Pesticide Regulation Data**

During the 2024 California Integrated Report, an error associated with duplicative pesticide data was corrected. Staff identified two data submissions containing some overlapping data results collected by California Department of Pesticide Regulation (“CDPR”) for the Central Valley Region. This resulted in some data being assessed twice and the CDPR data having an outsized influence on listing recommendations. This issue affected 36 CalWQA Decisions and 68 pairs of LOEs spanning four waterbodies (Pleasant Grove Creek, the south branch of Pleasant Grove Creek, and



two tributaries to Pleasant Grove Creek) and 15 different pesticides. For the 2024 California Integrated Report, each LOE pair was examined, the LOE with the most complete data was kept in the assessment, and the listing recommendation was amended. The listing status for most recommendations remain unchanged from the 2020-2022 California Integrated Report. For a list of the pesticide LOE pairs and CalWQA Decisions that were corrected in the 2024 California Integrated Report, please reference Appendix N: List of Central Valley Water Board Decisions Corrected Due to Duplicate California Department of Pesticide Regulation Data Submission.

### **6.2.6 Sediment Toxicity LOE Mislabeled Reassessments**

During the 2024 California Integrated Report, an error from incorrectly labelling four pyrethroids in sediment LOEs as sediment toxicity LOEs was corrected. There were 16 CalWQA Decisions affected by the mislabeled LOEs that were not corrected for the 2020-2022 California Integrated Report. By correctly labelling these LOEs, a new CalWQA Decision for pyrethroids was created for an unnamed tributary to Pleasant Grove Creek, South Branch. Of the 17 corrected or new CalWQA Decisions, the listing status for 11 did not change when the error was corrected. Of the remaining six CalWQA Decisions corrected, three waterbody-pollutant combinations for pyrethroid pesticides were delisted and three CalWQA Decisions for toxicity were delisted and will be retired in the 2026 California Integrated Report. State Water Board staff is waiting for the listing cycle for the 2026 California Integrated Report to retire the CalWQA Decisions to ensure that there is a record of the error and correction of the error within the database. For specific information on changes to CalWQA Decisions see Appendix O: List of Central Valley Water Board Decisions Corrected Due to Pyrethroids Sediment Toxicity Mislabeled Error.

### **6.2.7 Battle Creek Watershed**

Data submitted outside of the normal solicitation period for the 2024 California Integrated Report was included in assessments for four waterbodies in the Sacramento River Basin:

- Bailey Creek (Shasta County)
- Digger Creek (Shasta and Tehama County)
- South Fork Digger Creek (Shasta and Tehama County)
- Rock Creek tributary to Bailey Creek (Shasta County)

Data for pH from Sierra Pacific Industries were submitted in January 2022 after the 2024 data solicitation period ended on October 16, 2022. The data were evaluated during the listing cycle for the 2024 California Integrated Report and incorporation of these data resulted in one delisting (Rock Creek tributary to Bailey Creek (Shasta County)) of a waterbody identified as impaired by pH on the 2020-2022 303(d) List.



### 6.2.8 Secondary MCL

The Central Valley Salinity Alternatives for Long-Term Sustainably (“CV-SALTS”) Basin Plan Amendment changed the chemical constituents water quality objective and how data should be compared to secondary MCLs. Per the amended Basin Plan, secondary MCLs shall be assessed using an annual average. In addition, *for surface waters designated MUN the concentration of chemical constituents shall not exceed the “secondary maximum contaminant level” specified in Title 22, Table 64449-A or the “Upper” level specified in Table 64449- B, unless otherwise authorized by the Central Valley Water Board in accordance with the provisions of Title 22, section 64449 et seq. Constituent concentrations ranging to the “Upper” level in Table 64449-B are acceptable if it is demonstrated that it is not reasonable or feasible to achieve lower levels.*”

For the 2020-2022 California Integrated Report, the State Water Board committed to assessing data using the new objective during the 2024 California Integrated Report as part of an early, off-cycle assessment. For the 2024 California Integrated Report, data was reassessed from waterbodies in the Sacramento River Watershed and applied the revised objective for secondary MCLs.

**Table 6-1: Title 22 of the California Code of Regulations, Table 64449-B - Secondary Maximum Contaminant Levels - “Consumer Acceptance Contaminant Level Ranges”**

	<i>Maximum Contaminant Level Ranges</i>		
<i>Constituent, Units</i>	<i>Recommended</i>	<i>Upper</i>	<i>Short Term</i>
Total Dissolved Solids, mg/L	500	1,000	1,500
or			
Specific Conductance, $\mu$ S/cm	900	1,600	2,200
Chloride, mg/L	250	500	600
Sulfate, mg/L	250	500	600

For the purposes of the 2024 California Integrated Report, concentrations of total dissolved solids, specific conductivity, chloride, and sulfate above the upper level of the Secondary MCL range in Table 64449-B were counted as exceedances.

Concentrations below the recommended level of the Secondary MCL range were not counted as exceedances. For concentrations between the recommended and upper levels, a demonstration that it is not reasonable or feasible to achieve the lower (i.e., recommended) level is needed to determine the appropriate threshold and identify if there are any exceedances. Without a demonstration of achievability, the level to use as the objective for 2024 California Integrated Report purposes is uncertain. Therefore, in such circumstances, concentrations between the recommended and upper levels were not counted as exceedances but were considered as evidence to place a

waterbody in Category 3, indicating there is insufficient data and/or information to make a beneficial use support determination but data and/or information indicates beneficial uses may be potentially threatened.

Additionally, secondary MCL pollutant data were reassessed using the annual average.

A complete list of the CalWQA Decisions and updated recommendations status can be found in Appendix Q: List of Central Valley Water Board Decisions Revised Due to Use of Amended Chemical Constituents Objective and Secondary Maximum Contaminant Levels.

Data associated with the San Joaquin River Watershed, the Sacramento-San Joaquin River Delta, and the Tulare Lake Basin will be reassessed during the listing cycles for the 2026 and 2028 California Integrated Reports.

### **6.3 Central Valley Region 303(d) List Recommendations**

There are 123 new waterbody-pollutant combinations recommended for listing in the Central Valley Region and 57 waterbody-pollutant combinations are recommended for delisting. If approved by the U.S. EPA as recommended, the Central Valley Region's 303(d) list would be revised to have a total of 1,274 waterbody-pollutant combinations on the 303(d) list. Tables 6-2 and 6-3 below summarize new listing and delisting recommendations by pollutant category for the Central Valley for the 2024 California Integrated Report. A list of individual recommendations can be found in Appendix A: Recommended 2024 303(d) List of Impaired Waters.

**Table 6-2: Summary of Central Valley Region Waterbody Pollutant Combination Listing Recommendations by Pollutant Category**

<b>Pollutant Category</b>	<b>Number of New Listing Recommendations<sup>14</sup></b>	<b>Number of New Listing Recommendations Changed from Previous Listing Cycle<sup>15</sup></b>	<b>Total</b>
Metals	31	21	52
Nutrients (including dissolved oxygen)	2	5	7
Other Cause	3	4	7
Pathogens/Bacteria	1	0	1
Pesticides	5	4	9
Total Toxics	1	2	3
Toxic Organics	42	1	43
Salinity/Total Dissolved Solids/Chlorides/Sulfates	0	1	1

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<sup>14</sup> Listing recommendations based on new assessments.

<sup>15</sup> Updated listing recommendations include decisions that were previously assessed as “do not list” or “delist” and updated to “list.”

**Table 6-3: Summary of Central Valley Region Waterbody Pollutant Combination Delisting Recommendations by Pollutant Category**

<b>Pollutant Category</b>	<b>Delisting Due to Change in Water Quality</b>	<b>Delisting Due to Other Changes<sup>16</sup></b>	<b>Total</b>
Metals	0	11	11
Nutrients (including dissolved oxygen)	1	2	3
Pathogens/Bacteria	2	1	3
Pesticides	4	19	23
Other Cause	2	0	2
Salinity/Total Dissolved Solids/Chlorides/Sulfates	1	7	8
Total Toxics	3	3	6
Toxic Organics	0	1	1

### **6.3.1 Central Valley Scheduling of TMDLs and Efforts to Address Impaired Waters**

Efforts to address impaired waterbodies identified on the 303(d) list can include revising standards, developing and implementing TMDLs, individual permits, or other programs of implementation, which are sometimes known as TMDL alternative projects. TMDL prioritization is influenced by a number of factors within the Central Valley Region. The Triennial Review of the two regional Basin Plans consists of solicitation for comments on water quality issues in the Central Valley that may need to be addressed through Basin Plan amendments and preparing a work plan for each Basin Plan which describes the actions the Regional Water Board may take over the next three years to investigate and respond to the issues. Additionally, input from the Central Valley Regional Water Board and the regional executive management team are incorporated into work planning through the portfolio management process. Priorities are established through the content of the Triennial Review, annual consultations with program managers, and direction from the Regional Water Board during yearly presentations by the Executive Officer. Finally, the TMDL prioritization is influenced by other work going on within the Region. Regulatory programs such as the ILRP address water quality

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<sup>16</sup> Delisting recommendations based on change in water quality standards, change in assessment method, listing corrections, or other miscellaneous changes.

impairments throughout the Region. Programs that can ensure that water quality standards will be met in a reasonable amount of time obviate the need for the development of a TMDL.

