STATE OF CALIFORNIA
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION

DRAFT GENERAL WASTE DISCHARGE REQUIREMENTS FOR DISCHARGES FROM IRRIGATED LANDS

ORDER NO. R3-20XX-XXXX

February 21, 2020

ATTACHMENT A

Findings

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This Attachment A includes the following sections: A) background and information regarding the central coast region, including a description of agricultural and water resources; B) discussion of legal and regulatory considerations, including relevant plans, policies, and narrative and numeric water quality objectives for surface water and groundwater; C) key findings and water quality conditions describing the rationale for the requirements in the Order's sections 2.C.1 through 2.C.5; and D) tables displaying groundwater quality data and surface water quality data.

THE CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD, CENTRAL COAST REGION FINDS:

Section A. Background and Resources in the Central Coast

1. Order No. R3-20xx-xxxx, *Waste Discharge Requirements for Discharges from Irrigated Lands*, requires Dischargers to comply with applicable state plans and policies and applicable state and federal water quality standards and to prevent nuisance. Water quality standards are set forth in state and federal plans, policies, and regulations. The California Regional Water Quality Control Board, Central Coast Region's (Central Coast Water Board) Water Quality Control Plan (Basin Plan) contains specific water quality objectives, beneficial uses, and implementation plans that are applicable to discharges of waste and/or waterbodies that receive discharges of waste from irrigated lands. The State Water Resources Control Board (State Water Board) has adopted plans and policies that may be applicable to discharges of waste and/or surface waterbodies or groundwater that receive discharges of waste from irrigated lands. The United States Environmental Protection Agency (USEPA) has adopted the National Toxics Rule and the California Toxics Rule, which constitute water quality criteria that apply to waters of the United States.

2. The specific waste constituents required to be monitored and the applicable water quality standards that protect identified beneficial uses for the receiving water are set forth in Attachment B, Monitoring and Reporting Program (MRP).

3. This Attachment A lists additional findings, relevant plans, policies, and regulations, and the rationale for the requirements included in this Order.

Background

4. The Central Coast Water Board is the principal state agency in the central coast region with primary responsibility for the coordination and control of water quality (California Water Code section 13001). This Order focuses on the highest water

quality priorities and maximize water quality protection to ensure the long-term reliability and availability of water resources of sufficient supply and quality for all present and future beneficial uses, including drinking water and aquatic life. Given the magnitude and severity of water quality impairment and impacts to beneficial uses caused by irrigated agriculture and the significant cost to the public, the Central Coast Water Board finds that it is reasonable and necessary to require specific actions to protect water quality.

5. Irrigated agricultural discharges have been regulated by the Central Coast Water Board for over 15 years, since the adoption of the first agricultural order in 2004. The previous agricultural orders relied on a management practice implementation approach without clear and enforceable requirements (i.e., numeric limits and time schedules) or monitoring and reporting necessary to drive the development and implementation of effective management practices or evaluate their effectiveness with respect to reducing pollutant loading, achieving water quality objectives and protecting beneficial uses. However, the previous orders generated significant additional data documenting ongoing widespread and severe water quality degradation associated with irrigated agricultural activities. The previous orders also generated nitrogen application data documenting excessive applications of fertilizer nitrogen relative to published crop needs for a significant subset of central coast growers. Although the previous orders increased awareness of the pollutant loading and associated water quality problems caused by agricultural activities, they have not resulted in improved water quality or beneficial use protection.

6. This Order takes a more meaningful and performance-based approach focused on accountability and verification of resolving the known water quality problems by establishing 1) numeric limits to protect water quality (i.e., application limits, discharge limits, receiving water limits, and setback requirements), 2) time schedules to meet the numeric limits, 3) monitoring and reporting to verify compliance with the numeric limits, and 4) consequences for not meeting the numeric limits. Reasonable time schedules are incorporated to ensure that pollutant loading is decreased over time, while also providing time for Dischargers to reach full compliance with the final limits. Dischargers are required to implement management practices to achieve the established limits and to perform monitoring and reporting to demonstrate that progress is being made to achieve water quality objectives and protect beneficial uses. The Central Coast Water Board encourages Dischargers to participate in third-party programs to facilitate compliance with this Order.

Agricultural and Water Resources in the Central Coast

7. In the central coast region, nearly all agricultural, municipal, industrial, and domestic water supply comes from groundwater. Groundwater supplies approximately 90 percent of the drinking water in the central coast region. Currently, more than 700 municipal public supply wells in the central coast region provide drinking water to the public. In addition, based on 1990 census data, there are more than 40,000 permitted private wells in the region, most providing domestic drinking water to rural households and communities from shallow sources. The number of private domestic wells has likely significantly increased in the past 30 years due to population growth.

8. In the Salinas, Santa Maria, and Pajaro groundwater basins, agriculture accounts for approximately 80 to 90 percent of groundwater pumping (MCWRA, 2007; PVWMA, 2002; Luhdorff and Scalmanini Consulting Engineers, April 2009).

9. The central coast region supports some of the most significant biodiversity of any temperate region in the world and is home to the last remaining population of the California sea otter, three sub-species of threatened or endangered steelhead (Oncorhynchus mykiss) and one sub-species of endangered coho salmon (Oncorhynchus kisutch). The endangered marsh sandwort (Arenaria paludicola), Gambel's watercress (Nasturtium rorippa gambelii), California least tern (Sterna antillarum browni), and threatened red-legged frog (Rana draytonii) are present in the region. Several dozen additional threatened and endangered species present, or with the potential to be present in or near agricultural lands in the central coast region are identified in the draft EIR.

10. Several watersheds drain into Monterey Bay National Marine Sanctuary, one of the largest marine sanctuaries in the world. Elkhorn Slough is one of the largest remaining tidal wetlands in the United States and one of the National Oceanic and Atmospheric Administration (NOAA) designated National Estuarine Research Reserves. The southern portion includes the Morro Bay National Estuary and its extensive salt marsh habitat.

11. Two endangered plants, marsh sandwort and Gambel's watercress, are critically imperiled and their survival depends upon the health of the Oso Flaco watershed. The last remaining known population of marsh sandwort and one of the last two remaining known populations of Gambel's watercress occur in Oso Flaco Lake (United States Department of the Interior, Fish and Wildlife Service, 2007).

12. California's central coast region is one of the most productive and profitable agricultural regions in the nation, reflecting a gross production value of more than

seven billion dollars in 2018 and contributing to more than 14 percent of California's agricultural economy. The region produces many high value specialty crops including lettuce, strawberries, raspberries, artichokes, asparagus, broccoli, carrots, cauliflower, celery, fresh herbs, onions, peas, spinach, wine grapes, tree fruit and nuts. Various agricultural areas of the central coast region are the most productive and profitable on a per acre basis because the coastal Mediterranean climate facilitates multiple cropping cycles per year of these high value specialty crops. An adequate water supply of sufficient quality is critical to supporting the agricultural industry in the central coast region.

13. As described in the Order and this Attachment A, discharges from irrigated lands affect the quality of the waters of the State depending on the quantity of the waste discharge, quantity of the waste, the quality of the waste, the extent of treatment, soil characteristics, distance to surface water, depth to groundwater, implementation of management practices and other site-specific factors. Multiple cropping cycles per year of high value, high nitrogen need crops in the central coast region result in significant irrigation, nitrogen fertilizer and pesticide applications that are the root cause of water quality impairment in agricultural areas. Discharges from irrigated lands have impaired and will continue to impair the quality of the waters of the state within the central coast region if such discharges are not controlled.

Water Quality Grants

14. The State and Regional Water Boards have made over $600 Million of public grant funds available to address agricultural water quality issues from approximately 2000 – 2011. These funds came from Bond Propositions 13, 40, 50, and 84, and addressed myriad water quality projects, watershed protection, and nonpoint source pollution control throughout California. In addition, the State Water Board, in coordination with USEPA, also allocates approximately $4 Million per year in 319(h) program funding to address nonpoint source pollution.

15. The Central Coast Water Board has supported agricultural projects with contracts and settlement funds. Between 2009 and 2019, approximately $7.5 million were granted to agricultural-related projects in the central coast region. Agricultural project proponents leverage funds, with most grantees providing a 25 percent local match from private landowners and staff personnel for construction costs and other in-kind services.

16. Agricultural project proponents, in coordination with the Central Coast Water Board, develop competitive proposals that are aligned with the highest priorities to improve water and habitat quality. Proactive stakeholders, including Resource Conservation Districts and other agencies, private agricultural landowners, non-profit organizations, researchers, and professional consultants collaborate to

implement management practices that reduce nutrient, pesticide, and sediment discharges throughout the region.

17. Central Coast Water Board grants have funded innovative projects such as numerous wood chip bioreactors that remove nitrogen from agricultural operations in the Pajaro, Salinas, Morro Bay, and Santa Maria watersheds, along with thousands of acres of source control practices such as Irrigation and Nutrient Management (INM) and Integrated Pest Management (IPM), and edge of field practices such as vegetative filter strips and sediment basins. Grantees have partnered with agricultural landowners and installed granular activated carbon (GAC) filters that reduce pesticide toxicity in the Pajaro watershed, built a California Irrigation Management Information System (CIMIS) station to improve growers' understanding of crop water needs in the Salinas Valley, and constructed regional treatment systems to treat tailwater from creeks and collective agricultural drainages, such as an 18-acre constructed treatment wetland in the Moro Cojo watershed.

18. Watershed-wide planning and assessment grants have also led to implementation grant funding designed to address severe downstream water quality and aquatic life impairments, such as toxic algal blooms in Pinto Lake and legacy pesticides in Oso Flaco Lake. Grant projects include performance metrics to demonstrate significant pollutant load reductions, outreach to share project effectiveness outcomes, and implementation of a suite of options for regulatory compliance.

Section B. Legal and Regulatory Considerations

California Water Code

1. The California Water Code (Water Code) grants authority to the State Water Board with respect to state drinking water, water rights and water quality regulations and policy, and establishes nine Regional Water Boards with authority to regulate discharges of waste that could affect the quality of waters of the State and to adopt water quality regulations and policy.

2. According to Water Code section 13263(g), the discharge of waste to waters of the state is a privilege, not a right. It is the responsibility of Dischargers of waste from irrigated agricultural lands to comply with the Water Code through waste discharge requirements (WDRs) or a waiver of WDRs. This Order provides a mechanism for Dischargers to meet their responsibility to comply with the Water Code and to prevent degradation of waters of the state, prevent nuisance, and to protect beneficial uses.

3. Water Code section 13263(a) requires regional boards to consider the provisions of Water Code section 13241 when prescribing WDRs. Water Code section 13241 requires regional boards to consider several factors, including "economic considerations" when establishing water quality objectives to ensure the reasonable protection of beneficial uses and prevent nuisance. The *Cost Considerations* section below discusses estimates of cost associated with compliance with the Order.

4. Additional specific sections of the Water Code relate to specific requirements included in this Order and are discussed in the Order itself and in Sections C.1 through C.5 of this Attachment A.

Central Coast Basin Plan

5. The Water Quality Control Plan for the Central Coastal Basin (Basin Plan) designates beneficial uses, establishes water quality objectives, contains programs of implementation needed to achieve water quality objectives, and references the plans and policies adopted by the State Water Board. The water quality objectives identified by the Basin Plan as required to protect the beneficial uses of waters of the state are identified in this Attachment A in Table A.B-1 and Table A.B-2.

6. This Order is consistent with the Basin Plan because it requires Dischargers to comply with applicable water quality standards, as defined in this Attachment A, and prescribes terms and conditions, including prohibitions and implementation of management practices, with which the Discharge must comply. This Order also requires monitoring and reporting, as defined in the MRP, to determine the effects of discharges of waste from irrigated lands on water quality, to verify the adequacy and effectiveness of this Order's terms and provisions, and to evaluate each individual Discharger's compliance with this Order.

7. Specific sections of the Basin Plan that relate to specific requirements included in this Order and will be discussed in Sections C.1 through C.5 of this Attachment A.

California Environmental Quality Act (CEQA) Status Summary

8. For the purposes of adoption of this Order, the Central Coast Water Board is the lead agency pursuant to the California Environmental Quality Act (CEQA) (Pub. Res. Code section 21000 et seq.).

9. In June 2017, Central Coast Water Board staff sent a formal notification of a decision to undertake a project and notification of consultation opportunity to the

Ohlone/Costanoan-Esselen Nation in compliance with AB 52 (Pub. Res. Code section 21080.3.1). Additionally, in December 2018, Central Coast Water Board staff contacted all Tribes in close proximity to the central coast region to provide notice of the Order development and solicit consultation if desired.

10. In February 2018, the Central Coast Water Board published an Initial Study for a 73-day public comment period. The Central Coast Water Board submitted a Notice of Completion and Environmental Document transmittal as well as a Notice of Preparation of a Draft Environmental Impact Report to the State Clearinghouse. The State Clearinghouse distributed the Initial Study to reviewing agencies. The Central Coast Water Board received comments from the Department of Fish and Wildlife, the California Farm Bureau Federation, and joint comments from Grower-Shipper Association, Grower-Shipper of Santa Barbara and San Luis Obispo Counties, Grower-Shipper Association of Central California, Western Growers Association, San Luis Obispo County Farm Bureau, California Strawberry Commission, and Central Coast Groundwater Coalition.

11. In March 2018, Central Coast Water Board staff held a series ofCEQA scoping meetings throughout the central coast region.

12. Prior to the adoption of this Order, and after considering public comment, the Central Coast Water Board will review and certify an Environmental Impact Report (EIR) that identifies the potential environmental impacts associated with this Order and identifies mitigation measures to reduce the potential environmental impacts.

Cost Considerations

13. Water Code section 13241 requires the Central Coast Water Board to consider certain factors, including economic considerations, in the adoption of water quality objectives. CWC section 13263 requires the Central Coast Water Board to take into consideration the provisions of CWC section 13241 in adopting waste discharge requirements. The following findings discuss the potential change in regulatory costs between the 2017 agricultural order (Ag Order 3.0) and this Order (Ag Order 4.0). Several assumptions were required to be made for these analyses and there are several inherent limitations and uncertainties, discussed below.

14. It should be noted that there are instances outside of this Order that are relevant to aspects of this Order where the Central Coast Water Board previously considered economics. When the Central Coast Water Board adopted the water quality objectives that serve as the basis for several requirements in this Order, it took economic considerations into account in accordance with Water Code section

13241. The Central Coast Water Board also previously considered the cost of complying with TMDL load allocations during the adoption of each TMDL.