Projects with a 2023 estimated TMDL completion date are currently under development (Table 6-4: Schedule for Central Valley TMDLs and Other Effects to Address Impaired Waters).

**Table 6-4: Schedule for Central Valley TMDLs and Other Efforts to Address Impaired Waters**

Project	Projected Completion Date
Sacramento-San Joaquin Delta Methylmercury TMDL	2023

## 7 Santa Ana Region 303(d) List

The Santa Ana Regional Water Quality Control Board was “on-cycle” for the 2024 California Integrated Report. Data was assessed from a total of 173 waterbodies, containing 2,423 waterbody-pollutant combinations. Based on these assessments, 78 waterbody-pollutant combinations are recommended to be added the 303(d) list.

### 7.1 Santa Ana Region-Specific Assessments

Selected assessments specific to the Santa Ana Regional Water Board are described in the following subsections.

#### 7.1.1 303(d) Listings for TDS, Sulfate, Chloride, Hardness, TIN, and Sodium in Chino Creek Reach 1B

Total dissolved solids (“TDS”), sulfate, chloride, hardness, total inorganic nitrogen (“TIN”), and sodium were assessed using the 7-day averaging period consistent with Listing Policy section 6.1.5.6 which states that, “If the averaging period is not stated for the standard, objective, criterion, or evaluation guideline, then the samples collected less than 7 days apart shall be averaged.” The site-specific water quality objective for Chino Creek Reach 1B does not specify an averaging period and in such circumstances, the Listing Policy’s 7-day averaging period applies. Chino Creek Reach 1B is listed as impaired for TDS, sulfate, chloride, hardness, TIN, and sodium using the default 7-day averaging period.

The antidegradation surface water quality objectives for minerals in the 1975 Basin Plan<sup>17</sup> were established and are currently used for regulatory purposes (i.e., permits, determining compliance) as ‘annual flow-weighted averages.’ The subsequent amendments to the 1975 Basin Plan (1983, 1995, 2004, and 2019) maintained the 1975 antidegradation numbers but did not include the table heading stating the values are annual flow-weighted averages. The use of annual flow-weighted averages for the salt and nutrient management program in the Santa Ana Region has been a common practice since the development of the 1975 antidegradation surface water quality objectives. Application of the 7-day averaging period for the purposes of developing the California Integrated Report does not impose a requirement in permits to regulate TDS, sulfate, chloride, hardness, TIN, and sodium using a 7-day averaging period.

Santa Ana Water Board staff’s perspective is that omission of the reference to the annual flow-weighted average for Chino Creek Reach 1B, and other surface waters, is likely an editorial oversight. Santa Ana Water Board staff is considering adding specificity to the Basin Plan regarding averaging periods in a future Basin Plan amendment (as soon as 2023). Chino Creek 1B is listed as impaired for TDS, sulfate, chloride, and sodium using the default 7-day averaging period consistent with the Listing Policy. Should the pertinent water quality standards in the Basin Plan be amended (e.g., to include an annual averaging period), data for this waterbody will be reassessed in a subsequent California Integrated Report using the annual flow-weighted averaging period after the Basin Plan is amended. It is expected that a TMDL would not be prioritized for development until after the Santa Ana Regional Water Board completes the Basin Plan amendment and data are reassessed. Further, the Santa Ana Regional Water Board staff will use their discretion, where appropriate, in establishing permitting, monitoring, and other data collection requirements associated with TDS, sulfate, chloride, hardness, TIN, and sodium in Chino Creek Reach 1B.

The Santa Ana Regional Water Board staff has interpreted the Basin Plan in a manner that utilizes the annual flow-weighted average when applying these objectives in many regulatory settings. The following subsections include additional information on the history of successive versions of the Basin Plan and the application of the averaging period for TDS, sulfate, chloride, hardness, TIN, and sodium in Chino Creek Reach 1B.

#### **7.1.1.1 1983 Basin Plan**

In the 1983 Basin Plan<sup>18</sup>, in Chapters 1 and 3, there is language that states the water quality objectives from the 1975 Basin Plan were adopted in the 1983 Basin Plan with

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<sup>17</sup> The 1975 Basin Plan was developed before Assembly Bill 434 was adopted to ensure Water Boards are compliant with Government Code Section 7405 and 11135. This document has not been remediated for accessibility. Please contact [WQAssessment@waterboards.ca.gov](mailto:WQAssessment@waterboards.ca.gov) to obtain a copy of this document.

<sup>18</sup> The 1975 Basin Plan was developed before Assembly Bill 434 was adopted to ensure Water Boards are compliant with Government Code Section 7405 and 11135. This

some minor changes. The changes did not include changing the mineral objectives from annual flow-weighted averages to an instantaneous objective. The changes included in Chapter 1 were related to waste discharge prohibitions, and proposals and projects to implement the Basin Plan. The changes included in Chapter 3 were to lower the chloride water quality objective for the Santa Ana River, Reach 3, from 160 milligrams per liter (“mg/l”) to 140 mg/l and to raise the boron objective from 0.5 in the 1975 Basin Plan to 0.75 mg/l for the 1983 Basin Plan. These were changes to the 1975 Basin Plan values shown in Table 4-1 as flow-weighted averages to a new value in the 1983 Basin Plan that was also supposed to be expressed as annual flow-weighted averages.

Also, in Chapter 3 (1983), there are two other excerpts that were included to help with the discussion. One states that the 1983 Basin Plan replaces and supersedes the 1975 Basin Plan; and as explained above, the antidegradation surface water quality objectives had been developed for the 1975 Basin Plan and were largely adopted with only minor changes that did not include changing the values from annual flow-weighted averages. The second excerpt explains how the Santa Ana Watermaster determines compliance with the Basin Plan objectives using flow-weighted averages.

An excerpt of language from the 1983 Basin Plan is included at the end of this section.

#### **7.1.1.2 Current Basin Plan (Updated June 2019)**

The antidegradation surface water quality objectives for minerals in the current Basin Plan are the same values used in the 1975 and 1983 Basin Plans and have not changed. Again, Santa Ana Water Board staff’s perspective is that a footnote clarifying that the values are annual flow-weighted averages may have erroneously been omitted. Since the 1975 and 1983 Basin Plans historic values are still in-place in the current Basin Plan, Santa Ana Regional Water Board staff assumes that these values are applied as annual flow-weighted averages.

Lastly, the 1983 Basin Plan in Chapter 3 and the Current Basin Plan in Chapter 4, explain how the Watermaster demonstrates compliance with the Basin Plan water quality objectives and that an annual flow-weighted average is used.

#### **7.1.1.3 1983 Basin Plan Excerpts: (underline emphasis added)**

##### **7.1.1.3.1 Chapter 1 (pg. 1-11), in “Keeping the Basin Plan Current”**

As was stated earlier, the Porter-Cologne Act (California Water Code) directs the Regional Water Boards to prepare and periodically review water quality control plans (i.e., Basin Plans). Water quality standards, as described in the Federal Clean Water Act, are an important part of these Basin Plans. The Clean Water Act requires that water quality standards be routinely reviewed and modified as necessary. These

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federal and state requirements for review are met by the Triennial Review Process, established in 1982.

Because of budget shortages and other problems, the 1975 Basin Plan and its water quality standards did not undergo review until 1982-83. Now that the Triennial Review process has been established, a formal review is projected for 1985-86. The requirement for Triennial Review does not mandate changes in the Basin Plan. It directs only that public hearings be held at least once each three years to consider modification of existing standards or adoption of new standards.

In using and applying the 1975 Basin Plan, it has been our experience that water quality standards do not change very much or very rapidly. Two parts of the plan where changes do occur relatively frequently are (1) those concerning waste discharge prohibitions and (2) proposals and projects to implement the Basin Plan itself. It is anticipated, therefore, that most of the effort spent to keep the Basin Plan current will be directed toward changes in these areas, rather than toward changes in water quality standards.

#### 7.1.1.3.2 Chapter 3, Pg 3-10

As part of the analysis of historic data, the water quality objectives adopted in the 1975 Basin Plan were modified as follows: the water quality objective for chloride was shown to be met consistently while the objectives for the other individual constituents were being violated. The chloride objective, therefore, was lowered from 160 mg/l to 140 mg/l to be consistent with the others. The objective for boron was raised from 0.5 to 0.75 mg/l, as a result of analyses which showed that beneficial uses would not be affected by the change, and that there is additional assimilative capacity available for boron.

#### 7.1.1.3.3 Chapter 3, pg. 3-1

Two important additional factors which were also considered in setting these water quality objectives are (1) historic and present water quality, and (2) the Non-degradation Policy cited in Chapter One.

The water quality objectives in this plan supersede and replace those adopted in the 1975 Basin Plan. In accordance with the Porter-Cologne Act, this plan must be submitted to and approved by the State Water Resources Control Board. (Wat. Code, § 13245). The Clean Water Act CP.L. 92-500, as amended) requires that new or revised water quality standards be submitted to the Environmental Protection Agency for approval. The contents of this plan are designed to satisfy all state and federal requirements, specifically including sections 303(c), (d) and (e) of the Clean Water Act.