15. Assumptions, Limitations, and Uncertainties

a. The increase in total costs between Ag Order 3.0 and Ag Order 4.0 is in large part because only a subset of Dischargers was subject to many of the requirements under Ag Order 3.0. Under Ag Order 4.0, the requirements nearly always apply to all Dischargers.

b. The Central Coast Water Board has provided Dischargers a significant amount of flexibility to choose how to comply with the Order. Dischargers have the flexibility to select the management practices that are best suited to solving or preventing water quality problems based on their specific ranch and receiving waterbody characteristics. Dischargers have two compliance pathways available for complying with the nitrogen discharge targets and limits and four compliance pathways available for complying with the riparian setback requirements. Additionally, Dischargers have the option to form or join third-party programs to assist in efforts such as monitoring and reporting. In general, it is expected that third-party programs will be the more cost-effective option for many Dischargers to select, considering economies of scale and associated cost savings that many third-party programs provide.

c. This cost analysis presents estimated costs associated with implementing Ag Order 3.0 versus implementing Ag Order 4.0 over five-year project periods. For Ag Order 3.0, the hypothetical project period was assumed to be 2017–2021, since Ag Order 3.0 was adopted in 2017. For Ag Order 4.0, a project period of 2021–2025 was used, since the Central Coast Water Board anticipates the order will be adopted in late 2020 or early 2021. The five-year project periods are necessary to account for one-time costs and the phasing and prioritization approach taken under Ag Order 4.0. In most instances, a range between minimum and maximum costs was used. In other instances, a single value was estimated because the number of Dischargers and compliance cost could be quantified (e.g., cooperative surface water quality trend monitoring and reporting costs).

d. Most costs discussed below are “total costs” representing the cost of complying with the requirement over the course of five years. These numbers do not represent the cost associated with complying with the requirement for only one year. Per-acre costs (also representing the total cost over the course of five years) are also included and are calculated by dividing the total cost by the approximate number of irrigated acres enrolled in the central coast region.

e. The requirements in this Order were designed to be accomplished by in-house employees in most instances. Total cost estimates assume all Dischargers use in-house employees to perform tasks associated with compliance. In some cases, a requirement may necessitate the use of qualified professionals, but this only applies to a small subset of Dischargers. In this instance, total costs are estimated based on available data.

f. Based on available enrollment data from 2017, 2018, and 2019, the number of actively enrolled Dischargers is assumed to be static throughout the project term (0.7 percent change). A linear increasing trend in future compliance costs based on the trend in current data was assumed. A discount rate was not used to estimate future costs as the hypothetical project period is relatively short (i.e., five years) for both orders. All cost data has been presented in nominal dollars. Values are upper rounded. A 3 percent inflation adjustment rate was used to bring values into present value ($2,019) (ENR, 2019).

g. Per acre costs under Ag Order 3.0 are based on 2017 NOI data (423,841 acres) and an average of 2017 through 2019 NOI data (426,867 acres) under Ag Order 4.0.

h. An average hourly rate of $45 and average time for task completion was used for in-house employees, based on estimates provided by technical assistance providers serving the central coast region.

i. Data limitations contributed to uncertainties associated with the analysis of potential compliance costs under Ag Orders 3.0 and 4.0. Cost estimates were generated using Discharger-reported information on the electronic notice of intent (eNOI), annual compliance form (ACF), labor hour estimates obtained from technical assistance providers (TAPs), white papers, peer-reviewed journal articles, websites, and Central Coast Water Board staff experience providing compliance assistance to Dischargers. **Table A.B-5** summarizes key uncertainties and potential effects on estimated costs.

Table A.B-5. Key Uncertainties and Potential Effects on Estimated Costs

Issue or Assumption	Impact on Estimated Costs	Comments
Verification of reporting data.	Uncertainty.	Dischargers self-report to the Central Coast Water Board, which is not always verified. Wherever possible, Central Coast Water Board staff have identified potential discrepancies or inaccuracies in the data or information provided by Dischargers and/or third parties.
Assumption that most Dischargers will opt for cooperative monitoring for surface water quality trend monitoring.	Estimated costs may be understated.	It is expected that Dischargers will opt to continue to participate in the cooperative monitoring program because of the lower cost. However, if a Discharger decides to implement individual monitoring, they may incur higher costs.
Total costs for follow-up monitoring are not calculated.	Estimated costs may be understated.	The number of Dischargers subject to follow-up monitoring requirements due to numeric target/limit exceedances is speculative. Dischargers subject to follow-up monitoring requirements will likely incur costs associated with additional monitoring and reporting, as well as management practice implementation.
Total costs for riparian habitat management are not calculated.	Estimated costs may be understated.	The number of Dischargers opting for a particular compliance pathway and the associated scope and scale of the management practices are unknown. They may incur costs associated with third-party cooperative watershed restoration programs, setback restoration and maintenance, rapid assessments, or development and implementation of an alternative proposal.

16. Annual Compliance Form (ACF)

a. The objective of the ACF is to assess management practices and management measures implemented by Dischargers to meet water quality objectives and protect beneficial uses. The ACF is submitted annually.

b. Under Ag Order 3.0, all Tier 2 and Tier 3 Dischargers were required to submit an ACF annually. The information required in the ACF under Ag Order 3.0 was basic (e.g., dropdown selections for primary source of irrigation water, whether stormwater/tailwater runoff leaves the farm, and whether there are containment structures on the farm, checkboxes to identify methods implemented to manage nutrients, irrigation, pesticides, and sediment, as well as methods used to assess the effectiveness and outcomes of those management measures).

c. Based on an analysis of the number and type (yes/no questions, checkboxes, and dropdown menus) of required reporting fields in the ACF under Ag Order 3.0, it is estimated that a Discharger who was inexperienced at submitting the ACF would spend approximately one hour to track and report on the ACF the first time and then need only about 15 minutes for annual updates. Based on an average hourly wage rate of $45 for in-house employees, a total of 2,176 Dischargers required to submit the ACF for their ranch, labor hours ranging from 0.26 to 1.04, and the required reporting fields in the ACF, the total estimated cost of ACF tracking and reporting costs under Ag Order 3.0 is between $127,000 and $509,000 (between $0.30 and $1.20 per acre) over the course of five years.

d. Under Ag Order 4.0, all Dischargers are required to submit an ACF annually. The ACF will require more information than under Ag Order 3.0 but will still be in the form of yes/no questions, check boxes, or dropdown selections. Some quantitative questions (where the Discharger needs to report numbers rather than using ranges) will be added.

e. Based on an analysis of the predicted number and type (yes/no questions, checkboxes, dropdown menus, and quantitative information) of required reporting fields on the ACF under Ag Order 4.0, it is estimated that a Discharger who is inexperienced at submitting the ACF would spend approximately 1.6 hours to track and report on the ACF the first time and then need only about 24 minutes for annual updates. Based on an average hourly wage rate of $45 for in-house employees, a total of 4,401 Dischargers required to submit the ACF for their ranch, labor hours ranging from 0.4 to 1.6, and the required reporting fields in the ACF, the total estimated cost of ACF tracking and reporting costs under Ag Order 4.0 is between $450,000 and $1,800,000 (between $1.06 and $4.25 per acre) over the course of five years. Annual costs associated with tracking and reporting ACF information are expected to decrease over time as Dischargers become more familiar with the requirement.

17. Total Nitrogen Applied (TNA) Report

a. The TNA report includes information on nitrogen applied from all sources (e.g., fertilizers, compost, and amendments), irrigation water applied, nitrogen present in the soil, and crops grown. The following findings differentiate between the estimated amount of time required to track information required through the TNA report and the estimated time required to complete and submit the TNA report itself. The time associated with tracking TNA was estimated on a per acre basis. The cost of TNA tracking varies widely with ranch size, type of crop, labor hours, and recordkeeping methods. The time associated with reporting TNA was estimated based on the amount of time required to complete and submit a TNA report form.

b. Under Ag Order 3.0, a subset of Tier 2 and Tier 3 Dischargers (1,915 ranches representing 247,808 acres) were required to submit a TNA report annually.

i. It is estimated that a Discharger who was inexperienced at tracking information for the TNA report would spend approximately 0.05 hours per acre to track TNA information the first time and then need only about 0.025 hours per acre to track TNA for subsequent reports. Based on an average hourly wage rate of $45 for in-house employees, a total of 247,808 acres required to have TNA reports submitted, and labor hours ranging from 0.025 to 0.05, the total estimated cost of TNA tracking under Ag Order 3.0 is between $1,394,000 and $2,789,000 (between $3.29 and $6.58 per acre) over the course of five years.

ii. It is estimated that a Discharger who was inexperienced at submitting the TNA report would spend approximately four hours completing and submitting the TNA report form and then need only about 1 hour to complete and submit the TNA report form in subsequent years. Based on an average hourly wage rate of $45 for in-house employees, a total of 1,915 ranches required to have TNA reports submitted, and labor hours ranging from one to four, the total estimated cost of TNA reporting under Ag Order 3.0 is between $431,000 and $1,724,000 (between $1.02 and $4.07 per acre) over the course of five years.

iii. In total, TNA tracking and reporting under Ag Order 3.0 is estimated to cost between approximately $1,825,000 and $4,513,000 (between $4.31 and $10.65 per acre) over the course of five years.

c. Under Ag Order 4.0, all Dischargers (4,439 ranches representing 426,867 acres) are required to submit a TNA report annually. The TNA report requirement is the same under Ag Order 4.0 as it was under Ag Order 3.0, so the estimates related to the amount of time required to track and report information are the same.

i. It is estimated that a Discharger who is inexperienced at tracking information for the TNA report would spend approximately 0.05 hours per acre to track TNA information the first time and then need only about 0.025 hours per acre to track TNA for subsequent reports. Based on an average hourly wage rate of $45 for in-house employees, a total of 426,867 acres required to have TNA reports submitted, and labor hours ranging from 0.025 to 0.05, the total estimated cost of TNA tracking under Ag Order 4.0 is between $2,705,000 and $5,410,000 (between $6.43 and $12.67 per acre) over the course of five years.

ii. It is estimated that a Discharger who is inexperienced at submitting the TNA report would initially spend approximately four hours completing and submitting the TNA report form and then need only about one hour to complete and submit the TNA report form in subsequent years. Based on an average hourly wage rate of $45 for in-house employees, a total of 4,439 ranches required to have TNA reports submitted, and labor hours ranging from one to four, the total estimated cost of TNA reporting under Ag Order 4.0 is between $1,125,000 and $4,500,000 (between $2.64 and $10.54 per acre) over the course of five years.

iii. In total, TNA tracking and reporting under Ag Order 4.0 is estimated to cost between approximately $3,830,000 and $9,910,000 (between $8.97 and $23.22 per acre) over the course of five years. Annual costs associated with tracking and reporting TNA information are expected to decrease over time as Dischargers become more familiar with the requirement.

18. <u>INMP Summary Report</u>

a. An INMP Summary report was not required under Ag Order 3.0. A subset of Tier 3 Dischargers was required to submit an INMP Effectiveness report, which was a qualitative report that discussed impacts to surface water and groundwater related to nitrogen management. The INMP Summary report is a quantitative report that includes more defined monitoring and reporting requirements than the INMP Effectiveness report. Because the INMP Effectiveness report is no longer required, it will not be discussed further in these findings.

b. The INMP Summary report includes the TNA report (discussed above), as well as information on nitrogen removed and irrigation water applied and discharged. The findings below focus on the nitrogen removed and irrigation water sections of the INMP Summary report because the TNA sections of the report are covered in the TNA cost discussion. The INMP Summary report requirement is phased-in over time; however, for the purposes of these findings, the cost associated with the requirement is based on the cost for all ranches to comply with the requirement annually for five years. The information that Dischargers will need to track to submit a complete INMP Summary report includes the total pounds of crop material removed from the ranch, the volume of irrigation water applied to the ranch, and crop evapotranspiration. Based on the information Dischargers input into the form, the INMP Summary report form will calculate nitrogen applied minus nitrogen removed (A-R) and the amount of irrigation water discharged to surface water and groundwater (irrigation water applied minus evapotranspiration).

i. It is estimated that a Discharger who is inexperienced at tracking nitrogen removed and irrigation information for the INMP Summary report would spend approximately 0.05 hours per acre to track the information the first time and then need only about 0.025 hours per acre to track the information for subsequent reports. Based on an average hourly wage rate of $45 for in-house employees, a total of 426,867 acres required to submit INMP Summary reports, and labor hours ranging from 0.025 to 0.05, the total estimated cost of tracking nitrogen removed and irrigation information under Ag Order 4.0 is between $2,705,000 and $5,410,000 (between $6.43 and $12.67 per acre) over the course of five years.

ii. It is estimated that a Discharger who is inexperienced at submitting the nitrogen removed and irrigation information for the INMP Summary report would spend approximately four hours completing and submitting these sections of the report form and then need only about one hour to complete and submit these sections of the report form in subsequent years. Based on an average hourly wage rate of $45 for in-house employees, a total of 4,439 ranches required to have INMP Summary reports submitted, and labor hours ranging from one to four, the total estimated cost of nitrogen removed and irrigation tracking and reporting under Ag Order 4.0 is between $1,125,000 and $4,500,000 years (between $2.64 and $10.54 per acre) over the course of five years.

iii. In total, nitrogen removed and irrigation tracking and reporting for the INMP Summary report under Ag Order 4.0 is estimated to cost between approximately $3,830,000 and $9,910,000 (between $8.97 and $23.22 per acre) over the course of five years. Annual costs associated with tracking and reporting INMP Summary report information are expected to decrease over time as Dischargers become more familiar with the requirement. Furthermore, the annual cost in the first several years of Ag Order 4.0 will be less because the requirement will not yet be fully phased-in and therefore will not yet apply to all ranches.