#### 7.1.1.3.4 Chapter 3, Pg 3-9 (1983 Basin Plan) and Chapter 4, pg. 4-27 (Current Basin Plan)

The Santa Ana River Watermaster calculates the amount and quality of total flow for each water year (October 1 to September 30). The Watermaster's Annual Report is used to determine compliance with the stipulated judgement referred to earlier, which set quality and quantity limits on the river. The Watermaster's report presents summary

data compiled from the continuous monitoring of flow in cfs (cubic feet per second) and salinity as EC (electrical conductivity) at the USGS Prado Gaging Station. The Watermaster's annual determination of total flow quality will be used to determine compliance with the total flow objective in this Plan. In years of normal rainfall, most of the total flow of the river is percolated in the Santa Ana Forebay, and directly affects the quality of the groundwater. For that reason, compliance with the TDS water quality objective for Reach 2 will be based on the five-year moving average of the annual TDS content of total flow. Use of this moving average allows the effects of wet and dry years to be smoothed out over the five-year period.

### **7.1.2 Corrected Beneficial Uses for Various Waterbodies**

The Santa Ana Region Basin Plan specifies mountain and valley reaches for several waterbodies. The beneficial uses between the mountain and valley reaches often differ, most notably between the COLD and WARM beneficial uses. For the 2024 California Integrated Report, a number of these waterbodies, including East Twin Creek and City Creek, were split in CalWQA to reflect the difference between the mountain and valley reaches of a waterbody.

As a result of the split, some mountain reaches of waterbodies were inadvertently designated COLD and WARM. Per the Santa Ana Region Basin Plan, only the COLD beneficial use applies to the mountain reaches of waterbodies. Incorrect WARM LOEs were deleted, and the correct COLD LOEs were retained for the mountain reaches of those waterbodies.

### **7.1.3 Newport Coast Streams Bacteria Assessment**

Three streams draining to the Newport Coast (Buck Gully, Morning Canyon, and Los Trancos) are recommended to remain listed as impaired by pathogens, based on indicator bacteria data collected prior to August 31, 2010. The original listings were based on exceedances of now outdated water quality objectives for *E. coli*, fecal coliforms or total coliforms. As described in more detail in section 3.5 above, the 2024 California Integrated Report is the first listing cycle for which bacteria data in the Santa Ana Region were assessed for support of the REC-1 beneficial use since new statewide bacteria water quality objectives took effect. For the 2024 California Integrated Report, historical data could either be reassessed against the new objectives, or if sufficient new data were available, listing recommendations could rely on data collected since 2010 only. Although new *E. coli* and enterococci data were collected for each of these three streams, the only data available in CEDEN for assessment purposes were *E. coli* data.

Salinity data collected and analyzed by Santa Ana Regional Water Board staff indicate that salinity is greater than 1 ppt at each of the three stations located downstream of Pacific Coast Highway ("Newport Coast Streams bacteria Impairment Assessment" – Newport Coast Report) (Shibberu 2020), thereby indicating that the correct bacterial indicator to assess bacterial impairment in the three streams at each of the three locations is enterococci. Since no new enterococci data were available for assessment

purposes, staff relied on the situation-specific weight of evidence listing factor (Listing Policy section 3.11) to determine standards attainment. The recommendation to continue to list the three streams as impaired for bacteria is based on other data, specifically the Newport Coast Report (Shibberu 2020), which analyzed data that are not available in CEDEN. The Newport Coast Report includes the assessment of data collected by Santa Ana Regional Water Board staff in 2019, and data submitted by the Orange County Department of Public Works in its annual reports to the Santa Ana Water Board (in accordance with the Orange County Municipal Storm Sewer Systems (“MS4”) Permit requirements. In summary, 969 of 974 geomeans exceed the 30 cfu/100 ml enterococci geomean objective for Buck Gully and 470 of 525 geomeans exceed the 30 cfu/100 ml enterococci geomean objective for Los Trancos, which exceeds the allowable frequency in Table 4.2 of the Listing Policy. The data were collected from March 30, 1999 to June 26, 2019 (Buck Gully) and from March 30, 1999 to October 27, 2009 (Los Trancos), and are presented in Table 16 of the Newport Coast Report (Shibberu 2020).

Reassessment of data for Morning Canyon Creek shows that the average enterococci geomean for Morning Canyon was 366 most probable number (“mpn”) / 100 milliliters (“ml”) for dry weather and 6,351 mpn/100 ml for wet weather, while the average enterococci geomean for station mc2 was 576 mpn/100 mL, which clearly exceeds the 30 colony forming unit (“cfu”)/100 ml enterococci geomean objective. The data were collected by Weston Solutions from September 2005 - February 2006 for the City of Newport Beach and by Coastkeeper from November 21, 2005 - April 10, 2006, and are presented in Tables 10 and 11, respectively, of the Newport Coast Report (Shibberu 2020).

Two of two geomeans exceed the 30 cfu/100ml enterococci geomean objective for Morning Canyon Creek, and this sample size is insufficient to determine, with the power and confidence of the Listing Policy, the applicable beneficial use support rating; however, five of six samples exceed the enterococci STV objective, and this does exceed the frequency listed in Table 3-6: Summary of Water Quality Thresholds used for Bacteria. The data were collected from January 2, 2019 through June 4, 2019, and are presented in Table 12 of the 2020 Newport Coast Report (Shibberu 2020).

Historical data will be reassessed, and any new data submitted to CEDEN will be assessed as an off-cycle assessment in the 2026 California Integrated Report. Historical lines of evidence include data collected at stations upstream of Pacific Coast Highway that may or may not exceed the 1 ppt salinity threshold. As part of the reassessment process, Santa Ana Water Board staff might need to remap each of the three streams into two separate reaches with the upstream reaches using one bacteria indicator and the downstream reaches using a different indicator.

#### **7.1.4 Total Dissolved Solids at Santa Ana River, Reach 3**

The objective for TDS in Santa Ana River, Reach 3 (Prado Dam to Mission Blvd) is specified as a base flow objective in the Santa Ana Region Basin Plan: Table 4-1. Base flow, as defined in the Basin Plan, is composed of wastewater discharges, rising

groundwater, and nonpoint source discharges. Chapter 4 of the Basin Plan states that in order to determine if water quality objectives for base flow are being met, samples are collected when the influence of storm flows and nontributary flows is at a minimum, which typically occurs in August and September. Therefore, only samples from the months of August and September were assessed.

TDS in Santa Ana River, Reach 3 was first assessed in the 2016 California Integrated Report. For the listing cycle assessment for the 2016 California Integrated Report, Santa Ana Regional Water Board staff implemented a seasonal average across the two-month base flow period. While the seasonal average is not explicitly stated in the current version of the Santa Ana Region Basin Plan, the TDS objective in Santa Ana River, Reach 3 was assessed as a seasonal average across the two-month base flow period to be consistent with Chapter 4 of the Basin Plan, and past-listing cycle assessments. Data were assessed using the TDS objective in Santa Ana River, Reach 3 as a seasonal average across the two-month base flow period for the 2024 California Integrated Report. In other words, all samples collected during the months of August and September were averaged and considered as one sample to be assessed against the objective of 700 mg/L.

#### **7.1.5 Coyote Creek and San Antonio Creek**

At different points in their reaches, both Coyote Creek and San Antonio Creek cross in and out of the Los Angeles and Santa Ana Regional Water Board's jurisdictional boundaries. Since the Regional Water Board border does not follow the watershed boundary, neither waterbody lies entirely within one region. Due to current limitations in the mapping of waterbodies and assessment, each waterbody was required to be considered within one region for the purposes of assessment. Therefore, Regional and State Water Board staff determined Coyote Creek would be assessed as if it were entirely within the Los Angeles Region. The Santa Ana Region Basin Plan specifies site-specific objectives for San Antonio Creek, and the waterbody originates and terminates in the Santa Ana region. For these reasons, San Antonio Creek would be better assessed as if entirely within the Santa Ana Region. The Santa Ana Region Basin Plan does not specify site-specific objectives for Coyote Creek.

#### **7.1.6 Lead and Cadmium Reassessments**

The Santa Ana Region Basin Plan specifies site specific water quality objectives ("SSOs") for lead, cadmium, and copper for Santa Ana River, Reach 3. The CTR specifies criteria for the same constituents. Since there are conflicting objectives for the same constituents, the more stringent objectives apply. Of the three constituents, the SSO for copper is less stringent than the CTR criterion, while the SSOs for lead and cadmium are more stringent than the CTR criteria. Therefore, data from the 2024 California Integrated Report for Santa Ana River, Reach 3 were assessed against the CTR criterion for copper and against the SSOs for lead and cadmium.

As a result, previous listing cycle data were reassessed against the SSOs for lead and cadmium. The data from previous listing cycles were used to develop new LOEs utilizing the SSOs for lead and cadmium. Previous listing cycle LOEs utilizing the CTR criteria for lead and cadmium at Santa Ana River, Reach 3 were subsequently retired.

### **7.1.7 Chloride Reassessment**

For the 2010 California Integrated Report, chloride data at City Creek (Mountain Reach) were incorrectly assessed against the Chloride U.S. EPA National Recommended Ambient Water Quality Criteria for Freshwater Aquatic Life. Instead, that data should have been assessed against the applicable and more stringent chloride SSO specified in the Santa Ana Region Basin Plan: Table 4-1. For the 2024 California Integrated Report, current listing cycle chloride data were assessed against the SSO. Additionally, previous listing cycle data were reassessed against the SSO, and new LOEs were developed. Previous listing cycle LOEs utilizing the National Recommended Ambient Water Quality Criteria for chloride at City Creek (Mountain Reach) were subsequently retired.