19. Groundwater Monitoring (on-farm domestic wells and irrigation wells)

a. Under Ag Order 3.0, Dischargers were required to monitor the primary irrigation well on each ranch and all on-farm domestic wells twice during the life of the permit (once in spring and once in fall). Dischargers had the option of performing groundwater monitoring individually or as part of a cooperative. The Central Coast Groundwater Coalition (CCGC) represented approximately 541 operations under Ag Order 3.0 (an operation can represent a single ranch or multiple ranches). In total, 6,242 domestic and irrigation wells were required to be sampled twice, resulting in 12,484 groundwater samples required to be taken. Estimates of laboratory costs were obtained from several commercial laboratories in the central coast region (Dellavalle Laboratory, Fruit Growers Laboratory, Monterey Bay Analytical Services, and Oilfield Environmental and Compliance Laboratory).

i. Approximately 541 operations, representing 753 domestic wells and 1996 primary irrigation wells, obtained CCGC membership, with annual membership dues of $350 per operation in 2017 and raised to $750 per operation in 2019. The total CCGC membership cost for all participating Dischargers is estimated at $1,596,000 over the course of five years. CCGC members were responsible for covering well sampling and laboratory costs. Considering an estimated average of $155 cost per sample, two sampling events for each well, and inflation, the total groundwater monitoring cost for Dischargers with CCGC membership is estimated at $988,000 over the course of five years. The total cost associated with CCGC membership fees, sampling, and laboratory costs are estimated at $2,584,000 ($6.10 per acre) over the course of five years.

ii. Approximately 639 operations opted to perform groundwater monitoring individually, representing 1200 domestic wells and 2293 primary irrigation wells. Considering an estimated average of $155 cost per sample, two sampling events for each well, and inflation, the total groundwater monitoring cost for Dischargers sampling individually is estimated at $1,177,000 ($2.96 per acre) over the course of five years.

iii. In total, groundwater monitoring under Ag Order 3.0 cost an estimated $3,840,000 ($9.06 per acre) over the course of five years.

b. Under Ag Order 4.0, all Dischargers will be required to monitor all on-farm domestic wells once per year (five times over the course of five years) and either the primary irrigation well or all irrigation wells once per year, based on their Groundwater Phase. The requirement to monitor all irrigation wells, as opposed to only the primary irrigation well, is phased-in coincident to the INMP Summary report. Once the requirement is fully phased-in, 6,242 domestic and irrigation wells will be required to be sampled annually. The numbers below account for the sampling requirement being phased-in over time.

i. Dischargers will continue to have the option of performing groundwater monitoring individually or as part of a cooperative. However, it is unknown at this time what the membership cost will be, what the membership fees will cover, or how many Dischargers will join a cooperative effort. Therefore, for this analysis, the cost estimate will be based solely on the cost of sampling all wells that are required to be sampled.

ii. Considering 6,242 total wells, an estimated average of $155 cost per sample, annual sampling events for each well based on Groundwater Phase over the course of five years, and inflation, the total groundwater monitoring cost for irrigation and domestic well monitoring is estimated at $6,924,000 ($16.03 per acre) over the course of five years.

20. Groundwater Trend Monitoring

a. Ag Order 3.0 does not include any requirements for groundwater quality trend monitoring.

b. Under Ag Order 4.0, all Dischargers must conduct groundwater trend monitoring either individually or as part of a cooperative. The goals of the groundwater trend monitoring program are to evaluate the state of groundwater basin health throughout the central coast region over time and assess the effectiveness of this Order's requirements and the management practices implemented by Dischargers at reducing nitrate impacts to groundwater.

c. Dischargers who choose the cooperative approach to groundwater trend monitoring must ensure that the cooperative provides a detailed groundwater trend monitoring work plan to the Central Coast Water Board for review. The details of the work plan, including the number of wells and frequency of monitoring, are unknown.

d. Dischargers who choose the individual approach must provide well construction information to the Central Coast Water Board for all wells located on enrolled parcels, hire a qualified professional to determine how existing and/or potentially new on-farm wells will be used for trend evaluation, and may need to install monitoring wells. Wells in the individual trend monitoring program must be monitored quarterly.

e. It is not possible to predict the total cost of groundwater trend monitoring, tracking, and reporting under Ag Order 4.0. The number of Dischargers who select a cooperative versus individual approach is unknown, and the requirements and associated costs are different depending on the approach selected. In general, it is expected that performing groundwater trend monitoring as part of a cooperative would provide economies of scale and therefore result in significantly less cost to Dischargers.

f. To generate a cost for reference purposes, it can be assumed that some monitoring wells may have to be drilled to conduct groundwater trend monitoring, either individually or as part of a cooperative. It should be noted that existing wells can be used for groundwater trend monitoring, depending on the well construction, so this analysis is speculative. If 150 monitoring wells of varying depths were to be installed throughout the region, the cost could be an estimated $2,185,000 ($5.06 per acre).

21. <u>Ranch-Level Groundwater Discharge</u>

a. Ranch-level groundwater discharge monitoring and reporting was not required under Ag Order 3.0. Under Ag Order 4.0, it may be required if Dischargers do not achieve the nitrogen discharge limits. Because this requirement can be avoided by complying with the requirements of this Order, and because it is not possible to know how many Dischargers will be required to comply with this requirement, costs associated with ranch-level groundwater discharge monitoring and reporting are not discussed further.

22. Surface Receiving Water Trend Monitoring

a. Under Ag Order 3.0, Dischargers are required to conduct surface water quality trend monitoring, either cooperatively or individually. This requirement continues under Ag Order 4.0, with the potential addition of two to four monitoring sites for the cooperative monitoring program (CMP). The objectives of the monitoring include assessing impacts of waste discharges from irrigated lands to receiving surface water, assessing the quality of the receiving surface water, and evaluating surface water quality impacts from agricultural discharges.

b. The fees collected by the CMP cover all costs associated with surface water quality trend monitoring and reporting. CMP fees are based on operations, not ranches. An operation can have a single ranch or multiple ranches. Participation in the CMP allows for reduced State Board permit fees to Dischargers. The CMP under Ag Order 3.0 is implemented by Central Coast Water Quality Preservation, Inc. (CCWQP). CCWQP initiated monitoring in January 2005 and has indicated they intend to continue to implement the CMP under Ag Order 4.0. Under Ag Order 3.0, the CMP monitors 54 sites monthly in six hydrologic units in the central coast region. Under Ag Order 4.0, an additional two to four monitoring sites may be added. Compliance costs associated with the CMP include all monitoring, reporting, and administrative activities.

c. Under Ag Order 3.0, the total number of operations opting for cooperative monitoring were approximately 1,652. Total and per acre costs were assessed using irrigated and tailwater acreage enrollment data. This analysis assumes the number of Dischargers opting for cooperative monitoring and their associated irrigated acreage will remain relatively constant (99.9% of all Dischargers). Cost per monitoring site per year was calculated and adjusted for inflation. Total cost was estimated for 54 monitoring sites. Total cooperative surface receiving water trend monitoring and reporting costs under Ag Order 3.0 are estimated at $6,688,000 ($15.96 per acre) over the course of five years.

d. CCWQP has indicated that they intend to continue to implement the CMP under Ag Order 4.0. Under Ag Order 4.0, an additional two to four monitoring sites may be added (here, it is assumed that four monitoring sites will be added). Compliance costs associated with the CMP include all monitoring, reporting, and administrative activities. It is estimated that 1,657 operations are likely to participate in the CMP under Ag Order 4.0. Total and per acre costs were assessed using irrigated and tailwater acreage enrollment data over the course of five years and were adjusted for inflation. This analysis assumes the number of Dischargers opting for cooperative monitoring and associated irrigated acreage will remain relatively constant. Total cooperative surface receiving water monitoring costs under Ag Order 4.0 are estimated at $8,847,000 ($20.72 per acre) over the course of five years.

e. Only approximately 21 operations opted to perform surface receiving water trend monitoring individually under Ag Order 3.0. It is expected that the number would be similar or less under Ag Order 4.0 due to the significant cost savings associated with performing surface receiving water trend monitoring as part of the CMP. For these operations, the total cost of performing surface receiving water trend monitoring individually is estimated at $4,028,000 over the course of five years under Ag Order 3.0. Adjusting for inflation, the total cost is estimated at $4,667,000 over the course of five years under Ag Order 4.0.

23. Follow-Up Surface Receiving Water

a. Under Ag Order 3.0, there are no requirements for developing a follow-up surface water implementation work plan or conducting follow-up monitoring and reporting for source identification and pollution abatement purposes.

b. Under Ag Order 4.0, Dischargers are required to develop a follow-up surface water implementation work plan, either individually or through a cooperative program. The work plan may be limited to identifying outreach and education that will be performed for ranches in high quality watersheds or may include follow-up monitoring and reporting for ranches in degraded watersheds. It is not possible to predict the cost of the follow-up work plan, monitoring, and reporting costs because the cost will be dependent on the level of water quality impairment and what the Discharger or third party proposes in their work plan. However, for reference purposes, the cost of including additional monitoring sites can be assessed. The total cost of a new monitoring site (assuming the site monitors the same constituents at the same frequency as the existing CMP sites) is estimated at $152,500 over the course of five years. If 10 additional monitoring sites were added throughout the region, the total cost would be an estimated $1,525,000 ($3.57 per acre) over the course of five years. This analysis assumes all 10 sites are added in the first year of Ag Order 4.0, which is unlikely to occur because the follow-up work plan (and potential additional monitoring and reporting) is required for different watershed areas over time based on the Surface Water Priority.

24. Ranch-Level Surface Discharge

a. Ranch-level surface discharge monitoring and reporting was required of a subset of Tier 3 ranches under Ag Order 3.0. Under Ag Order 4.0, it may be required of Dischargers if they do not achieve the surface water limits by the Order compliance dates. Additionally, Dischargers who select the alternative proposal compliance pathway for complying with the riparian setback requirements (discussed further below) must perform ranch-level surface discharge monitoring and reporting. Because this requirement can be avoided by complying with the surface water requirements of this Order or by selecting a different riparian setback compliance pathway, and because it is not possible to know how many Dischargers will be required to comply with this requirement, costs associated with ranch-level surface discharge monitoring and reporting are not discussed further.

25. Impermeable Surfaces and Steep Slopes

a. Under Ag Order 3.0, there were not increased requirements to have a sediment and erosion management plan (SEMP) developed by a qualified professional.

b. Under Ag Order 4.0, Dischargers with ranches on steep slopes with impermeable surfaces during the winter months must have their SEMP developed by a qualified professional. An analysis using enrollment information, county parcel data, and USGS elevation data was used to estimate the number of ranches that might be subject to this requirement under Ag Order 4.0. It is estimated that 212 Dischargers are likely to have impermeable surface on slopes greater than 5 percent, although it is not possible to know whether these Dischargers use impermeable surfaces during the winter months.

c. It is estimated that the average hourly rate for a qualified professional to develop a SEMP is between $150 and $250 per hour, that it would take an average of 14 hours to develop the SEMP, and it is assumed that the SEMP is only developed once during the 5 year time period. The total cost for SEMP development for all 212 Dischargers with impermeable surfaces on steep slopes is estimated between $472,000 and $787,000 (between $1.11 and $1.84 per acre).

26. Riparian Setback Requirements

a. Under Ag Order 2.0 (the 2012 agricultural order), a small subset of Tier 3 Dischargers were required to develop a Water Quality Buffer Plan (WQBP) that described how they would comply with a 30-foot buffer requirement or submit an alternative proposal for a lesser setback assessing functional equivalency. These Dischargers were required to implement their plans and submit status reports on their plans once during Ag Order 3.0. The costs associated with WQBP development and implementation vary depending on factors such as ranch size, length of stream reach on or adjacent to the ranch, and existing buffer conditions. Furthermore, the requirement to develop the WQBP was an Ag Order 2.0 requirement; the requirement in Ag Order 3.0 was to report on implementation progress. Because the WQBP is no longer required under Ag Order 4.0, it will not be discussed further in these findings.

b. Under Ag Order 4.0, Dischargers with a waterbody on or adjacent to their ranch are required to develop and implement a Riparian Area Management Plan (RAMP). Dischargers in Riparian Priority areas must develop and implement their RAMP to comply with riparian setback requirements. There are four compliance pathways available to Dischargers: participation in a third-party cooperative watershed restoration program, establishment or retention of an existing riparian setback based on Strahler Stream Order, having a rapid assessment (RipRAM) conducted at the ranch and achieving the reference site score, or submitting an alternative proposal to the Executive Officer. It is not possible to know how many Dischargers will select each compliance pathway.

i. Under the third-party cooperative restoration program pathway, a third-party organization would develop and manage a cooperative watershed restoration program. This program would identify restoration opportunities within a watershed, collect fees from participating Dischargers, distribute funds to selected restoration efforts, and manage, conduct, and monitor restoration projects to improve wetland and riparian water quality. Costs for mitigation programs associated with restoration, rehabilitation, and enhancement of riparian areas can range from $95,000 to $265,000 per acre or $386 to $580 per linear foot.

ii. Under the on-farm setback compliance pathway, a Discharger would be required to re-establish or maintain a riparian setback on their ranch. It is not possible to predict the number of Dischargers that may select the on-farm setback compliance pathway or the number of Dischargers that already have riparian setbacks that meet the requirement. The potential acreage taken out of production was estimated assuming the worst-case scenario (i.e., all Dischargers opt for this compliance path and have no existing riparian setbacks on their ranch). Under this worst-case scenario, approximately 3,143 acres (0.9% of enrolled irrigated acres) could potentially be taken out of production due to the riparian setback requirements. The riparian setback requirements would also newly protect 323 miles of streams (5.45% of the estimated total of 5,924 stream miles of Strahler Order 2 through 6 streams in the central coast region). The potential cost associated with land taken out of production is discussed below.

iii. Under the rapid assessment method compliance pathway, a Discharger would have a RipRAM assessment conducted on their farm. The RipRAM index score is compared to the index score of an established reference site score in irrigated agricultural land use. If the RipRAM index score for the ranch meets the reference site index score, the Discharger has met the riparian setback requirement. The cost of having a RipRAM assessment completed is between $200 and $500. It is not possible to predict the number of Dischargers that may select the rapid assessment method compliance pathway.

iv. Under the alternative proposal compliance pathway, a Discharger must quantitatively demonstrate that the proposed alternative does not cause or contribute to degradation of water quality and protects all beneficial uses for inland surface waters, enclosed bays, and estuaries as outlined in section 3.3.2 of the Basin Plan. The alternative proposal requires Executive Officer approval prior to implementation. If approved by the Executive Officer, Dischargers must implement the alternative proposal, conduct ranch-level surface discharge monitoring, and submit reporting that quantitatively demonstrates the alternative proposal is not causing or contributing to degradation of water quality and protects all beneficial uses. It is not possible to predict the number of Dischargers that may select the alternative proposal compliance pathway.

v. As part of complying with the setback requirements, Dischargers with a waterbody on or adjacent to their ranch (1,318 Dischargers) will be required to report on the riparian setback conditions that currently exist on their ranch (setback width, percent vegetative cover, percent vegetation by type). It is likely that this assessment would involve taking setback measurements approximately every 100 feet along the waterbody and making visual estimates of vegetation coverage for trees, shrubs, and grasses. This analysis assumes that the setback assessment is conducted by an in-house employee at an average hourly rate of $45 per hour, adjusted for inflation. The total cost to conduct this assessment is estimated to range between $227,000 and $455,000 (between $0.53 and $1.07 per acre).

27. Setback Requirements and Land Potentially Taken Out of Production

a. As previously discussed, an analysis was conducted to estimate the number of acres that could potentially be taken out of production due to both the riparian setback requirements and the operational setback requirements. The analysis was a worst-case scenario analysis; it is possible that some portion of the land is currently non-cropped land or is healthy riparian vegetation. Based on this analysis, approximately 3,143 acres could potentially be taken out of production due to the riparian setback requirements and 922 acres could potentially be taken out of production due to the operational setback requirements, for a total of 4,064 acres. The riparian setback requirements would also newly protect 323 miles of streams and the operational setback requirements would newly protect 231 miles of streams, for a total of 554 miles of newly protected streams. Potential costs associated with land taken out of production were estimated based on average rent values ranging from $800 to $2,150 per acre. Actual costs throughout the region are likely to be significantly less than the estimated range suggests because not all land in the analysis is currently under agricultural production due to the worst-case scenario nature of the analysis and because Dischargers have three other compliance pathways available to reduce the amount of land potentially affected by the riparian setback requirements.