## **7.2 Data Not Used to Determine Standards Attainment**

### **7.2.1 Alkalinity data for Santa Ana River Reach 3**

Alkalinity data for the Santa Ana River Reach 3 submitted by the City of Riverside Regional Water Quality Control Plant were not used for the purposes of this assessment. Some samples included in the dataset were reported as non-detect, but with a corresponding value in the results column that was well above the method detection limit. Santa Ana Regional Water Board staff reached out to the data provider and was unable to resolve these discrepancies. Santa Ana Regional Water Board staff will continue to work with the data provider, and if the issues can be resolved, will consider reassessing the data as an off-cycle assessment in the 2026 California Integrated Report.

### **7.2.2 CIWQS Data**

CIWQS data were evaluated for use in the 2024 California Integrated Report. The dataset included data collected by several wastewater treatment plants within the region; however, the metadata were variable, and did not always include necessary information to determine data quality. Only data that included method detection limits and reporting limits were used in the 2024 California Integrated Report. Data submitted by Corona Waste Water Reclamation Facility (“WWRF”) and Western Riverside County Regional Wastewater Authority (“WRCRWA”) Regional WWRF did not include this information, and therefore were not used.

### **7.2.3 National Water Quality Portal Data**

Data from WQP database for waterbodies in the Santa Ana Region were evaluated for use in the 2024 California Integrated Report. The WQP dataset includes data collected

by the San Bernardino National Forest, the San Manuel Band of Mission Indians, the California Department of Water Resources and the USGS. The quality of the datasets, available metadata, and QAPPs varied. Therefore, the data did not meet Listing Policy data quality requirements and were not used to make listing recommendations but were used only as ancillary evidence. More information about the data quality concerns is provided below. These data sets may be utilized in a future California Integrated Report if the discrepancies are remedied.

- a. Data submitted by the San Bernardino National Forest were used only to develop ancillary LOEs because the measurements included field data for streams that were not listed in the QAPP (i.e., QAPP Table 5) but that fall within the San Bernardino National Forest boundary; for example, Barton Creek (BRCR1). The data were included to provide information about these streams that typically are not sampled. Staff communicated with the data provider about the stations not identified in the 2017 QAPP; however, the QAPP was not revised.
- b. Data submitted by the San Manuel Band of Mission Indians did not include sufficient metadata to determine the quality of the data, and sampling locations were in ponds and springs that are not included as identified waterbodies in the Santa Ana Basin Plan.
- c. California Department of Water Resources data were not used because data included discharge outfall data which are not considered ambient waters and are not assessed for the California Integrated Report. Additionally, sample comments noted that data were from pre- and post-treatment events; however, metadata were not included that discussed the treatment. Data did not include method detection limits or lab batch information, among other quality issues.
- d. Data submitted by the USGS California Science Center were not used because results were different from those housed in the USGS database. Data were collected at multiple verticals and as composite samples and were not documented in a way that the automated LOE tools could recognize. It was not possible to understand the metadata because there was no QAPP associated with the data.

#### **7.2.4 Identified Trash Data**

Trash data collected from multiple waterbodies within Riverside County and submitted to CEDEN were evaluated, but not assessed for beneficial use attainment, due to inadequate data quality and lack of a QAPP or QAPP equivalent documentation. Trash measurements were recorded as presence information without any additional measure to quantify the amount of trash represented by a “present” entry. Additionally, approximately half of the station data entries contained no trash measurement and appeared as blank entry fields. Staff was unable to determine what the blank data entries were intended to represent (e.g., no trash found, the station was not surveyed, etc.). For these data to be used for assessment, additional information and details are



necessary (e.g., information to quantify the amount of trash, quality assurance information, and spatial detail to discern the area that was surveyed).

### **7.3 Santa Ana Region 303(d) List Recommendations**

There are 78 new waterbody-pollutant combinations recommended for listing in the Santa Ana Region. If approved by the U.S. EPA as recommended, the Santa Ana Region's 303(d) list would be revised to have a total of 217 waterbody-pollutant combinations on the 303(d) list. Table 7-1 below summarizes new listing recommendations by pollutant category for the Santa Ana Region for the 2024 California Integrated Report. There are no new delisting recommendations for the 2024 California Integrated Report. A list of individual recommendations can be found in Appendix A: Recommended 2024 303(d) List of Impaired Waters.



**Table 7-1: Summary of Santa Ana Region Waterbody Pollutant Combination Listing Recommendations by Pollutant Category**

<b>Pollutant Category</b>	<b>Number of New Listing Recommendations<sup>19</sup></b>	<b>Number of New Listing Recommendations Changed from Previous Listing Cycle<sup>20</sup></b>	<b>Total</b>
Metals	6	5	11
Nuisance	3	0	3
Nutrients (including dissolved oxygen)	8	0	8
pH	12	2	14
Cyanotoxins	7	0	7
Pathogens/Bacteria	2	6	8
Pesticides	8	4	12
Salinity/Total Dissolved Solids/Chlorides/Sulfates	5	4	9
Total Toxics	1	1	2
Toxic Inorganics	1	1	2
Toxic Organics	1	1	2

### **7.3.1 Santa Ana Region Scheduling of TMDLs and Efforts to Address Impaired Waters**

Efforts to address impaired waterbodies identified on the CWA section 303(d) list can include TMDLs, individual permits, or other programs of implementation, which are sometimes known as TMDL alternative projects. TMDL projects, and other efforts to address impaired waters, are identified, assessed, and ranked during the Santa Ana Basin Plan triennial review process. The proposed ranking of projects identified during

<sup>19</sup> Listing recommendations based on new assessments.

<sup>20</sup> Updated listing recommendations include decisions that were previously assessed as “do not list” or “delist” and updated to “list.”

the triennial review is based on the factors required by the Listing Policy (described in section 2.6, above) and consideration of several other factors, which include but are not limited to:

- Relevance to human health protection.
- Relevance to threatened and endangered species protection.
- Importance to the implementation of other Regional Water Board programs.
- Stated priorities of the Regional Water Board, State Water Board, or the U.S. EPA.
- Requests of stakeholders, including tribal governments, cities and counties, other state or federal agencies, non-governmental organizations, and individuals.
- Availability of necessary expertise, funding, and other resources.

Additionally, Santa Ana Regional Water Board staff will consider the Human Right to Water as applicable when addressing impaired waterbodies, as described in Resolution R8-2019-0078. The Resolution directed staff to implement a work plan that includes tasks to ensure that the Santa Ana Regional Water Board programs are equitably and consistently administered and are supportive of the Human Right to Water in all communities.

Santa Ana Water Board staff meet on a regular basis in a task force format with major water purveyors, wastewater agencies, various other permitted agencies, members of the public, and nongovernmental agencies. Watershed-wide collaboration has been the key to the development of TMDL programs and a comprehensive waste load allocation model. Technical knowledge-sharing and financial cost-sharing amongst interested parties has helped board staff establish, review, and revise TMDL programs for multiple waterbodies.

For the purpose of the triennial review exercise, TMDL projects are ranked as the number 1 priority. Individual TMDL projects receive a sub-ranking of a, b, c, etc. A workplan is subsequently developed by assessing the amount of time each highly ranked project is estimated to take and the staff resources available during the next triennial period. The current high priority TMDL projects are itemized in Table 7-2: Schedule for Santa Ana TMDLs and Other Efforts to Address Impaired Waters.

**Table 7-2: Schedule for Santa Ana TMDLs and Other Efforts to Address Impaired Waters**

Project	Projected Completion Date
Revisions to Middle Santa Ana River Watershed Bacterial Indicator TMDLs	2024
Newport Bay Copper TMDLs	2025
Revisions to Lake Elsinore and Canyon Lake Nutrient TMDLs	2026

## **7.3.2 Waterbodies and/or Pollutants Not Prioritized for TMDL Development**

### **7.3.2.1 Shellfish Listings**

While there is justification for placing water segment-pollutant combinations on the CWA section 303(d) list for impairment of the SHELL (shellfish harvesting) beneficial use, the Santa Ana Regional Water Board considers these to be a lower priority for TMDL development, as the water quality objective for the SHELL beneficial use has been determined by the State Water Board to require review and possible updating. On December 3, 2019, the State Water Board adopted the 2019 Triennial Review of the Ocean Plan and identified as a high priority a project to consider amending the Ocean Plan to review and revise the existing shellfish harvesting total coliform objective. The State Water Board recognized that the current total coliform water quality objective may be unattainable, as exceedances of the standard were found to be common in reference-quality areas. Following the update of the water quality objective, waterbodies in the Santa Ana region will be reassessed and reprioritized for TMDL development, if needed. See section 2.6 for more information.

### **7.3.2.2 Addressing Salinity in Chino Creek Reach 1B**

Several pollutants (i.e., total dissolved solids, sodium, sulfate, chloride) associated with excess salinity are proposed for listing in Chino Creek Reach 1B. The Santa Ana Regional Water Board is not planning to prioritize these constituents for TMDL development in Chino Creek Reach 1B. due to the ongoing efforts to control the discharge of salts in the Santa Ana River Basin.

Chino Creek Reach 1B is included in the TDS and Nitrogen Management Plan, which was first adopted into the Santa Ana Basin Plan in 2004 and subsequently revised in 2010, 2012, 2014, 2020, and 2021. This plan is designed to address the build-up of salts within the Santa Ana River Basin for both groundwater and surface waters. Each of the dischargers to the Santa Ana River Basin have been assigned allocations, which are implemented principally through TDS and nitrogen limits in the waste discharge requirements issued to municipal wastewater treatment facilities.