Total Maximum Daily Loads (TMDLs)

28. Section 303(d) of the federal Clean Water Act requires every state to evaluate all available water quality data and make a list of waterbodies that do not attain water quality standards[1] (called the 303(d) List). Waters on the 303(d) List are considered impaired for a particular pollutant. States must develop Total Maximum Daily Loads (TMDLs) approved by USEPA to address the impairments. A TMDL is the maximum amount of a pollutant a waterbody can assimilate and still attain water quality standards. The Central Coast Water Board adopts the TMDL(s) and an associated implementation plan that identifies actions, regulatory (e.g., waste discharge requirements, conditional waivers, etc.) and/or non-regulatory (e.g., voluntary actions and grant funded restoration and treatment projects), that should be taken to attain water quality standards within a reasonable time schedule. When the TMDL is implemented effectively, the waterbody will attain water quality standards and be removed from the 303(d) List.

[1] USEPA defines water quality standards as consisting of three elements: designated beneficial uses for each waterbody, criteria to protect those uses, and consideration of antidegradation requirements.

29. Throughout the TMDL development process, program staff develop fact sheets and other outreach materials and hold public meetings to facilitate stakeholder engagement. For proposed TMDLs where agriculture was identified as a source of the pollutant, staff invited all Dischargers enrolled in the agricultural order in the TMDL area to participate in TMDL development. For example, prior to adopting the TMDL for nutrients for Franklin Creek in 2018, Central Coast Water Board staff held public workshops in February 2016, June 2016, and September 2017, and held CEQA scoping meetings in June and September 2017. In addition to providing outreach to interested stakeholders registered on the Water Boards' TMDL email Listserv Management System (Lyris list), TMDL staff also provided targeted outreach to growers within the TMDL subject watershed using ILRP eNOI email addresses.

30. TMDLs are not self-implementing, are not enforceable on their own, and do not replace existing water pollution control programs. TMDLs are only enforceable when incorporated into a regulatory program action, such as this Order.

31. Water Code section 13263(a) states that WDRs "shall implement any relevant water quality control plans [basin plans] …" This Order is consistent with the Basin Plan and adopted TMDLs because it implements applicable TMDL load allocations and associated time schedules in the form of numeric limits with time schedules.

<u>TMDLs Established through a Basin Plan Amendment</u>

32. The following TMDLs identify agricultural waste discharges as a source of the named pollutant and were established by the Central Coast Water Board through Basin Plan Amendments.

    a. On May 16, 2003, through Resolution No. R3-2002-0051, the Central Coast Water Board adopted a Basin Plan Amendment establishing the TMDL for Sediment in Morro Bay. The Basin Plan Amendment was subsequently approved by the State Water Board on September 16, 2003, and the Office of Administrative Law on December 3, 2003, and USEPA approved the TMDL on January 20, 2004.

    b. On September 9, 2005, through Resolution No. R3-2005-0106, the Central Coast Water Board adopted a Basin Plan Amendment establishing the TMDL for Nitrate in San Luis Obispo Creek. The Basin Plan Amendment was subsequently approved by the State Water Board on June 21, 2006, and the Office of Administrative Law on August 4, 2006, and USEPA approved the TMDL on January 10, 2007.

c. On December 2, 2005, through Resolution No. R3-2005-0132, the Central Coast Water Board adopted a Basin Plan Amendment establishing the TMDL for Sediment in the Pajaro River. The Basin Plan Amendment was subsequently approved by the State Water Board on September 21, 2006, and the Office of Administrative Law on November 27, 2006, and USEPA approved the TMDL on May 3, 2007.

d. On March 14, 2013, through Resolution No. R3-2013-0008, the Central Coast Water Board adopted a Basin Plan Amendment establishing the TMDL for Nutrients in the Lower Salinas River Watershed. The Basin Plan Amendment was subsequently approved by the State Water Board on February 4, 2014, and the Office of Administrative Law on May 7, 2014, and USEPA approved the TMDL on October 13, 2015.

e. On May 30, 2013, through Resolution No. R3-2013-0013, the Central Coast Water Board adopted a Basin Plan Amendment establishing the TMDL for Nutrients in the Santa Maria Watershed. The Basin Plan Amendment was subsequently approved by the State Water Board on February 4, 2014, and the Office of Administrative Law on May 22, 2014, and USEPA approved the TMDL on March 8, 2016.

f. On January 30, 2014, through Resolution No. R3-2014-0009, the Central Coast Water Board adopted a Basin Plan Amendment establishing the TMDL for Toxicity and Pesticides in the Santa Maria River Watershed. The Basin Plan Amendment was subsequently approved by the State Water Board on July 2, 2014, and the Office of Administrative Law on October 29, 2014, and USEPA approved the TMDL on August 31, 2015.

g. On July 30, 2015, through Resolution No. R3-2015-0004, the Central Coast Water Board adopted a Basin Plan Amendment establishing the TMDL for Nutrients in the Pajaro River Watershed. The Basin Plan Amendment was subsequently approved by the State Water Board on April 5, 2016, and the Office of Administrative Law on July 12, 2016, and USEPA approved the TMDL on October 6, 2016.

h. On July 14, 2017, through Resolution No. R3-2016-0003, the Central Coast Water Board adopted a Basin Plan Amendment establishing the TMDL for Sediment Toxicity and Pyrethroid Pesticides in Sediment in the Salinas River Watershed. The Basin Plan Amendment was subsequently approved by the State Water Board on March 6, 2018, and the Office of Administrative Law on June 28, 2018, and USEPA approved the TMDL on August 9, 2018.

i. On March 23, 2018, through Resolution No. R3-2018-0006, the Central Coast Water Board adopted a Basin Plan Amendment establishing the TMDL for Nutrients in Franklin Creek (Carpinteria Salt Marsh Watershed). The Basin Plan Amendment was subsequently approved by the State Water Board on November 6, 2018, and the Office of Administrative Law on March 4, 2019, and USEPA approved the TMDL on May 9, 2019.

<u>TMDLs Adopted through a Permitting Action</u>

33. A TMDL may be adopted with and reflected in findings underlying a permitting action that is designed by itself to correct the impairment. According to the Water Quality Control Policy for Addressing Impaired Waters (State Water Board Resolution No. 2005-0050, p. 5), "[w]hen an implementation plan can be adopted in a single regulatory action, such as a permit, . . . there is no legal requirement to first adopt the plan through a basin plan amendment. The plan may be adopted directly in that single regulatory action."

a. On December 3, 2004, through Resolution No. R3-2004-0165, the Central Coast Water Board adopted the TMDL for Nutrients for Los Osos Creek, Warden Creek, and Warden Lake Wetland and found that the existing agricultural order and associated monitoring and reporting program was an appropriate plan for implementation of the TMDL. The TMDL was subsequently approved by USEPA on March 1, 2005.

b. On May 5, 2011, through Resolution No. R3-2011-0005, the Central Coast Water Board adopted the TMDL for Chlorpyrifos and Diazinon in Lower Salinas River Watershed and found that the existing agricultural order and associated monitoring and reporting program was an appropriate plan for implementation of the TMDL. The TMDL was subsequently approved by USEPA on October 7, 2011.

c. On May 3, 2012, through Resolution No. R3-2012-0018, the Central Coast Water Board adopted the TMDL for Nitrate for the Los Berros Creek Subwatershed and found that the existing agricultural order and associated monitoring and reporting program was an appropriate plan for implementation of the TMDL. The TMDL was subsequently approved by USEPA on June 11, 2012.

d. On March 14, 2013, through Resolution No. R3-2013-0004, the Central Coast Water Board adopted the TMDL for Diazinon and Additive Toxicity with Chlorpyrifos in the Arroyo Paredon Watershed and found that the existing agricultural order and associated monitoring and reporting program was an appropriate plan for implementation of the TMDL. The TMDL was subsequently approved by USEPA on June 13, 2013.

e. On May 30, 2013, through Resolution No. R3-2013-0012, the Central Coast Water Board adopted the TMDL for Nitrate in the Bell Creek Watershed and found that the existing agricultural order and associated monitoring and reporting program was an appropriate plan for implementation of the TMDL. The TMDL was subsequently approved by USEPA on August 20, 2013.

f. On July 11, 2013, through Resolution No. R3-2013-0011, the Central Coast Water Board adopted the TMDL for Chlorpyrifos and Diazinon in the Pajaro River Watershed and found that the existing agricultural order and associated monitoring and reporting program was an appropriate plan for implementation of the TMDL. The TMDL was subsequently approved by USEPA on November 12, 2013.

g. On December 5, 2013, through Resolution No. R3-2013-0050, the Central Coast Water Board adopted the TMDL for Nitrate in the Arroyo Paredon Watershed and found that the existing agricultural order and associated monitoring and reporting program was an appropriate plan for implementation of the TMDL. The TMDL was subsequently approved by USEPA on February 13, 2014.

h. On March 7, 2014, through Resolution No. R3-2014-0011, the Central Coast Water Board adopted the TMDL for Nitrate for Glen Annie Canyon, Tecolotito Creek, and Carneros Creek and found that the existing agricultural order and associated monitoring and reporting program was an appropriate plan for implementation of the TMDL. The TMDL was subsequently approved by USEPA on July 31, 2014.

34. This Order supersedes previous agricultural orders. The Central Coast Water Board has reviewed the adopting resolutions, project reports, and supporting technical documentation for the TMDLs listed in the previous paragraph and finds that this Order continues or strengthens the appropriate requirements to address the water quality impairments. Accordingly, this Order and associated monitoring and reporting program constitute a single regulatory action to continue implementation of the TMDLs listed in the previous paragraph.

TMDLs Where the Final Compliance Date Has Passed

35. The final compliance date for numeric limits has passed for some TMDLs that were approved by the Central Coast Water Board prior to the adoption of this Order. The Central Coast Water Board finds that it is appropriate to continue the implementation of the TMDLs without altering their adopted time schedules. In the situation where the numeric limits from adopted TMDLs have not been achieved, the Order requires that Dischargers implement new or improved management practices, including treatment and source control methods to achieve the numeric limits. Dischargers in TMDL areas where the final compliance date has passed may request a time schedule order pursuant to Water Code section 13300 for the Central Coast Water Board's consideration. At a minimum, the request for a time schedule order must include the following:

a. Water quality data demonstrating the current status of surface receiving water quality relative to the numeric limit(s) established in the Order;

b. A description and chronology of structural controls and source control efforts implemented by the Discharger to reduce pollutant loading since the effective date of the TMDL;

c. Justification of the need for additional time to achieve the numeric limit;

d. Description of the specific actions the Discharger will take to meet the numeric limit and a time schedule of interim and final deadlines proposed to implement those actions; and

e. A demonstration that the time schedule requested is as short as possible, considering the technological, operational, and economic factors that affect the design, development, and implementation of the control measures that are necessary to comply with the numeric limit(s).

Nonpoint Source Program Implementation

36. Several legal authorities govern or guide the implementation of nonpoint source programs and inform the requirements included in this Order: the Central Coast's Basin Plan, the State Water Board's Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program (Nonpoint Source or NPS Policy), the trial court and appellate court decisions on the State Water Board's modifications to Agricultural Order 2.0, the federal Coastal Zone Act Reauthorization Amendments (CZARA), and the State Water Board's Nonpoint Source Program Implementation Plan.

Basin Plan Provisions for Nonpoint Source Implementation

37. Chapter 4 of the Basin Plan is the Implementation Plan, which includes guidance regarding nonpoint source control actions, the nonpoint source program, and nonpoint source measures.

Chapter 4.5.2: Nonpoint Source Program

38. Chapter 4.5 is *Control Actions under Regional Board Authority*. Chapter 4.5.2 is the *Nonpoint Source Program*. This chapter of the Basin Plan describes three approaches to addressing nonpoint source management: voluntary implementation of best management practices, enforcement of best management practices, and adoption of effluent limitations. The following findings include language from the Basin Plan and a discussion of the history of agricultural orders in the central coast region relative to these three approaches.

39. Voluntary implementation of Best Management Practices

   a. *"Property owners or managers may volunteer to implement Best Management Practices. Implementation could occur for economic reasons and/or through awareness of environmental benefits."*

   b. Prior to the adoption of Agricultural Order 1.0 in 2003, the Central Coast Water Board did not have formal requirements for Dischargers to implement management practices or protect water quality; the implementation of management practices was voluntary.

40. Enforcement of Best Management Practices

   a. *"Although the California Porter-Cologne Water Quality Control Act constrains Regional Board from specifying the manner of compliance with water quality standards, there are two ways in which Regional Boards can use their regulatory authorities to encourage implementation of Best Management Practices. First, the Regional Board may encourage Best Management Practices by waiving adoption of waste discharge requirements on condition that discharges comply with Best Management Practices. Alternatively, the Regional Board may enforce Best Management Practices indirectly by entering into management agency agreements with other agencies which have the authority to enforce Best Management Practices."*

b. Agricultural Orders 1.0, 2.0, and 3.0 were all waivers of WDRs. Agricultural Orders 2.0 and 3.0 explicitly required management practice implementation, assessment, and improvement. However, as shown in the findings related to water quality conditions in Section C and Section D of this document, water quality conditions have not improved in terms of achieving water quality objectives and protecting beneficial uses.

41. Adoption of Effluent Limitations

a. *"The Regional Board can adopt and enforce requirements on the nature of any proposed or existing waste discharge, including discharges from nonpoint sources. Although the Regional Board is precluded from specifying the manner of compliance with waste discharge limitations, in appropriate cases, limitations may be set at a level which, in practice, requires implementation of Best Management Practices."*

b. In consideration of currently degraded water quality conditions and beneficial uses and the associated impacts to human health and the environment, as well as the fact that sufficient water quality improvements have not been achieved over the last 15 years of agricultural orders that relied on the implementation, assessment, and improvement of management practices, this Order instead follows the third method of nonpoint source discharge control described in the Basin Plan. This Order's numeric application, discharge, and receiving water limits and setback requirements will, in practice, require implementation of management practices protective of water quality. Consistent with Water Code section 13360, this Order does not specify the specific management practices that must be implemented; dischargers may choose the manner of compliance provided the practices implemented achieve the applicable limits.