The Basin Monitoring Task Force was formed to implement the monitoring and analysis programs necessary for the TDS and Nitrogen Management Plan. This group, formed from water resource agencies in the Santa Ana Watershed, has obligations to prepare monitoring reports to evaluate compliance with applicable objectives; prepare ambient groundwater quality analysis and updates; update predictive models and evaluate allocations for wastewater treatment plants; and work with the Santa Ana Regional Water Board to conduct special studies and investigations as needed to ensure compliance with water quality objectives.

This program and activities implemented by the Basin Monitoring Task Force will continue to evolve and adapt to address the exceedances of water quality objectives in Chino Creek Reach 1B. This program is preferential to the development of a TMDL,

and Santa Ana Regional Water Board staff will work with the Task Force members to gain compliance with water quality objectives.

## **8 Los Angeles Region 303(d) List**

The Los Angeles Regional Water Quality Control Board was “on-cycle” for the 2024 California Integrated Report. Staff assessed data from a total of 288 waterbodies, containing 6,442 waterbody-pollutant combinations. Based on these assessments, 465 waterbody-pollutant combinations are recommended to be added to and 30 waterbody-pollutant combinations are recommended to be removed from the 303(d) list.

### **8.1 Los Angeles Region-specific Assessments**

Selected assessments specific to the Los Angeles Water Board are described in the following subsections.

#### **8.1.1 Ammonia Delistings in the Los Angeles River Watershed**

Los Angeles River Reaches 3 and 5, Balboa Lake, Bull Creek, and Wildlife Lake are recommended to be delisted for ammonia using the situation-specific weight of evidence evaluation described by section 4.11 of the Listing Policy. As detailed below, the weight of evidence indicates water quality standards are being attained in these waterbodies.

The principal source of nitrogen compounds in the Los Angeles River is discharge from three water reclamation plants, two of which are relevant to these delistings. The Donald C. Tillman Water Reclamation Plant (“DCTWRP”) discharges tertiary treated effluent into Lake Balboa, Wildlife Lake, Bull Creek, and Reach 5 of the Los Angeles River. The Los Angeles-Glendale Water Reclamation Plant (“LAGWRP”) discharges effluent into Reach 3 of the Los Angeles River. In order to come into compliance with water quality objectives for ammonia in the Los Angeles Region Basin Plan, the City of Los Angeles implemented nitrification/denitrification (“NDN”) treatment processes at the two plants in the Los Angeles River watershed. The NDN processes have resulted in a substantial decrease in the amount of ammonia contained in effluent discharged to receiving waters. These processes were installed and operational at the LAGWRP and DCTWRP in 2007.

Section 6.1.5.3 of the Listing Policy states, “If the implementation of a management practice(s) has resulted in a change in the waterbody segment, only recently collected data [since the implementation of the management measure(s)] should be considered”. The NDN system represents such a change in management practices, resulting in improved water quality in the waterbody segments downstream of the facilities’ respective discharges.

Previous monitoring data from DCTWRP and LAGWRP demonstrated a statistically significant improvement in water quality in sections of the Los Angeles River influenced

by the plants' discharges when considering data collected before and after the installation of NDN processes. These data could not be considered in a previous 303(d) listing cycle because they were not submitted to the Regional Water Board during a data solicitation period, and without substantial processing were not compatible with CalWQA. For the 2024 California Integrated Report, the Los Angeles Region worked with the State Water Board to acquire monitoring reports submitted by dischargers to their respective permitting programs. Manual quality control/quality assurance was performed, and data was converted into a form that could be assessed.

The Los Angeles Region assessed the waterbodies that receive discharge from DCTWRP and LAGWRP, looking at data from dates corresponding to before and after the installation of the NDN processes in both plants. Older data representing water quality "before NDN" are from lines of evidence used in the previous 303(d) listing cycle and were collected from 2005 to 2007. Newer data representing water quality "after NDN" were collected from 2012 to 2020 and are being assessed for the first time.

These newly assessed monitoring data from 2012 to 2022, a period after NDN processes were installed and operational at DCTWRP and LAGWRP, demonstrate that the waterbodies to which they discharge effluent are now meeting water quality objectives for ammonia according to Table 4.1 of the Listing Policy. These findings are reproducible, scientifically defensible, and were determined using the most recent data available.

### **8.1.2 Temperature Assessments**

The Los Angeles Region Basin Plan contains water quality objectives for temperature supporting the WARM and COLD beneficial uses (page 3-44). In order to support the COLD beneficial use, the Los Angeles Region Basin Plan specifies that "water temperature shall not be altered by more than 5 degrees Fahrenheit above the natural temperature." Where the natural temperature has not yet been established for a waterbody or waterbody segment, section 6.1.5.9 of the Listing Policy allows the use of alternative approaches to assess temperature impacts. Following Moyle (revised 2002), the Los Angeles Region uses 13 to 21 degrees Celsius (55.4 to 69.8 degrees Fahrenheit) as a threshold protective of the COLD beneficial use. This is an optimum temperature range for rainbow trout growth and completion of most life stages, without mortality from thermal stress. For waters designated as WARM, a threshold of 80 degrees Fahrenheit was used to assess impairments, following the Los Angeles Region Basin Plan's requirements.

Studies are currently underway in the Los Angeles Region to reevaluate the relationship between temperature and beneficial uses, and these may result in a modification of temperature objectives. For this reason, TMDL development for waterbodies impaired for temperature is not being prioritized at this time.

### **8.1.3 Chlordane Delisting in the Los Cerritos Channel**

The Los Cerritos Channel was listed for chlordane in sediment on the 2002 303(d) List. In the absence of new data for this waterbody-pollutant combination, it has remained listed since that time. In 2019, a representative from the Los Cerritos Channel Watershed Group provided information to the Los Angeles Region showing this listing was flawed, resulting from a mapping error. In the original CalWQA Decision, the stations from which the samples were collected were incorrectly assigned to Los Cerritos Channel instead of Los Cerritos Estuary. The LOEs and CalWQA Decisions were retired for Los Cerritos Channel, resulting in a delisting. The stations were remapped to Los Cerritos Estuary and added to an existing LOE. A Do Not List recommendation was made for chlordane in sediment in this waterbody.

### **8.2 New Sources of Data**

In addition to data submitted through CEDEN and the California Integrated Report Document Upload Portal, the Los Angeles Region assessed monitoring data collected by major dischargers, including the MS4s and publicly owned treatment works (“POTWs”). Monitoring reports from these dischargers were submitted to the Regional Water Board several times a year in fulfillment of permit requirements. MS4 monitoring reports were submitted to Regional Water Board staff by Coordinated Integrated Monitoring Program groups throughout the region, except for Ventura County stormwater data, which were submitted directly to CEDEN. Electronic monitoring reports from POTWs were submitted by permittees to CIWQS.

All monitoring reports were subject to a robust quality assurance/quality control assessment to ensure data were of high quality, were temporally and spatially independent, were supported by a QAPP, and were otherwise in compliance with data quality standards set forth in section 6.1 of the Listing Policy. In order to convert the data to a format compatible with the assessment database, Regional and State Board staff developed a crosswalk tool to translate the names of pollutants, analytes, laboratory test methods, units, and quality assurance codes to CEDEN equivalent parameters. Effluent monitoring data were excluded from the analysis, as were data that had already been submitted to CEDEN. This effort resulted in approximately 2,000 new lines of evidence from the MS4 monitoring reports and 3,000 lines of evidence from POTW reports, representing monitoring conducted from 2011 to 2020.

### **8.3 Los Angeles Region 303(d) List Recommendations**

There are 465 new waterbody-pollutant combinations recommended for listing in the Los Angeles Region and 30 waterbody pollutant combinations are recommended for delisting. If approved by the U.S. EPA as recommended, the Los Angeles Region’s 303(d) list would be revised to have a total of 1,316 waterbody-pollutant combinations on the 303(d) list. Tables 8-1 and 8-2 below summarize new listing and delisting recommendations by pollutant category for the Los Angeles for the 2024 California Integrated Report. A list of individual recommendations can be found in Appendix A: Recommended 2024 303(d) List of Impaired Waters.

Toxicant pollutants refer to pollutants assessed using Tables 3.1 and 4.1 of the Listing Policy, including aromatic hydrocarbons, solvents, and other organic and inorganic toxins. Conventional pollutants refer to pollutants assessed using Tables 3.2 and 4.2 of the Listing Policy, such as chloride, sulfates, and electrical conductivity.

**Table 8-1: Summary of Los Angeles Region Waterbody Pollutant Combination Listing Recommendations by Pollutant Category**

<b>Pollutant Category</b>	<b>Number of New Listing Recommendations<sup>21</sup></b>	<b>Number of New Listing Recommendations Changed from Previous Listing Cycle<sup>22</sup></b>	<b>Total</b>
Metals	45	46	91
Nutrients (including dissolved oxygen)	15	12	27
pH	2	4	6
Temperature	8	13	21
Pathogens/Bacteria	19	4	23
Pesticides	115	113	228
Other Conventional Pollutants	13	9	22
Other Toxicant Pollutants	29	18	47

<sup>21</sup> Listing recommendations based on new assessments.

<sup>22</sup> Updated listing recommendations include decisions that were previously assessed as “do not list” or “delist” and updated to “list.”