Chapter 4.8: Nonpoint Source Measures

42. Chapter 4.8 is *Nonpoint Source Measures*. This chapter of the Basin Plan discusses current measures that the State Board and Regional Board are undertaking to address and reduce nonpoint source impacts. The Basin Plan states that Regional Board staff are implementing State Board program objectives related to the Coastal Zone Act Reauthorization Amendments (CZARA): *"Implementation of the 1990 Coastal Zone Act Reauthorization Amendments, as developed by the State Board and the California Coastal Commission. This shall be an enforceable Nonpoint Source Management Program to control land use and anthropomorphic activities impacts that have a significant affect [sic] on coastal*

waters." Chapter 4.8.1 addresses CZARA section 6217 and related guidance issued by USEPA, both of which are further discussed below.

<u>Nonpoint Source Policy</u>

43. The Policy for Implementation and Enforcement of the Nonpoint Source (NPS) Pollution Control Program (NPS Policy) is a State Board policy requiring all regional boards to regulate nonpoint sources of pollution, including agricultural discharges. State Board policy, including the NPS Policy, has the effect of a regulation (Water Code section 13146; Gov. Code section 11353). The NPS Policy states that implementation programs for NPS pollution control must include five key elements. The NPS Policy further states that *"[b]efore approving or endorsing a specific NPS pollution control implementation program, a [regional water board] must determine that there is a high likelihood the implementation program will attain the [regional water board's] stated water quality objectives*." The following findings include descriptions of the NPS Policy's five key elements and expectations regarding management practice implementation and achievement of water quality objectives and protection of beneficial uses, as well as a description of how this Order is consistent with those aspects of the NPS Policy.

NPS Policy Key Elements

44. Key Element 1

    a. *"An NPS control implementation program's ultimate purpose shall be explicitly stated. Implementation programs must, at a minimum, address NPS pollution in a manner that <u>achieves and maintains water quality objectives and beneficial uses</u>, including any applicable antidegradation requirements."*

    b. This Order is consistent with Key Element 1 because the purpose of this Order has been explicitly stated through the Project Objectives and this Order requires compliance with application, discharge, and receiving water limits and setback requirements designed to achieve and maintain water quality objectives, protect beneficial uses, and prevent degradation of water quality, except as consistent with the antidegradation findings of this Order.

45. Key Element 2

    a. *"An NPS control implementation program shall include a description of the MPs [management practices] and other program elements that are expected to be implemented to ensure attainment of the implementation program's* *stated purpose(s), the process to be used to select or develop MPs, and the process to be used to ensure and verify proper MP implementation. The RWQCB must be able to determine that there is a high likelihood that the program will attain water quality requirements. This will include consideration of the management practices to be used and the process for ensuring their proper implementation."*

b. Related to management program implementation, the NPS Policy further states in a separate section: *"MPs may include, but are not limited to, structural and non-structural (operational) controls.* They may be applied before, during and after pollution producing activities to eliminate or reduce the generation of NPS discharges and the introduction of pollutants into receiving waters. *Successful MP implementation typically requires: (1) adaptation to site-specific or regional-specific conditions; (2) monitoring to assure that practices are properly applied and are effective in attaining and maintaining water quality standards; (3) immediate mitigation of a problem where the practices are not effective; and (4) improvement of MP implementation or implementation of additional MPs when needed to resolve a deficiency. MP implementation, however, may not be substituted for actual compliance with water quality requirements."*

c. This Order is consistent with Key Element 2 because it requires Dischargers to implement management practices to achieve compliance with the application, discharge, and receiving water limits and setback requirements. Compliance with the limits is assessed through monitoring and reporting requirements and Dischargers are required to implement additional or improved management practices or other actions if they are not achieving the limits. There is a high likelihood that this Order will achieve its project objectives because it includes program elements that require 1) compliance with numeric limits and setback requirements based on a time schedule (Key Element 3 specific time schedule and quantifiable milestones), 2) monitoring and reporting to evaluate management practice effectiveness towards achieving compliance with numeric limits and ultimately meeting water quality objectives and protecting beneficial uses (Key Element 4 feedback mechanism), and 3) follow-up actions if the management practices don't achieve compliance with the application, discharge, and receiving water limits and setback requirements (Key Element 5 consequences).

46. Key Element 3

a. *"Where the RWQCB determines it is necessary to allow time to achieve water quality requirements the NPS control implementation program shall include a* *specific time schedule, and corresponding quantifiable milestones designed to measure progress toward reaching the specified requirements."*

b. This Order is consistent with Key Element 3 because it includes specific time schedules and quantifiable milestones in the form of numeric application, discharge, and receiving water limits and setback requirements. The time schedules and quantifiable milestones are discussed further in the next section titled *Appellate Court Decision on State Board Modified Order* in relation to the holding of the appellate court in *Monterey Coastkeeper v. State Water Resources Control Board.*

47. Key Element 4

a. *"An NPS control implementation program shall include sufficient feedback mechanisms so that the RWQCB, dischargers, and the public can determine whether the program is achieving its stated purpose(s) or whether additional or different MPs or other actions are required."*

b. This Order is consistent with Key Element 4 because it includes monitoring and reporting designed to measure compliance with the numeric application, discharge, and receiving water limits and setback requirements. This Order requires monitoring data to be submitted to the Central Coast Water Board's electronics databases; all water quality data submitted in compliance with this Order is available to the public upon request. Specific monitoring and reporting designed to measure compliance with the requirements of this Order include:

i. Monitoring and reporting of nitrogen applied (A) and nitrogen removed (R) are submitted through the INMP report. The nitrogen applied data will be used to determine compliance with the nitrogen application limits. The nitrogen removed data will be used to calculate nitrogen applied minus nitrogen removed (A-R) to determine compliance with the nitrogen discharge limits. Irrigation well monitoring and reporting is included because the amount of nitrogen applied with the irrigation water is part of the calculation of nitrogen applied minus nitrogen removed.

ii. The groundwater quality trend monitoring and reporting requirement will allow the regional board to assess the effectiveness of this Order's requirements at improving groundwater quality over time. Domestic well monitoring and reporting will also allow the regional board to assess the effectiveness of this Order's requirements at improving groundwater quality over time, as well as help ensure that public health is being protected in the interim by ensuring that domestic well users are aware of the nitrate concentration of their well water, the health concerns associated with elevated nitrate levels, and allow the regional board to coordinate replacement water efforts where necessary.

iii. Surface water monitoring and reporting will allow the regional board to assess whether the receiving water limits for nutrients, pesticides, toxicity, and turbidity are being achieved in surface waters and will allow the regional board to continue to assess and understand long-term trends in surface water quality by continuing the existing monitoring program. In the event that the surface receiving water limits are not achieved in compliance with their time schedules, ranch-level surface discharge monitoring and reporting will allow the regional board to assess whether Dischargers are complying with the surface discharge limits for nutrients, pesticides, toxicity, and turbidity.

iv. The annual compliance form (ACF) includes monitoring and reporting of elements of the INMP, PMP, SEMP, and RAMP, including management practices and the status of setback implementation. This monitoring and reporting will allow the regional board to assess whether Dischargers are implementing additional management practices over time and whether they are complying with the setback requirements.

48. Key Element 5

a. *"Each RWQCB shall make clear, in advance, the potential consequences for failure to achieve an NPS control implementation program's stated purposes."*

b. This Order is consistent with Key Element 5 because each program element describes potential consequences for failure to achieve compliance with the numeric application, discharge, and receiving water limits and setback requirements, including the potential for requirements such as additional monitoring and reporting or other actions including progressive enforcement. Enforcement of this Order will be conducted consistent with the State Water Board's Enforcement Policy.

Trial Court and Appellate Court Decisions on State Board Modified Order

49. In March 2012, the Central Coast Water Board adopted Agricultural Order 2.0, which was subsequently petitioned to the State Water Board. The State Water

Board made several modifications to Agricultural Order 2.0.[2] Several petitioners sought judicial review of the State Water Board order modifying Agricultural Order 2.0. The trial court that heard the petition issued its decision, which was adverse to the State Water Board, in 2015. The State Water Board appealed the decision to the 3rd District Court of Appeal. On September 18, 2018, the Court of Appeal filed its decision in Monterey Coastkeeper, et al. v. State Water Resources Control Board. The petition to the State Water Board and the lawsuit addressed several issues, including whether Agricultural Order 2.0 as modified by the State Water Board complied with NPS Policy.

50. The State Water Board modified Agricultural Order 2.0 by adding provision 83.5. Provision 83.5 states, "*dischargers must (1) implement management practices that prevent or reduce discharges of waste that are causing or contributing to exceedances of water quality standards; and (2) to the extent practice effectiveness evaluation or reporting, monitoring data, or inspections indicate that the implemented management practices have not been effective in preventing the discharges from causing or contributing to exceedances of water quality standards, the Discharger must implement improved management practices*." This provision established an "iterative approach" of requiring improved management practices until discharges no longer cause or contribute to exceedances of water quality standards.

51. The trial court found that the modified waiver did not comply with the NPS Policy "*because it lacks adequate monitoring and reporting to verify compliance with requirements and measure progress over time; specific time schedules designed to measure progress toward reaching quantifiable milestones; and a description of the action(s) to be taken if verification/feedback mechanisms indicate or demonstrate management practices are failing to achieve the stated objectives*."

52. The trial court also stated "*While the court agrees that implementation of management practices may be an acceptable means to achieve water quality standards, as the NPS Policy makes clear, implementing management practices is not a substitute for actual compliance with water quality standards. Management practices are merely a means to achieve water quality standards. Adherence to management practices does not ensure that standards are being met. The Modified Waiver recognizes this, but fails to do anything about it. Under the Modified Waiver, if monitoring or inspections indicate that implemented management practices are not effective, the discharger must make a "conscientious effort" to identify and implement "improved management practices."*

[2] State Board Order WQ-2013-0101 is available at https://www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2013/wqo2013_0101.pdf

The Modified Waiver does not define what constitutes "improved" management practices, or include any additional monitoring or standards by which to verify the "improved" management practices are effectively reducing pollution. Under the Modified Waiver, compliance is achieved as long as the discharger implements a new management practice which the discharger believes will be an improvement. In this court's view, this is inadequate to ensure any meaningful progress toward achieving quantifiable reductions in pollutant discharges." Monterey Coastkeeper v. State Water Resources Control Board, (Super. Ct. No. 34-2012-80001324-CU-WM-GDS) *modified on other grounds* at 28 Cal.App.5th 342, 367-371.

53. The appellate court upheld the trial court's decision that the modified order did not comply with the NPS Policy's directive that a NPS control implementation program must include a <u>specific time schedule</u> and corresponding <u>quantifiable milestones</u> designed to measure progress, such that the implementation program results in the ultimate achievement of water quality objectives. The appellate court reasoned that "*the NPS Policy* expressly *requires time schedules and quantifiable milestones; the purpose is to assure that the water quality objectives are eventually met…Rather than establishing time schedules and milestones, [the State Water Board's modified order] requires only vague and indefinite improvement--'a conscientious effort.'* <u>*Without specific time schedules and quantifiable milestones, there is not a 'high likelihood' the program will succeed in achieving its objectives, as required by NPS Policy*</u>" (emphasis added).

54. Regarding compliance with the NPS Policy, the appellate court further found:

"*Here, the State Board is re-writing – or amending – the NPS Policy by replacing the required element of specific time schedules and quantifiable milestones with a vague requirement of "improved" management practices and a "conscientious effort." As in* State Water Resources Control Bd. Cases*, rewriting the NPS Policy to delay, diminish, or dilute a requirement that is part of the policy is improper. While we defer to an administrative agency's interpretation of a statute, regulation, or policy involving its area of expertise, we owe no deference to an interpretation that "flies in the face of the clear language and purpose of the interpreted provision*."" 28 Cal.App.5th 342, 370.

55. Regarding monitoring to verify the adequacy and effectiveness of the waiver's conditions pursuant to Water Code section 13269, subdivision (a)(2), the appellate court concluded:

"It appears these problems that the trial court perceived in the modified waiver do not signal a failure to meet section 13269's requirement to verify "the adequacy and effectiveness of the waiver's conditions." The court found the monitoring met

this requirement by determining and reflecting whether current management practices reduced pollution. Rather, the question posed by the absence of benchmarks or a definition of "improvement" is whether the monitoring provisions fail to meet the requirements of the NPS Policy. That policy mandates that an NPS program have a high likelihood of attaining water quality standards, with specific time schedules and quantifiable milestones to measure progress."

56. The appellate court concluded that the trial court did not err in finding the State Water Board's modified order did not comply with the NPS Policy due to the absence of "specific time schedules designed to measure progress toward reaching quantifiable milestones." The appellate court further concluded that because the modified waiver does not comply with the NPS Policy, it does not meet the requirements for a waiver under section 13269, subdivision (a).

57. The court decisions indicate that the inclusion of numeric limits, time schedules, and monitoring and reporting in an order regulating nonpoint source discharges are required to comply with the NPS Policy. This order is consistent with the appellate court's decision in *Monterey Coastkeeper* and the NPS Policy as interpreted by that court.

a. The order prohibits dischargers from causing or contributing to exceedances of water quality objectives, except where consistent with the antidegradation findings.

b. Dischargers must meet the requirement not to cause or contribute to exceedances of water quality objectives immediately, unless a specific time schedule has been provided either in accordance with the implementation schedule of an established TMDL or as determined by the Central Coast Water Board in the Order.

c. Where a time schedule has been provided in the Order, the time schedule incorporates quantifiable milestones to ensure progress toward the achievement of the applicable water quality requirement. Neither *Monterey Coastkeeper* nor the NPS Policy itself specify what types of requirements constitute "quantifiable milestones." This Order establishes quantifiable milestones in the form of numeric application, discharge, and receiving water limits and setback requirements, rather than merely quantifying the implementation of management practices without considering their effectiveness in achieving water quality objectives.

d. In addition, the Order considers the trial court's finding regarding the need for adequate monitoring and reporting to verify compliance with requirements and measure progress over time by incorporating monitoring and reporting requirements to verify compliance with the quantifiable milestones and associated time schedules.

58. The court decisions referenced above are nuanced with respect to the need for and adequacy of monitoring requirements as they relate to the NPS Policy and waivers, let alone individual or general orders. The Central Coast Water Board finds that sufficient monitoring and reporting requirements are required in this Order to comply with NPS Policy Key Element 4 (feedback mechanisms). Further, acknowledging that, 1) general and individual orders, relative to waivers, are regulatory instruments for the permitting of higher risk discharges, and 2) the Water Code does not contain the same level of monitoring requirement specificity for general or individual orders as it does for waivers, the Central Coast Water Board finds that it would be prudent to apply the same standard of "adequacy and effectiveness" monitoring to verify compliance with the Order requirements.