**Table 8-2: Summary of Los Angeles Region Waterbody Pollutant Combination Delisting Recommendations by Pollutant Category**

<b>Pollutant Category</b>	<b>Delisting Due to Change in Water Quality</b>	<b>Delisting Due to Other Changes<sup>23</sup></b>	<b>Total</b>
Metals	4	0	4
Nutrients	7	0	7
pH	2	0	2
Pathogens/Bacteria	4	0	4
Pesticides	7	0	7
Other Conventional Pollutants	1	0	1
Other Toxicant Pollutants	5	0	5

### 8.3.1 Los Angeles Scheduling and Efforts to Address Impaired Waters

Efforts to address impaired waterbodies identified on the CWA section 303(d) list can include TMDLs, individual permits, or other programs of implementation, which are sometimes known as TMDL alternative projects. The prioritization of TMDLs and other efforts to address impaired waters in the Los Angeles Region is based on the factors required by section 5 of the Listing Policy (described in section 2.6, above) and consideration of several other factors, including:

- Relevance to human health protection
- Relevance to threatened and endangered species protection
- Relevance to communities that have historically been disproportionately impacted by pollutants and other environmental stressors
- Relevance to climate change
- Importance to the implementation of other Regional Water Board programs
- Stated priorities of the Regional Water Board, State Water Board, or the U.S. EPA
- Requests of stakeholders, including tribal governments, cities and counties, other state or federal agencies, non-governmental organizations, and individuals

<sup>23</sup> Delisting recommendations based on change in water quality standards, change in assessment method, listing corrections, or other miscellaneous changes.

- Availability of necessary expertise, funding, and other resources

The current high priority TMDL projects are listed in Table 8-3: Schedule for Los Angeles TMDLs and Other Efforts to Address Impaired Waters. In addition to the development of new TMDLs, existing TMDLs are sometimes reconsidered to incorporate new information relevant to addressing the targeted impairments.

**Table 8-3: Schedule for Los Angeles TMDLs and Other Efforts to Address Impaired Waters**

Project	Projected Completion Date
Dominguez Channel and Greater Los Angeles and Long Beach Harbor Waters Toxic Pollutants TMDL Reconsideration	2023
Los Cerritos Channel and Estuary, Alamitos Bay, and Colorado Lagoon Indicator Bacteria TMDL	2023
Dominguez Channel and Torrance Lateral Channel Bacteria TMDL	2024
Los Angeles River Bacteria TMDL Reconsideration	2025

### 8.3.2 Waterbodies and/or Pollutants Not Prioritized for TMDL Development

Both the temperature and pH objectives included in the Los Angeles Region Basin Plan (pages 3-40 and 3-44) include consideration of natural background conditions. Studies are currently underway in the Los Angeles Region to reevaluate the relationship between temperature, pH, and beneficial uses, which may result in a modification of water quality objectives or development of site-specific objectives. For these reasons, TMDL development for waterbodies impaired for temperature or pH is not being prioritized at this time.

As noted in section 3.6, the State Water Board is considering actions to address the inherent difficulties in achieving the existing bacterial water quality standards at all locations where shellfish consumption exists (the SHELL beneficial use). In light of this and the Los Angeles Region’s focus on bacteria impairments of the REC-1 beneficial use, SHELL bacteria listings will not be prioritized for TMDL development at this time.

## 9 Central Coast Region 303(d) List

The Central Coast Regional Water Quality Control Board was “off-cycle” for the 2024 California Integrated Report; however, staff assessed data from a total of 120 waterbodies, containing 438 waterbody-pollutant combinations. Based on these assessments, 29 waterbody-pollutant combinations are recommended to be added to

and 1 waterbody-pollutant combination is recommended to be removed from the 303(d) list.

## **9.1 Central Coast Region-specific Assessments**

Assessments specific to the Central Coast Regional Water Board are described in the following subsections. Data sets that were not included in the 2020-2022 California Integrated Report assessment for various reasons were assessed and included in the 2024 California Integrated Report. This effort is essential to completely inform California Integrated Report recommendations and ensure inclusion of all data collected during the time period that are eligible for assessment. Additionally, staff reassessed data for aluminum, and pesticides in sediment.

### **9.1.1 Central Coast Long-term Environmental Assessment Network Data Inclusion**

The Central Coast Long-term Environmental Assessment Network (“CCLEAN”) conducts required monitoring and reporting for several of the Monterey Bay area municipal and industrial dischargers. Routine monitoring occurs at both inland surface waters and ocean sites each year.

During the 2020-2022 California Integrated Report, a significant amount of data from this program were left out of the assessment for various reasons, including lack of datum for certain monitoring sites, lack of reporting limits, and data with the sample matrix “Extract\_Samplewater.” Issues with the datum and reporting limits were resolved and much of these data were assessed for the 2024 California Integrated Report.

With respect to the sampling matrix, “Extract\_samplewater,” staff worked with the data provider, Applied Marine Science, to include data with this matrix for the 2024 California Integrated Report. “Extract\_samplewater” is the appropriate matrix for samples collected via an active sampler that pumps a known amount of water through a resin column over a defined time. The total amount (mass) of each parameter is then measured in the resin and divided by the total liters that flowed through the resin to get an average “integrated” sample concentration (mass/volume). These samples represent the average conditions during the period of sample collection, typically a 30-day period. This type of sampling is valuable in characterizing low levels of a pollutant that may be missed during a grab sampling event and/or stormwater event. The Central Coast Regional Water Board uses these data to determine compliance for Monterey Bay area municipalities with their National Pollutant Discharge Elimination System permits. Therefore, the receiving water data are appropriate to use for the California Integrated Report. “Extract\_samplewater” (shown as “Active Sampler” in the California Integrated Report CalWQA Decision language) and grab samples were not combined (summed) while making recommendations.

Including these data resulted in new listings for chlordane, DDT, dieldrin, PCBs, and toxaphene in the Monterey Bay; heptachlor epoxide in the Pajaro River; and bifenthrin in the lower Salinas River.

### **9.1.2 Toxicity Data Inclusion**

In the 2020-2022 California Integrated Report, some toxicity data collected through the Central Coast Ambient Monitoring Program in August and December 2018 were not included in the assessment. This is because deliverables from the lab were delayed and SWAMP Information Management and Quality Assurance (“SWAMP IQ”) prioritization did not allow for inclusion of the data in CEDEN in time for the 2020-2022 California Integrated Report. The data were included for the current listing cycle and did not result in any listing/delisting changes but did add to the situation-specific weight of evidence supporting existing toxicity CalWQA Decisions for several waterbodies. Inclusion of these data ensures that the complete data set collected prior to 2019 has now been assessed and included in the California Integrated Report.

### **9.1.3 Cyanotoxin Data Inclusion**

Cyanotoxin data (e.g., anatoxin-a, cylindrospermopsin, microcystins, and saxitoxins) collected during 2016-2018 were not assessed in the 2020-2022 California Integrated Report. All are often associated with harmful algal blooms. Cyanotoxin data collected by statewide and regional monitoring programs were not available in CEDEN for the 2020-2022 California Integrated Report because these data were prioritized for inclusion in a more user-friendly public facing platform due to the immediate public health consequences associated with cyanotoxins, and not to CEDEN. For the 2024 California Integrated Report, cyanotoxin data were assessed for 15 waterbodies that resulted in three new listings: one for anatoxin-a (Lopez Lake) and two listings for microcystins (Laguna Lake and San Antonio Reservoir).

### **9.1.4 San Luis Obispo Creek Estuary Enterococcus Data Inclusion**

Enterococcus data from San Luis Obispo Creek Estuary were inadvertently not assessed for the 2020-2022 California Integrated Report. The data were assessed for the 2024 California Integrated Report, resulting in a new listing for the Estuary.

### **9.1.5 Aluminum Data Reassessment**

Staff reassessed aluminum data previously used to support California Integrated Report recommendations using the 2018 U.S. EPA Criteria, in response to public comments received during the listing cycle for the 2020-2022 California Integrated Report (see section 3.1). See Final Summary of Comments and Responses for the Statewide Clean Water Act 303(d) List Portion of the 2020-2022 California Integrated Report, specifically comments 020.07 and 009.07. This resulted in the reassessment of data for 80 waterbodies and resulted in twelve new listings and one do not delist recommendations. There were no delisting recommendations because of the reassessment.

### **9.1.6 Pesticide Data Reassessment**

Some pesticide data from sediment samples were assessed without organic carbon-normalized calculations for the 2020-2022 California Integrated Report. As discussed in section 3.2.2.1, the toxicity of some pesticides is dependent on the amount of organic

carbon within sediment. Therefore, all data where the organic carbon-normalized concentration had not been correctly evaluated were reassessed using the appropriate carbon-normalized data. Pesticides reassessed include pyrethroids (cypermethrin, deltamethrin, and permethrin). Reassessment resulted in six new listings:

- Cypermethrin
  - Bradley Channel
  - Orcutt Creek
- Permethrin
  - Main Street Channel
- Pyrethroids
  - Arroyo Grande Creek (below Lopez Lake)
  - Santa Maria River
  - Watsonville Slough

### **9.1.7 Correction to 2020-2022 California Integrated Report**

In the 2020-2022 California Integrated Report, Pajaro River Estuary was listed for permethrin. This was an error in the assessment and the correct recommendation should have been, “do not list.” This has been corrected in the 2024 California Integrated Report with a “delist” recommendation.

### **9.1.8 Mapping Changes**

Several waterbodies had minor waterbody adjustments to their size, length, or location to make the delineation more accurate. Minor changes also involved reassociating certain sample sites to a different waterbody that more accurately represents the sampling sites. Please see Appendix G: Miscellaneous Mapping Changes Report for details. Examples include:

- Reassigned a station to “Pacific Ocean at Pismo State Beach (San Luis Obispo County), south of Pismo Pier.”
  - This resulted in a list recommendation for “Pacific Ocean at Pismo State Beach (San Luis Obispo County), south of Pismo Pier” for total coliform. This listing was formerly associated with “Pacific Ocean at Pismo Beach (San Luis Obispo County).”
- Revised waterbody named “Pacific Ocean at Pismo Beach (San Luis Obispo County)” to “Pacific Ocean at Pismo Beach Pier (San Luis Obispo County)” to reflect its location near the pier.
- Associated lines of evidence with a single waterbody ID (“WBID”) number where one waterbody name existed but had with two separate WBID numbers. The correction was to retain the original WBID no., CAX. For example:
  - Pacific Ocean at Butterfly Beach (Santa Barbara County) had two WBID numbers, CAX3153201220021001203735 and CAC3153200020190116044847.

- Pacific Ocean at Jalama Beach (Santa Barbara County) had two WBID numbers, CAX3151005120020107155608 and CAC3151006020190116046410.

## 9.2 Central Coast Region 303(d) List Recommendations

There are 29 new waterbody-pollutant combinations recommended for listing in the Central Coast Region and 1 waterbody pollutant combination is recommended for delisting. If approved by the U.S. EPA as recommended, the Central Coast Region’s 303(d) list would be revised to have a total of 1,204 waterbody-pollutant combinations on the 303(d) list. Tables 9-1 and 9-2 below summarize new listing and delisting recommendations by pollutant category for the Central Coast for the 2024 California Integrated Report. A list of individual recommendations can be found in Appendix A: Recommended 2024 303(d) List of Impaired Waters.

**Table 9-1: Summary of Central Coast Region Waterbody Pollutant Combination Listing Recommendations by Pollutant Category**

Pollutant Category	Number of New Listing Recommendations <sup>24</sup>	Number of New Listing Recommendations Changed from Previous Listing Cycle <sup>25</sup>	Total
Metals	1	11	12
Cyanotoxins	3	0	3
Pathogens/Bacteria	1	1	2
Pesticides	4	7	11
Toxic Organics	1	0	1

<sup>24</sup> Listing recommendations based on new assessments.

<sup>25</sup> Updated listing recommendations include decisions that were previously assessed as “do not list” or “delist” and updated to “list.”

**Table 9-2: Summary Central Coast Waterbody Region Pollutant Combination Delisting Recommendations by Pollutant Category**

Pollutant Category	Delisting Due to Change in Water Quality	Delisting Due to Other Changes <sup>26</sup>	Total
Pesticides	0	1	1

### 9.2.1 Central Coast Scheduling of TMDLs and Other Efforts to Address Impaired Waters

The efforts to address impaired waters have not changed since the 2020-2022 California Integrated Report. See the [2020-2022 California Integrated Report staff report](https://www.waterboards.ca.gov/water_issues/programs/tmdl/2020_2022state_ir_reports_revised_final/2020-2022-integrated-report-final-staff-report.pdf) for the prioritization process. ([https://www.waterboards.ca.gov/water\\_issues/programs/tmdl/2020\\_2022state\\_ir\\_reports\\_revised\\_final/2020-2022-integrated-report-final-staff-report.pdf](https://www.waterboards.ca.gov/water_issues/programs/tmdl/2020_2022state_ir_reports_revised_final/2020-2022-integrated-report-final-staff-report.pdf).)

## 10 San Diego Region 303(d) List

The San Diego Regional Water Quality Control Board was “off-cycle” for the 2024 California Integrated Report; however, data were assessed from a total of 79 waterbodies, containing 194 waterbody-pollutant combinations. Based on these assessments, three waterbody-pollutant combinations are recommended to be removed from the 303(d) list.

### 10.1 San Diego Region-Specific Assessments

“Off-cycle” work included correcting data errors, investigating why specific data were not assessed in the 2020-2022 California Integrated Report, correcting and/or updating mapping of some waterbodies, updating TMDL information in several CalWQA Decisions, reassessing aluminum data (see section 3.1), and correcting pyrethroid CalWQA Decisions with sediment data (normalization error described above in section 3.8). Assessments specific to the San Diego Regional Water Board are described in the following subsections.

#### 10.1.1 Data Corrections

A portion of the data provided by the County of San Diego for the Lower Santa Margarita River and Lower San Luis Rey River were submitted to CEDEN with incorrect latitude and longitude and therefore were incorrectly assessed for the Lower Santa Margarita River in the 2020-2022 California Integrated Report. The County of

<sup>26</sup> Delisting recommendations based on change in water quality standards, change in assessment method, listing corrections, or other miscellaneous changes.



San Diego has since corrected and resubmitted the data to CEDEN. Following the CEDEN correction update, San Diego Regional Water Board staff modified the LOEs (retired incorrect LOEs and created new LOEs with correct data) and affected CalWQA Decisions for the two waterbodies.

Data provided by the City of Chula Vista for selenium in Telegraph Canyon Creek were submitted to CEDEN with incorrect latitude and longitude for the 2020-2022 California Integrated Report. The City of Chula Vista corrected the coordinates in CEDEN, and four LOEs were created for the data. These data were assessed and are included in the CalWQA Decision.

### **10.1.2 Mapping Corrections and Adjustments**

Several types of mapping updates were completed during the off-cycle period. Some adjustments were made to better represent waterbodies that were previously mapped and assessed, some waterbodies were newly mapped, and in some cases, existing waterbodies were merged into a single waterbody for assessment purposes.

The County of Orange and California Stormwater Quality Association noted that station S11 was associated with the wrong waterbody in their comment letters submitted for the 2020-2022 California Integrated Report. LOEs for station S11 that were incorrectly associated with “Pacific Ocean Shoreline, Aliso HSA, at Aliso Beach – north” were retired. A new waterbody called “Pacific Ocean Shoreline, Aliso HSA, Laguna Beach – Treasure Island” was created, and S11 data were associated with it.

Mapping around Hodges Reservoir was adjusted to better represent the reservoir, San Dieguito River (downstream of the reservoir), and a tributary to the reservoir, named Santa Ysabel Creek (below Sutherland Reservoir). With these mapping adjustments, data from sampling station SDC-TWAS-2 were assigned to Santa Ysabel Creek (below Sutherland Reservoir). LOEs were retired for this sampling station that were incorrectly assigned to San Dieguito River during previous listing cycles. New LOEs were created for SDC-TWAS-2, and the data were assessed for Santa Ysabel Creek (below Sutherland Reservoir).

Mapping of geographically close but previously separately mapped Pacific Ocean Shoreline segments were combined into a single waterbody for assessment purposes. The first set includes “Pacific Ocean Shoreline, San Clemente HA, at South Capistrano Beach at Beach Road,” “Pacific Ocean Shoreline, San Clemente HA, at South Capistrano County Beach” and “Pacific Ocean Shoreline, Lower San Juan HSA, 5000 feet south of outfall”, which are now assessed as “Pacific Ocean Shoreline, San Clemente HA, at South Capistrano County Beach.” Existing (previously assessed) data were combined.

The second set includes “Pacific Ocean Shoreline, Scripps HA, at Ravina,” “Pacific Ocean Shoreline, Scripps HA, at Whispering Sands Beach, Nicholson Point, La Jolla” and “Pacific Ocean Shoreline, Scripps HA, at Vista de la Playa, Windansea Beach,”

which are now assessed as “Pacific Ocean Shoreline, Scripps HA, Vista de la Playa to Nicholson Point.” Existing (previously assessed) data were combined.

The names of two waterbodies were changed, and no new data were assessed for either waterbody. The waterbody segment formerly named “Pacific Ocean Shoreline, San Elijo HSA, at Cardiff State Beach” is now assessed as “Pacific Ocean Shoreline at Cardiff Reef.” The waterbody segment formerly named “Pacific Ocean Shoreline, San Joaquin Hills HSA, at Aster Street” is now assessed as “Pacific Ocean Shoreline, San Joaquin Hills HSA, at Heisler Park.”

### **10.1.3 TMDL and TMDL Alternative Updates**

Many bacteria CalWQA Decisions were updated to include the TMDL information that was missing from CalWQA Decisions generated during previous listing cycles. The recommendations did not change, as no new data were assessed.

The Indicator Bacteria CalWQA Decisions for the following waterbodies now include the missing TMDL titled “Revised Total Maximum Daily Loads for Indicator Bacteria, Project I – Twenty Beaches and Creeks in the San Diego Region (Including Tecolote Creek)”, which was approved by U.S. EPA on June 22, 2011.