CZARA, Management Measures, and the State Nonpoint Source Program Implementation Plan

59. Section 6217 of the federal Coastal Zone Act Reauthorization Amendments of 1990 (CZARA) requires states and territories with federally approved coastal management plans under Coastal Zone Management Act section 306 to develop a coastal nonpoint pollutant control program for National Oceanic and Atmospheric Administration and USEPA approval. A state or territory's coastal nonpoint pollutant control program must identify how it plans to control NPS pollutant discharges within its coastal waters and ensure implementation of management measures through enforceable state polices and mechanisms, such as permit programs, zoning, bad actor laws, enforceable water quality standards, and general environmental laws, as well as economic incentives if they are backed by appropriate regulations. Failure to comply with CZARA section 6217 results in a reduction in federal funding to implement approved state or territory nonpoint source pollution management programs.

60. To assist states and territories in developing and administering their coastal nonpoint pollution control programs, NOAA and USEPA, which jointly administer the federal program, have developed guidance and policy memoranda. The *Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters* (CZARA NPS Guidance), published by USEPA in 1993, describes the types of management measures that should be included in nonpoint pollution control programs and is discussed below. As discussed in a previous finding, the Basin Plan also references the CZARA NPS Guidance.

61. USEPA and NOAA fully approved California's coastal nonpoint pollution control program in July 2000. The State Water Board and the California Coastal Commission jointly administer the program in California and chose to include the entire state in the program both to address CZARA section 6217 requirements and to update the State's Clean Water Act (CWA) section 319 Nonpoint Source Program. The 2014-2020 California Nonpoint Source Program Implementation Plan (Implementation Plan) is an update to the State's Nonpoint Source Program Plan approved in 2000.[3]

62. The 2014-2020 Implementation Plan includes initiatives, goals, and objectives each regional board plans to take to reduce nonpoint source pollution. The central coast region's initiatives in the 2014-2020 Implementation Plan are irrigated agriculture, including implementing the current agricultural order and developing its replacement (Agricultural Order 4.0); groundwater protection, including providing replacement water where needed; and aquatic habitat protection.

63. As described in the CZARA NPS Guidance, nonpoint source pollution generally results from land runoff, atmospheric deposition, drainage, seepage, or hydrologic modification. Technically, the term "nonpoint source" is defined to mean any source of water pollution that does not meet the legal definition of "point source" in section 502(14) of the Clean Water Act. That definition states: "The term 'point source' means any discernable, confined and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agricultural water discharges and return flows from irrigated agriculture."

64. Two chapters of the CZARA NPS Guidance directly relate to requirements included in this Order: *Management Measures for Agricultural Sources* and *Management Measures for Wetlands, Riparian Areas, and Vegetated Treatment Systems*. Each of these chapters identifies both "management measures" and "management practices."

65. Management measures are defined in section 6217 of CZARA as "*economically achievable measures to control the addition of pollutants to our coastal waters, which reflect the greatest degree of pollution reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives. These management measures will be incorporated by States into their coastal nonpoint*

[3] The State Water Board NPS Implementation Plan can be found online at https://www.waterboards.ca.gov/water_issues/programs/nps/plans_policies.html

source programs, which under CZARA are to provide for the implementation of management measures that are 'in conformity' with this guidance."

66. The CZARA NPS Guidance further discusses management practices: "*In addition to specifying management* measures*, this chapter also lists and describes management* practices *for illustrative purposes only. While State programs are required to specify management* measures *in conformity with this guidance, State programs need to specify or require the implementation of the particular management* practices *described in this document*."

67. The CZARA NPS Guidance document describes how USEPA determined that the protection and restoration of riparian and wetland areas should be included as management measures: "*CZARA requires EPA to specify management measures to control nonpoint pollution from various sources. Wetlands, riparian areas, and vegetated treatment systems have important potential for reducing nonpoint pollution in coastal waters from a variety of sources. Degradation of existing wetlands and riparian areas can cause the wetlands or riparian areas themselves to become sources of nonpoint pollution in coastal waters. Such degradation can result in the inability of existing wetlands and riparian areas to treat nonpoint pollution. Therefore, management measures are presented in this chapter specifying the control of nonpoint pollution through (1) protection of the full range of functions of wetlands and riparian areas to ensure contouring nonpoint source pollution abatement, (2) restoration of degraded systems, and (3) the use of vegetated treatment systems*."

68. The CZARA NPS Guidance document further states: "*A degraded wetland has less ability to remove nonpoint source pollutants and to attenuate storm water peak flows (Richardson and Davis, 1987; Bedford and Preston, 1988). Also, a degraded wetland can deliver increased amounts of sediment, nutrients, and other pollutants to the adjoining waterbody, thereby acting as a source of nonpoint source pollution instead of a treatment (Brinson, 1988)*."

69. This Order incorporates the following management measures relevant to irrigated agricultural operations identified in the NPS Guidance document and therefore is consistent with CZARA and the State Board's 2014-2020 NPS Implementation Plan.

    a. Nutrient management
        i. Development and implementation of an INMP, including accounting for the nitrogen present in fertilizers, soil, compost, and irrigation water.
    b. Irrigation management

   i. Development and implementation of an INMP, including accounting for crop evapotranspiration and the volume of water applied.
   ii. Backflow prevention if chemigation or fertigation occurs.
c. Pesticide management
   i. Development and implementation of a PMP, including using IPM strategies where possible to reduce pesticide use and discharge.
   ii. Secondary containment and backflow prevention.
   iii. Prohibition of storing chemicals within specified setback distances from surface waterbodies.
d. Erosion and sediment management
   i. Development and implementation of a SEMP designed to minimize erosion events and sediment delivery to surface water.
   ii. Stormwater management requirements for ranches with impermeable surfaces during the wet season.
e. Riparian area management
   i. Development and implementation of a RAMP designed to protect existing riparian areas and maintain their functions and values and/or restore preexisting functions in damaged or destroyed riparian areas.

<u>Conclusion Regarding NPS Policy Compliance</u>

70. This Order complies with the NPS Policy by establishing numeric limits in the form of application, discharge, and receiving water limits and setback requirements, monitoring and reporting requirements and associated time schedules, and consequences (e.g., additional requirements and enforcement actions). The rationale for including these requirements is summarized as follows:

a. The NPS Policy requires “quantifiable milestones,” “time schedules” and “feedback mechanisms” to ensure a “high likelihood of success” that the Order will attain water quality standards, and states that “MP implementation, however, may not be substituted for actual compliance with water quality requirements.”

b. Compliance with Agricultural Order 2.0 was determined through management practice implementation and assessment, as described in provision 83.5; the trial court and appellate court found that the provision 83.5 approach was not compliant with the NPS Policy because it lacked quantifiable milestones and a time schedule, and there wasn’t a high likelihood of success. Agricultural Order 3.0 follows the same approach (note the provision number was updated to provision 84). Based on the courts’ determinations, the iterative approach established through provision 83.5 in Agricultural Order 2.0 is not compliant with the NPS Policy.

c. Prior orders over the past 15 years that have relied on management practice implementation, assessment, and improvement, and have not to-date resulted in measurable progress towards achieving water quality objectives and protecting beneficial uses. Therefore, a new order that relies the same approach would not have a high likelihood of success.

d. Because implementation programs that rely solely on iterative management practice implementation have been held by an appellate court not to comply with the NPS Policy and further because such implementation programs have not sufficiently addressed water quality impairments in the region, the Central Coast Water Board must change course in this Order to ensure a high likelihood of achieving water quality objectives and protecting beneficial uses. This Order prohibits dischargers from causing or contributing to exceedances of water quality objectives, either immediately or through a time schedule, and does not allow iterative management practice implementation to substitute for such compliance. This Order establishes quantifiable milestones in the form of numeric limits in accordance with applicable time schedules. This approach to complying with the NPS Policy follows the third approach for regulating nonpoint source discharges described in the Basin Plan, and the numeric limits also reflect the management measures found in the CZARA NPS Guidance document.

e. The numeric application, discharge, and receiving water limits and riparian setback requirements established as quantifiable milestones in this Order comply with the NPS Policy and have a high likelihood of achieving water quality objectives and protecting beneficial uses over time. Further, the monitoring and reporting requirements in the Order act as the feedback mechanism to evaluate management practice effectiveness, verify compliance with the quantifiable milestones and measure progress in achieving water quality objectives and protecting beneficial uses over time.

71. In summary, this Order requires Dischargers to implement, assess, and improve management practices, as needed, to achieve the Order's numeric application, discharge, and receiving water limits and setback requirements. Compliance with this Order will be determined based on achieving the numeric limits, rather than on quantifying the number or type of management practices implemented. Implemented management practices are sufficient to meet the Order requirements only if they achieve the water quality limits; therefore, this Order is consistent with

the expectations regarding management practice implementation and water quality outcomes of the NPS Policy.

72. For all the reasons stated above, the Central Coast Water Board finds that there is a high likelihood that this Order will achieve the program's ultimate purpose of preventing exceedances of water quality objectives and protecting beneficial uses.

Antidegradation Policy

73. State Water Board Resolution 68-16, Statement of Policy with Respect to Maintaining High Quality Waters (Antidegradation Policy), requires the following:

First: "Whenever the **existing quality of water is better than the quality established in policies as of the date which such policies become effective** [emphasis added], such existing high quality will be maintain until it is demonstrated to the State that any change will be consistent with maximum benefit to the people of the state, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies."

Second: "Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained."

74. Permits issued by the Water Boards where the waste discharge is to navigable waters are also subject to the federal antidegradation policy, 40 C.F.R. section 131.12. Where the federal antidegradation policy is applicable, the State Water Board has interpreted State Water Board Resolution 68-16 to incorporate the federal antidegradation policy. (State Water Board Order WQ 86-17.)

75. The Antidegradation Policy does not provide specific direction on what elements must be included in an order, but it does provide direction on receiving water quality that must be protected through an order and the findings that must be made if the order allows degradation of high quality waters.

Antidegradation Policy Guidance and Interpretation

76. The State Water Board's Questions and Answers, Resolution No. 68-16 guidance memorandum issued February 16, 1995 (Resolution No. 68-16 Guidance Memorandum) summarizes State Water Board orders and guidance interpreting the Antidegradation Policy in a "question and answer" format. The Resolution No. 68-16 Guidance Memorandum defines high quality waters as follows:

"Existing high quality waters are waters with existing background quality **unaffected by the discharge of waste** [emphasis added] and of better quality than that necessary to protect beneficial uses. The [Water Code] directs the [State Board] and the [regional water quality control boards] to establish beneficial uses of waters of the State and to establish water quality objectives, which are the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of the beneficial uses. ([Water Code] Section 13050(h).) Where the waters contain levels of water quality constituents or characteristics that are better than the established water quality objectives, such waters are considered high quality waters. High quality waters are determined based on specific properties or characteristics. Therefore, waters can be of high quality for some constituents or beneficial uses, but not for others."

The guidance memorandum further states:

"With respect to polluted ground water, a portion of the aquifer may be polluted with waste while another portion of the same aquifer may not be polluted with waste. The unpolluted portion is high quality water within the meaning of Resolution No. 68-16." (St. Water Res. Control Bd., Guidance Memorandum (Feb. 16, 1995) p. 4.)

77. The Resolution No. 68 16 Guidance Memorandum states that a determination of whether a change in water quality will be consistent with the "maximum benefit to the people of the State" is a fact-specific inquiry based on reasonableness, and that "[f]actors to be considered include (1) past, present, and probable beneficial uses of the water (specified in Water Quality Control Plans); (2) economic and social costs, tangible and intangible, of the proposed discharge compared to the benefits, (3) environmental aspects of the proposed discharge; and (4) the implementation of feasible alternative treatment or control methods. With reference to economic costs, both costs to the discharger and the affected public must be considered."

78. With respect to BPTC, the Resolution No. 68-16 Guidance Memorandum states that BPTC determinations should consider relative benefits of proposed treatment

or control methods to proven technologies; performance data; alternative methods of treatment or control; methods used by similarly situated dischargers; and/or promulgated best available technology (BAT) or other technology-based standards. The costs of the treatment or control should also be considered and would be considered in determining the "maximum benefit to the people of the State."

79. The State Board issued an Administrative Procedures Update in 1990 (APU-90-004) that provides guidance to regional water quality control boards in implementing Resolution No. 68-16 in the National Pollutant Discharge Elimination System (NPDES) permitting process. Although APU-90-004 only applies to permitting actions under the Clean Water Act's NPDES program, it is instructive for the implementation of Resolution No. 68-16 in general.

80. APU-90-004 sets forth a procedure for determining whether the existing water quality is to be protected: "The baseline quality of the receiving water determines the level of water quality protection. Baseline quality is defined as the best quality of the receiving water that has existed since 1968 when considering Resolution No. 68-16, . . . unless subsequent lowering was due to regulatory action consistent with State and federal antidegradation policies."

81. The Asociación de Gente Unida por el Agua v. Central Valley Regional Water Quality Control Board (2012) 210 Cal.App.4th 1255 (AGUA) decision restates and applies the framework for an antidegradation analysis. The court considered the sufficiency of the antidegradation findings in a general order regulating waste discharges from approximately 1,600 dairies in the central valley region. The court's analysis relied extensively on the State Water Board's interpretation of the Antidegradation Policy set forth in a guidance memorandum incorporated in the BPTC findings below.

82. State Water Board Order 2018-0002 (ESJ Order), which reviewed and modified WDRs by the Central Valley Water Board for agricultural discharges in an area of the central valley region, provides direction to regional water boards on how to apply the Antidegradation Policy to nonpoint sources. In addition to restating the general framework for an antidegradation analysis as summarized in the above findings, Order WQ 2018-0002 provides in part as follows:

   a. "The baseline water quality considered in making the appropriate findings is the best quality of the water since 1968, the year of the adoption of the Antidegradation Policy, or a lower level if that lower level was allowed through a permitting action that was consistent with applicable antidegradation policies."

b. "When assessing baseline water quality for a general order, . . . a general review and analysis of readily available data is sufficient. Regional water boards need not generate new data or take extraordinary steps to search for existing data. . . In almost all cases, it will be impossible for the regional water boards to establish an accurate numeric baseline for potentially hundreds of waterbodies and dozens of waste constituents in an area covered by general order. Instead, regional water boards must conduct a general assessment of the existing water quality data that is reasonably available." In providing this direction, the State Water Board also referenced State Water Board Order WQ 2015-0075, which considered the application of the Antidegradation Policy to stormwater discharges from multiple sources with multiple outfalls and multiple pollutants affecting multiple water bodies.

83. State Water Board Order WQ 2015-0175 provides additional guidance on how to conduct an antidegradation analysis for an order covering multiple dischargers over a large area. In Order WQ 2015-0175, the State Water Board considered the antidegradation analysis for 86 municipal separate storm sewer system (MS4) dischargers in Los Angeles County. The board laid out some general principles that are instructive for conducting an analysis for a general order:

a. "The baseline for the application of the state Antidegradation Policy is generally the highest water quality achieved since 1968. However, where a water quality objective for a particular constituent was adopted after 1968, the baseline for that constituent is the highest water quality achieved since the adoption of the objective." (Id., pp. 24-25, n.82.)

b. The baseline is adjusted to reflect degradation that was authorized consistent with the Antidegradation Policy. A prior order that lacks adequate antidegradation findings will not adjust the antidegradation baseline. In that case, a board reissuing an existing permit cannot simply compare the new requirements to the prior requirements to determine whether, and how much, degradation will occur.

84. Antidegradation findings are necessarily made at a generalized level in an order covering many dischargers and many pollutant/waterbody combinations. The State Water Board's 1990 guidance for NPDES permitting was designed for individual facilities. That guidance "has limited value when considering antidegradation in the context of storm water discharges from diffuse sources, conveyed through multiple outfalls, with multiple pollutants impacting multiple water bodies within a municipality, or in this case, region, especially given that reliable data on the baseline water quality from 1968 is not available." (Id., p. 27.)

The State Water Board went on to modify the MS4 permit's findings to demonstrate how the order met the antidegradation requirements.

Implementation of the Antidegradation Policy

85. Compliance with the Antidegradation Policy includes a multistep process. First, the regional water board must conduct an initial water quality assessment to determine the baseline receiving water quality, defined as the best quality that has existed since 1968 (i.e., existing high quality water relative to when the policy became effective), minus any previous degradation authorized by the Water Boards. Based on the analysis of the baseline receiving water quality, the regional water board must then determine whether the water bodies receiving the permitted discharges are high quality waters relative to applicable water quality objectives such that the Antidegradation Policy applies to the permitting action. Finally, the regional water board must either ensure that there is no degradation of any high quality waters or make findings allowing degradation. Such findings must establish that the requirements of the permit result in the best practicable treatment or control (BPTC) of wastes and any degradation of high quality waters that occurs is found to be consistent with the maximum benefit to the people of the state. In no case may high quality waters be allowed to degrade below the water quality objectives (i.e., concentrations are not allowed to increase to levels that are higher than water quality objectives).

86. When undertaking an antidegradation analysis, the regional board must compare the baseline water quality (the best quality that has existed since 1968 or since the date for which applicable water quality objectives were established after 1968; this is what the policy and guidance documents refer to as existing high quality water) to the water quality objectives. The analysis needs to be conducted on a constituent by constituent basis. If the baseline water quality is equal to or less than the objectives (i.e., just meeting the water quality objectives or impaired water quality and beneficial uses), the objectives set forth the water quality that must be maintained or achieved. In that case the Antidegradation Policy is not triggered. However, if the baseline water quality is better than the water quality objectives (i.e., unimpaired condition for which beneficial uses are currently protected), the baseline water quality must be maintained in the absence of findings required by the Antidegradation Policy.

87. Depending on the outcome of antidegradation analysis the regional board needs to include requirements and findings in an order related to allowable degradation of high quality water as supported by a maximum benefit balancing test, the implementation of BPTC, the establishment of enforceable discharge and receiving water limits to protect or restore high quality water or protect water

quality and beneficial uses as they relate to the baseline water quality conditions or objectives, or a mix of all these things along with monitoring and reporting to confirm the prescribed requirements are being met.

88. To effectively protect high quality water the Antidegradation Policy required a baseline water quality analysis at the time the policy was adopted in 1968 (or the adoption date of applicable water quality objectives after 1968) or prior to any unauthorized degradation. Unfortunately, this has not occurred in some situations for controllable pollutants. In many areas of the state, unpermitted discharges of controllable pollutants have already degraded or polluted high quality water and associated beneficial uses. This is particularly true for nitrate discharges to groundwater from agricultural sources that have degraded water quality and drinking water beneficial uses. The agricultural areas of the central coast region are a prime example of where this has occurred. In these cases, the antidegradation analysis helps quantify the level of impairment by comparing the historical high quality antidegradation baseline (i.e., existing high quality water) with current water quality conditions. This information is needed to prioritize the development and implementation of management plans focused on restoring high quality water and beneficial uses, not just protecting high quality water as required by Resolution No. 68-16.

89. As part of the Agricultural Order 3.0 adoption process, the Central Coast Water Board conducted a general baseline water quality analysis for the region and determined that many of the water bodies were at one time since 1968 high quality with regard to the constituents found in agricultural discharges. Those findings are incorporated herein. Additionally, available water quality data indicates that many central coast water bodies are currently degraded below water quality objectives (i.e., concentrations are higher than water quality objectives) and beneficial uses are impaired. This is particularly true for major portions of central coast groundwater basins that are currently polluted with nitrate as a result of unauthorized discharges of unused fertilizer nitrogen applied to crops. The primary objective of the Order is to address the ongoing discharges of waste and existing conditions of water quality pollution.

<u>Baseline Water Quality Assessment and Determination of High Quality Waters</u>

90. The Central Coast Water Board completed a water quality assessment to determine the baseline for high quality waters in agricultural areas of the central coast region. The baseline is the best water quality that has existed since 1968, the year in which the Antidegradation Policy was promulgated. Substantial water quality data are available to determine this baseline, which enabled staff to conduct general groundwater sub-basin and hydrologic sub-area constituent of

concern specific analysis. The primary agricultural constituents of concern for groundwater included nitrate, chloride, sulfate, conductivity, total dissolved solids and pesticides (e.g., aldicarb, chlorpyrifos, diazinon, imidacloprid, permethrin, glyphosate). The primary agricultural constituents of concern for surface water included nutrients (e.g., nitrate, ammonia), toxicity, pesticides[4] (e.g., aldicarb, chlorpyrifos, diazinon, imidacloprid, permethrin, glyphosate), chloride, sulfate, turbidity, and total dissolved solids.

91. Focusing on these constituents of concern, the Central Coast Water Board evaluated water quality in agricultural areas of the central coast region using all available data (water-quality parameters and sampling locations) from multiple data sources maintained in the following state-wide and regional data management systems:
    a. California Environmental Data Exchange Network (CEDEN)
    b. Surface Water Ambient Monitoring Program (SWAMP)
    c. Central Coast Ambient Monitoring Program (CCAMP)
    d. GeoTracker Groundwater Ambient Monitoring and Assessment (GAMA) Program

92. The baseline water quality assessment included surface water quality data from agricultural areas collected by Central Coast Water Quality Preservation, Inc. (CCWQP) on behalf of participating growers to implement the Cooperative Monitoring Program (CMP) required by the agricultural orders since 2004, as well as groundwater monitoring data required since 2012. For the specific primary constituents of concern identified for agricultural discharges, the Central Coast Water Board compared the water quality data to the relevant numeric limits to ensure protection of the beneficial uses associated with the groundwater and surface receiving water. In total, 261,181 lines of evidence were assessed to establish baseline water-quality for 71 groundwater sub-basin areas and 53 hydrologic sub-areas.

93. The results of the baseline water quality assessment for groundwater and surface water are summarized in Table A.B-3 and Table A.B-4, respectively. Although baseline water quality varies in agricultural areas in the central coast region, all groundwater sub-basin areas with sufficient data were at one time after 1968 high quality for one or more constituents of concern per the Antidegradation Policy, meaning that baseline groundwater quality is or was better than that required by

[4] Thousands of pesticides are in use in California including insecticides, herbicides, fungicides, fumigants, rodenticides, avicides, plant growth regulators, defoliants, desiccants, algicides, and antimicrobials. Many have a combination of multiple active ingredients. The pesticide constituents of concern used in this assessment are not exhaustive and generally focused on those commonly documented as causing impacts to water quality in the central coast region.

water quality control plans and policies (i.e., as compared to applicable numeric or narrative water quality objectives). Furthermore, for all groundwater sub-basin areas with sufficient nitrate data to conduct the baseline water quality assessment, all are or were at one time high quality waters with respect to nitrate because historical nitrate concentrations since 1968 were substantially below the water quality objective (public health drinking water maximum contaminant level [MCL]). For individual constituents of concern, three of the 71 groundwater sub-basin areas are low quality for total dissolved solids (Cholame Valley, Cuyama Valley) and three groundwater sub-basin areas were low quality for conductivity (Cholame Valley, Cuyama Valley, Toro Valley).

94. Similarly, for surface water, all 53 hydrologic sub-areas are or were high quality for one or more constituents of concern per the Antidegradation Policy. For nitrate, all hydrologic sub-areas are or were at one time high quality per the Antidegradation Policy with the exception of two hydrologic sub-areas which lacked sufficient water quality data to conduct the assessment. For toxicity and pesticides, monitoring data is only available after approximately 1997; therefore, there was insufficient data to conduct assessments for some hydrologic sub-areas. However even with recent data for the 41 hydrologic sub-areas with sufficient toxicity data, all are high quality waters for toxicity per the Antidegradation Policy. Furthermore, no hydrologic sub-areas are low quality for any individual constituent of concern per the Antidegradation Policy.

95. Historical surface water data is generally lacking for total dissolved solids, chlorpyrifos, diazinon, and toxicity. Additionally, historical groundwater data is also lacking for chlorpyrifos and diazinon. Therefore, water quality data was insufficient to complete a baseline water quality assessment for these constituents of concern in some groundwater sub-basin and hydrologic sub-areas.

96. Previous agricultural orders did not include numeric limits associated with agricultural discharges. However, that does not mean that previous agricultural orders authorized degradation or that such degradation (whether measured today or at some point since 1968) has resulted in a new baseline. As the Central Coast Water Board learned more about the relationship between agricultural inputs and discharges, including the application of fertilizer nitrogen and the discharge of nitrate to groundwater, permit requirements in agricultural orders have been modified so as to protect high quality waters and prevent further degradation. Degradation that has occurred to-date is not permanent and can be remedied by actions consistent with this Order. None of the previous agricultural orders authorized degradation of high quality waters.

Potential for Degradation of High Quality Waters

97. The ultimate goal of this Order is to prevent the degradation of current high quality waters and protect beneficial uses, and where water quality and beneficial uses are already impaired, achieve water quality objectives and restore beneficial uses. Although not part of this Order, it would be desirable to ultimately achieve the best water quality that existed since 1968 or since applicable water quality objectives were adopted (i.e., antidegradation baseline).

98. Over the last 30 years, many studies have documented severely degraded water quality conditions in agricultural areas in the central coast region resulting from the continuing application of fertilizers and pesticides and agricultural land disturbance. The California Nitrogen Assessment documented that excess nitrogen from synthetic fertilizers is the largest statewide import of nitrogen in California and a significant cause of groundwater contamination (2016 California Nitrogen Assessment). In addition, the 2012 UC Davis Nitrate Report documented that nitrate from fertilizer is the largest regional source of nitrate in groundwater in the Salinas Valley groundwater basin, resulting in contamination of public drinking water wells and private domestic wells (2012 UC Davis Nitrate Report).

99. Similarly, for surface waters, many studies have documented that toxicity resulting from agricultural waste discharges of pesticides has significantly impacted aquatic life in central coast streams (Anderson et al., 2003a; Anderson et al., 2003b, Anderson et al., 2006a; Anderson et al., 2006b; Anderson et al., 2010). Recently, a collaborative study of the Central Coast Water Board's Central Coast Ambient Monitoring Program (CCAMP), Department of Pesticide Regulation (DPR) and the Granite Canyon Marine Pollution Studies Laboratory documented toxicity in the Santa Maria and Salinas watersheds resulting from the agricultural use of a broad suite of pesticides.

100. This Order addresses the requirement that agricultural discharges not unreasonably affect present and anticipated future beneficial uses and not result in water quality less than that prescribed in state and regional policies by requiring that discharges not cause or contribute to exceedances of water quality objectives either immediately or through a specific time schedule incorporating quantifiable milestones in the form of numeric limits on pollutants and setback requirements. As directed in State Water Board Order WQ 2018-0002, this determination concerns the floor for water quality constituted by the applicable objectives and is distinct from a determination on the degradation of high quality waters with quality better than the objectives.

101. The Central Coast Water Board anticipates that the management practices implemented to comply with the numeric limits of the Order will also prevent degradation of high quality waters over time. The Central Coast Water Board cannot find, however, that there will be no degradation, in the near term, of high quality waters under the requirements of this Order. In particular, the Central Coast Water Board anticipates some short-term, limited, and reversable degradation of high quality waters during the period of time that Dischargers are working in accordance with time schedules described in this Order to achieve compliance with numeric limits via the implementation of management practices. The Central Coast Water Board finds that allowing short-term, limited and reversable degradation of high quality waters during this period of time is consistent with maximum benefit to the people of the state, will not unreasonably affect present and future beneficial uses, and will not result in water quality less than prescribed objectives. The Central Coast Water Board further finds that the permitted discharges will be controlled by the Best Practicable Treatment or Control (BPTC).

102. The Water Quality Control Plan, Central Coastal Region (Basin Plan), assigns the municipal and domestic supply (MUN) to all groundwater of the central coast region. The MUN beneficial use of groundwater is a past, present and probable future use of groundwater. The MUN beneficial use and all aquatic life related beneficial uses are assigned to specific surface waters identified in the Basin Plan, as well as all surface waters not specifically listed. MUN and aquatic life related beneficial uses are past, present and probable future uses of surface water in the central coast region.

103. This order protects beneficial uses by meeting water quality objectives, at a minimum, which is set as the floor of the Antidegradation Policy; no degradation is allowed below this floor in this Order. Additionally, this Order requires that high quality waters, where currently identified to exist, be maintained. Waste discharges must be reduced and water quality improved, as defined in the time schedules of this order, to achieve water quality objectives and protect beneficial uses. Time schedules for quantifiable milestones, including time schedules for targets and numeric limits for nitrogen; time schedules for numeric limits for pesticides and toxicity; time schedules for numeric limits for sediment; and time schedules for riparian setbacks will ensure that water quality objectives are achieved and beneficial uses are protected. This Order does not require that high quality waters, as defined by the Antidegradation Policy and determined an antidegradation baseline analysis, be restored to the best water quality since 1968. However, the Central Coast Water Board will consider this approach as part of future iterations of its agricultural order process.

Maximum Benefit to the People of the State

Agricultural Benefits

104. Agricultural productivity provides a benefit to the economy. In 2018, the total gross production value of crops grown included: $4.1 billion in Monterey County; $1.5 billion in Santa Barbara County; nearly $1 billion in San Luis Obispo County; $695 million in Santa Cruz County. Many of the crops grown on the central coast are exported to other states and to other countries, thereby providing broader economic benefit to society, albeit externalized relative to the where the crops are grown and agricultural related environmental impacts occur (Monterey County, 2018; Santa Barbara County, 2018; San Luis Obispo County, 2018; Santa Cruz County, 2018).

105. From 2015-2017 the dollar value of lettuce was sixth and broccoli was the tenth highest out of twenty crops grown in California (CDFA, 2018).