- Pacific Ocean Shoreline, San Joaquin Hills HSA, at Crescent Bay Beach
- Pacific Ocean Shoreline, Laguna Beach HSA, at Bluebird Canyon
- Pacific Ocean Shoreline, Laguna Beach HSA, at Dumond Drive at Victoria Beach
- Pacific Ocean Shoreline, Laguna Beach HSA, at Laguna Beach at Cleo Street
- Pacific Ocean Shoreline, Laguna Beach HSA, at Laguna Hotel
- Pacific Ocean Shoreline, Laguna Beach HSA, at Main Beach
- Pacific Ocean Shoreline, Aliso HSA, at Aliso Creek mouth
- Pacific Ocean Shoreline, Dana Point HSA, at Dana Point Harbor at guest dock
- Pacific Ocean Shoreline, Dana Point HSA, at Dana Strands Surfzone at Dana Strands Rd
- Pacific Ocean Shoreline, Dana Point HSA, at Salt Creek Service Road
- Pacific Ocean Shoreline, Dana Point HSA, at Table Rock Drive
- Pacific Ocean Shoreline, Dana Point HSA, at Thousand Steps Beach
- San Juan Creek
- Pacific Ocean Shoreline, San Clemente HA, at Capistrano Shores at North Ole Hanson Beach
- Pacific Ocean Shoreline, San Clemente HA, at Riviera Beach
- Pacific Ocean Shoreline, San Clemente HA, at San Clemente City Beach at Linda Lane
- Pacific Ocean Shoreline, San Clemente HA, at San Clemente City Beach at Mariposa Lane
- Pacific Ocean Shoreline, San Clemente HA, at San Clemente City Beach at South Trafalgar St Beach
- Pacific Ocean Shoreline, San Clemente HA, at San Clemente City Beach at Trafalgar Canyon outlet

- Pacific Ocean Shoreline, San Clemente HA, at San Clemente City Beach, 45ft North of Pier
- Pacific Ocean Shoreline, San Clemente HA, at South Poche Beach at Capistrano Shores
- Pacific Ocean Shoreline, San Luis Rey HU, at Tyson Way
- Pacific Ocean Shoreline, San Dieguito HU, at San Dieguito Lagoon Mouth at Seascape Beach Park
- Pacific Ocean Shoreline, Scripps HA, at Avenida de la Playa at La Jolla Shores Beach
- Pacific Ocean Shoreline, Scripps HA, at La Jolla Cove
- Pacific Ocean Shoreline, Scripps HA, at South Casa Beach

To match the 2022-2032 Program Vision, information about the TMDL alternative, approved in 2019 and titled “An Order Directing the Cities of Murrieta, Temecula, and Wildomar, The Counties of San Diego and Riverside, The Riverside Flood Control and Water Conservation District, and The United States Marine Corps Base Camp Pendleton to Design and Implement a Water Quality Improvement Monitoring and Assessment Program for Eutrophic Conditions in the Santa Margarita River Estuary and Watershed California,” was added to the Eutrophic CalWQA Decision for Santa Margarita Lagoon. No new data for Santa Margarita Lagoon were assessed during the listing cycle for the 2024 California Integrated Report.

To match the 2022-2032 Program Vision, information was added to multiple San Diego Bay CalWQA Decisions to include site-specific actions that are being taken other than a TMDL. These actions include Cleanup and Abatement Orders and Investigative Orders that require remediation plans and monitoring. No new data were assessed for the San Diego Bay during the listing cycle for the 2024 California Integrated Report. Updates were made to CalWQA Decisions for the following waterbody-pollutant combinations:

- San Diego Bay Shoreline, Downtown Anchorage and Benthic Community Effects
- San Diego Bay Shoreline, Downtown Anchorage and Toxicity
- San Diego Bay Shoreline, at Harbor Island (East Basin) and Copper
- San Diego Bay Shoreline, near Chollas Creek and Benthic Community Effects
- San Diego Bay Shoreline, near Chollas Creek and Toxicity
- San Diego Bay and PCBs

#### **10.1.4 Data Not Used to Determine Standards Attainment**

Comments received from the County of Orange, California Stormwater Quality Association, and the City of El Cajon about data that were not included in the 2020-2022 California Integrated Report prompted further investigation. The findings are as follows. Data from multiple stations submitted to Beachwatch and CEDEN were not used due to incorrect latitude and longitude and/or missing datum. These include stations S-1, ACJ01, CTPJ01, PDCM01, and EC-5. Once corrected in the appropriate databases, the data can be considered for future listing cycles.

## 10.2 San Diego Region 303(d) List Recommendations

There are three new waterbody-pollutant combinations recommended for delisting in the San Diego Region. If approved by the U.S. EPA as recommended, the San Diego Region's 303(d) list would have a total of 839 waterbody-pollutant combinations on the 303(d) list. Table 10-1 below summarize new delisting recommendations by pollutant category for the San Diego Region for the 2024 California Integrated Report. A list of individual recommendations can be found in Appendix A: Recommended 2024 303(d) List of Impaired Waters.

**Table 10-1: Summary of San Diego Region Waterbody Pollutant Combination Delisting Recommendations by Pollutant Category**

Pollutant Category	Delisting Due to Change in Water Quality	Delisting Due to Other Changes <sup>27</sup>	Total
Metals	0	3	3

### 10.2.1 San Diego Scheduling of TMDLs and Other Efforts to Address Impaired Waters

The efforts to address impaired waters have not changed since the 2020-2022 California Integrated Report. See the [2020-2022 California Integrated Report staff report](https://www.waterboards.ca.gov/water_issues/programs/tmdl/2020_2022state_ir_reports_revised_final/2020-2022-integrated-report-final-staff-report.pdf) for the prioritization process. ([https://www.waterboards.ca.gov/water\\_issues/programs/tmdl/2020\\_2022state\\_ir\\_reports\\_revised\\_final/2020-2022-integrated-report-final-staff-report.pdf](https://www.waterboards.ca.gov/water_issues/programs/tmdl/2020_2022state_ir_reports_revised_final/2020-2022-integrated-report-final-staff-report.pdf).)

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<sup>27</sup> Delisting recommendations based on change in water quality standards, change in assessment method, listing corrections, or other miscellaneous changes.

## 11 Recommended 303(d) List

A tally of new listing and delisting recommendations, as well as the total number of impaired waterbodies, for the 303(d) list portion of the 2024 California Integrated Report is shown in Table 11-1, below. The second column lists the number of waterbody-pollutant combinations currently listed as impaired on the 2020-2022 303(d) List. The two subsequent columns contain a count of recommended new listings and recommended new delistings. The last column includes the total number of listings for 2024 that would result if all recommendations are adopted. A comprehensive list can be found in Appendix A: Recommended 2024 303(d) List of Impaired Waters.

**Table 11-1: Recommended New Listings and Delistings for the 303(d) List Portion of the 2024 California Integrated Report**

Region	2020-2022 303(d) Listings	New Listings	Delistings	Total 2024 303(d) Listings
North Coast	217	0	0	217
San Francisco Bay	348	137	0	481
Central Coast	1,177	29	1	1,204
Los Angeles	877	465	30	1,316
Central Valley	1,202	123	57	1,274
Lahontan	256	0	0	256
Colorado River Basin	110	0	0	110
Santa Ana	142	78	0	217
San Diego	844	0	3	839
<b>TOTALS</b>	5,173	832	91	5,914

*Count of 2024 303(d) listings may not equal the addition of new listings and removal of delistings from the 2020-2022 303(d) List due to waterbody splits, merges, or other miscellaneous changes.*

## 12 California’s 305(b) Integrated Report Condition Categories

For the 2024 California Integrated Report, a total of 1,591 waterbodies (containing 20,632 waterbody-pollutant combinations) were assessed. See Tables 12-1 and Table 12-2, for a summary of the number of waterbodies both current and proposed in each of the five Integrated Report condition categories. Categories 1, 2, 3, and 4c are informational and do not require Water Boards approval. Waterbodies placed in those categories will be submitted as part of the 305(b) portion of the 2024 Integrated Report to the U.S. EPA for their report to Congress. Categories 4a, 4b, and 5 are the 303(d) list.

**Table 12-1: Count of Waterbodies in California’s 305(b) Integrated Report Condition Categories – Streams, Rivers, and Coastal Beaches**

California’s Integrated Report Condition Category	2020-2022 Streams, Rivers, and Coastal Beaches per Category	Proposed New Revisions	2024 Sum of Current and Proposed New Revisions
1	656	62	718
2	718	123	841
3	68	37	105
4A	175	40	215
4B	42	0	42
4C	3	2	5
5	1,000	65	1,065
<b>TOTAL</b>	2,662	329	2,991

*Count of current and proposed categorization of streams, rivers, and other linear surface waterbodies statewide.*

**Table 12-2: Count of Waterbodies in California’s 305(b) Integrated Report Condition Categories – Lakes, Reservoirs, Enclosed Bays, Estuaries, and Ocean Waters**

<b>California’s Integrated Report Condition Category</b>	<b>2020-2022 Lakes, Reservoirs, Enclosed Bays, Estuaries, and Ocean Waters per Category</b>	<b>Proposed New Revisions</b>	<b>2024 Sum of Current and Proposed New Revisions</b>
<b>1</b>	24	6	30
<b>2</b>	227	6	233
<b>3</b>	7	7	14
<b>4A</b>	28	-4	24
<b>4B</b>	6	0	6
<b>4C</b>	1	0	1
<b>5</b>	291	34	325
<b>TOTAL</b>	584	49	633

*Category assessments of lakes, reservoirs, and other non-linear surface waters statewide.*



## 13 References

*For a complete list of references (data, QAPPs, evaluation guidelines, etc.) used in all the Waterbody Fact Sheets, see Appendix H: Reference Reports.*

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