106. Agricultural productivity provides jobs, including: 76,054 jobs in Monterey County in 2015; 25,370 jobs in Santa Barbara County; nearly 14,000 jobs in San Luis Obispo County in 2018; 11,085 jobs in Santa Cruz County in 2011; 8,100 jobs in Santa Clara County in 2014 (Monterey County, 2015; Santa Barbara County, 2017; San Luis Obispo County, 2020; Santa Cruz County, 2013; Santa Clara County, 2014).

107. Central coast agriculture provides benefits to society, including tens of thousands of local jobs, thereby helping to support families locally and likely abroad; stimulating local economies; providing healthy fresh food locally, across the United States, and to other countries. Many of these benefits are externalized relative to the where the crops are grown, and agricultural related environmental impacts occur.

Social and Environmental Costs

108. As enumerated below, the social and environmental costs associated with the impairment of drinking water beneficial uses due to nitrate pollution are significant and will likely increase into the near future until nitrogen loading to groundwater is reduced to levels that are protective of the drinking water beneficial use. The ongoing assessment of these costs are still emerging and subject to various estimates and associated assumptions at local, regional, and statewide scales by numerous research institutions and agencies as noted in the findings below. One of the biggest difficulties in comprehensively determining these costs is uncertainty regarding the total number of individuals and communities affected,

the scale of the pollution, and the cost of the myriad solutions available to address the problem. The public health related costs are even more difficult to enumerate.

109. Crop production has significantly increased through time as fertilizer, pesticides and other agrochemical products have increased in availability and use. Nitrogen fertilizer is an essential agrochemical to California agriculture. Fertilizer sales in California increased from approximately 400,000 tons in 1970 to over 700,000 tons in 2008 (Rosenstock, 2013).

110. Agrochemical use in central coast agriculture has also had a deleterious impact on society by negatively impacting drinking water sources, human health, and local economies as a result of environmental and water quality degradation.

111. The 2012 UC Davis Nitrate Report summarized findings from a study of Tulare Lake Basin (in the central valley region) and the Salinas Valley in Monterey County (central coast region), and found that:
    a. Nitrate from fertilizer is the largest regional source of nitrate in groundwater in the Salinas Valley aquifer.
    b. Even if nitrate loading at the soil surface stopped today, loading to groundwater will continue because nitrate already present in the soil profile will take from years to decades to reach aquifers, resulting in continued nitrogen loading to groundwater over this time period.
    c. The proportion of the population on community public water systems with nitrate contaminated wells may rise as high as 80 percent by 2050, from the current 57 percent level. About 10 percent of the population is at risk of consuming drinking water contaminated with nitrate above the maximum contaminant level. Many smaller communities with contaminated well water cannot afford safe drinking water and smaller systems are particularly affected by high cost.

112. Nitrogen pollution from agricultural discharges has resulted in water quality degradation and is a significant cause of groundwater contamination (2016 California Nitrogen Assessment).

113. The central coast region is the most groundwater dependent hydrologic region in the state and relies on clean and usable groundwater for municipal, agricultural and industrial supply. Groundwater supplies approximately 90 percent of the drinking water in the central coast region and 100 percent in some areas.

114. Groundwater supplies drinking water to public water systems; community public water systems; state small water systems; local small water systems; and self-

supplied households (i.e., via private domestic wells). These systems are largely defined by the number of service connections, the number of people served, and the length of time served. California regulates the drinking water quality of public water systems and community public water systems. Some counties regulate state small water systems. Local small water systems and private domestic wells are regulated by county agencies (e.g., environmental or public health departments), but are unregulated with respect to drinking water quality for the most part.

115. From 2004 to 2008, eight community public water systems in Monterey County had violations of the drinking water maximum contaminant level (MCL) for nitrate. A violation occurs when two separate samples, taken within 24-hours of each other, have an average nitrate concentration exceeding the nitrate MCL. These systems served 117,186 people, some who drank water exceeding the nitrate MCL between the time the first sample exceeded the nitrate MCL and when safe drinking water could be provided (2012 UC Davis Nitrate Report, Technical Report 7: Alternative Water Supply Options for Nitrate Contamination).

116. In the Salinas valley, as of 2010 there were 10,365 people who receive their drinking water from self-supplied households and local small water system. Of this population, 1,294 people are served by drinking water systems with a high likelihood of nitrate contamination, based on the proximity groundwater exceeding the nitrate MCL (2012 UC Davis Nitrate Report, Technical Report 7: Alternative Water Supply Options for Nitrate Contamination). Most of these systems are not regulated; therefore, if the source water exceeded the nitrate MCL people would be drinking polluted water that does not meet the public health drinking water standard. There are thousands of people living in other areas of the central coast region within, adjacent to, or surrounded by irrigated agriculture with self-supplied and local small groundwater wells in areas of known or suspected groundwater nitrate pollution.

117. Over a quarter of the private domestic drinking water wells sampled adjacent to or surrounded by agricultural lands in the central coast region exceeded the allowable nitrate concentration for safe drinking water (Central Coast Water Board groundwater data). In the Salinas Valley alone, there are 10,365 people relying on domestic wells as their drinking water source.

118. Infants that drink water with nitrate above the nitrate MCL can become seriously ill or may die if not treated as a result of methemoglobinemia, or “blue baby syndrome.”. Nitrate contaminated drinking water in excess of the MCL has been associated with thyroid gland issues; unsuccessful pregnancy; cognitive functions; and cancer (2012 UC Davis Nitrate Report).

119. Groundwater and associated drinking water well contamination results in known and potentially significant economic costs to society. Solutions to address contaminated drinking water wells include abandoning the contaminated well; drilling a new well; connecting to an alternate drinking water source; modifying the existing well; blending with less-contaminated drinking water; and treatment, such as ion exchange and reverse osmosis. Disadvantaged communities bear a disproportionately higher burden due to the economic costs associated with drinking water pollution because the proportion of their income devoted to their water supply is high and in many cases is already a financial burden even for clean drinking water.

120. The costs to provide safe drinking water to those with contaminated groundwater have been studied and fall into three categories: 1) ongoing operation and maintenance costs for drinking water treatment; 2) one-time capital costs (e.g., new wells, treatment systems, consolidation); and 3) administrative, emergency, and technical assistance costs. The costs can be further detailed when only nitrate contamination is found, as compared to systems or wells impacted by both nitrate and non-nitrate contaminants. This analysis, and the myriad solutions being considered to provide safe drinking water, concluded that nitrate contamination will cost tens of millions of dollars statewide over the next several decades (Newman, M. Connolly, K. 2017). These costs have largely been externalized by those who discharge nitrate. This Order includes requirements for source control, with a goal of meaningful and measurable reductions in pollutant loading with an emphasis on nitrate. Treatment, restoration, and the identification of appropriate parties to bear such costs associated with existing conditions of pollution and nuisance are outside the scope of this Order.

121. In the Salinas Valley, there are two very large community public water systems serving more than 100,000 people; one of two are treating for nitrate contamination. Five community public water systems in the Salinas Valley, serving more than 100,000 people, must blend or treat due to nitrate contamination (2012 UC Davis Nitrate Report).

122. Cal Water-Salinas and the Salinas Valley State Prison treat their drinking water using ion exchange due to nitrate contamination. In Santa Cruz County, the City of Watsonville must blend their source water due to nitrate contamination. In San Luis Obispo County, 25 drinking water systems with 200 or more connections must address nitrate contamination by treatment or blending. In Santa Barbara county, 7 drinking water systems with 200 or more connections must address nitrate contamination by treatment or blending (personal communication with Division of Drinking Water, January 23, 2020).

123. The United Nations Human Right to Water and Sanitation suggests that 50-100 liters of safe water are needed each day per person to meet basic needs (United Nations, 2010). The average of 75 liters per day is approximately 20 gallons per day.

124. In 2010, per capita urban water use was 180 gallons per day in California. Approximately half of the water used in urban areas is for landscaping (NRDC, 2014). The population of Salinas is approximately 157,000; the population of Watsonville is approximately 54,000; the population of Monterey is approximately 29,000. If half of the water used in these cities were from a treated source, the treatment system would need to produce 9,812 gallons per minute for Salinas; 3,375 gallons per minute for Watsonville; 1,813 gallons per minute for Monterey.

125. The 2012 UC Davis Nitrate Report provides the following case studies of the cost of treatment:

a. The City of Chino with raw water nitrate of 9 – 45 mg/L as N is using ion exchange and blending to address nitrate contamination. The system capacity is 5,000 gallons per minute. The total capital cost was $4.6 million; total annual operation and maintenance cost were not reported, but does include $50,000 for brine disposal and treatment, $364,000 for salt and $50,000 for hydrochloric acid.

b. A California water district has multiple wells exceeding the maximum contaminant level for nitrate, the raw water nitrate concentrations ranged from 8 – 20 mg/L as N. The utility installed multiple ion exchange units and also blended to address nitrate contamination. The system capacity is 500-900 gallons per minute. Capital cost was $360,000 per unit; operation and maintenance costs are $59,239 per month per unit. The district destroyed seven wells or made them inactive and enhanced another well at unreported but likely significant costs in the millions of dollars.

c. A utility in California with raw water nitrate of 7-12 mg/L as N is using ion exchange and blending to address the nitrate contamination. The system capacity is 400 gallons per minute. The total capital cost was $350,000; annual operation and maintenance costs are $66,500.

d. A water district with raw water nitrate of 12 – 16 mg/L as N is using ion exchange to address nitrate contamination. The system capacity is 50 gallons per minute. The capital cost was $150,000; annual operation and maintenance costs are $0.23 – $0.35 per 1000 gallons treated.

126. Community public water systems include a category of non-transient noncommunity systems where the same people are served drinking water. This category includes schools and businesses that are regulated through California. Mission Union Elementary School (Mission School) is located in Soledad with an enrollment of approximately 130 children ranging from kindergarten through 8th grade. The School is served by Mission School Water System that is a community public system located adjacent to agricultural lands. Mission School Water System uses a single well for its drinking water source. On November 16, 2018, Mission School Water System received a nitrate MCL violation and directive to take actions toward providing safe, wholesome, healthful, and potable water. The school is installing twelve point of use water devices for a total capital cost of $32,000. The total cost over the first three years following installation will be approximately $62,000, which includes $10,000 per year in operation and maintenance costs. Emergency bottled water is being delivered to the school until the point of use water devices are installed and active; a coalition of local growers are providing the funds for the bottled water and a portion of the total installation cost.

127. The community of San Jerardo, a rural housing cooperative of primarily low-income farmworker families located in rural Monterey County that includes 66 houses and 350 residents, is surrounded by irrigated agriculture. Nitrate contamination forced San Jerardo to find alternate sources of drinking water. From 1990 to 2001, three drinking water wells were taken out of service due to exceedance of the maximum contaminant level for nitrate. The newest well was constructed in 2010 and is located two miles from the community; the new drinking water system cost $6 million dollars. As a result, water rates for community members have increased by as much as 500 percent (Amezquita, 2018). San Jerardo is a low-income disadvantaged community (DAC). Prior to the installation of the newly installed well, the community incurred costs of approximately $17,000 per month for several years for well-head treatment to treat groundwater contaminated with nitrate and other chemicals, or had to rely on bottled water as their drinking water source for five years.

128. Point of use (POU) under the sink reverse osmosis systems can reduce nitrate concentration to drinking water standards. Basic under the sink systems providing drinking water to a single spigot costs from $150 - $500; installation, pretreatment, operation and maintenance may increase this range and vary depending on the several factors. A point of entry (POE) system provides treated water to the entire house, rather than a single spigot, and ranges in cost from $500 to more than

$5000 installation; installation, pretreatment, operation and maintenance may increase this range and vary depending on the several factors.[5]

129. The Salinas Basin Agriculture Steward Group (Stewardship Group) provides replacement drinking water to individuals and communities in the Salinas basin who rely on domestic wells or small water systems that are unsafe to drink due to nitrate contamination. Since April 2017, the Stewardship group has provided over 100,000 gallons of bottled water to approximately 1000 people (SBASG, 2019).

130. Addressing nitrate contamination in drinking water sources is estimated to cost tens of millions of dollars across the state over the next several decades; (Newman, M. Connolly, K. 2017). The 2012 UC Davis Nitrate Report found that costs will range from $12 to $17 million per year in the near term to provide safe drinking water in the Salinas Valley and Tulare Lake basins alone for 85 susceptible systems serving approximately 220,000 people, with long term solutions costing $34 million per year if new wells are not sufficient.

131. The costs to treat and clean up existing nitrate pollution to achieve levels that are protective of human health are very expensive to water users (e.g., farmers, municipalities, domestic well users). Research indicates that the cost to remove nitrate from groundwater can range from hundreds of thousands to millions of dollars annually for individual municipal or domestic wells (Burge and Halden, 1999; Lewandowski, May 2008). Wellhead treatment on a region-wide scale is estimated to cost billions of dollars. Similarly, the cost to actively clean up nitrate in groundwater on a region wide scale would also cost billions of dollars and would be logistically difficult. If the nitrate loading due to agricultural activities is not significantly reduced, these costs will continue to increase.

132. The Anderson uses drinking water supplies from Morro and Chorro groundwater basins. Study results indicate that agricultural activities in these areas, predominantly over-application of fertilizer, have impacted drinking water supplies resulting in nitrate concentrations more than four times the nitrate drinking water standard in the city's supply wells (Cleath and Associates, 2007). The City of Morro Bay must blend or provide well-head treatment at significant cost to ensure water delivered to Morro Bay residents meets public health drinking water standards (Gonzalez, 2006). The City of Santa Maria public supply wells are also impacted by nitrate (in some areas nearly twice the drinking water standard) and must also blend sources to provide safe drinking water (Gonzalez, 2008).

[5] Best Osmosis Systems. Retrieved on January 29, 2020. https://www.best-osmosis-systems.com/reverse-osmosis-system-cost/#cost-factors

133. The cost of bottled drinking water ranges from $6.00 to $8.00 for every five gallons. United Nations Human Right to Water and Sanitation suggests that approximately 20 gallons of safe water are needed each day per person to meet basic needs; at $7.00 per five gallons, that is $28.00 per day for each person, or $10,220 per year for each person. Even if nitrate loading at the soil surface stopped today, nitrate contamination exceeding the safe drinking water concentration could remain for years or decades, due to nitrate already present in the soil profile and not yet percolated to groundwater; the cost of purchasing safe drinking water will continue during this time.

134. Offsite sediment discharged from agricultural areas results in costs to society and the environment. Sediment limits the capacity of flood control features, such as stormwater sewers and basins. Sediment discharged from agricultural lands plugs city storm sewer systems and retention basins, thereby increasing maintenance costs for municipalities (Buellton, 2017). Sediment discharged from agricultural lands causes a nuisance resulting in maintenance cost and also impairs protection of beneficial uses of water, particularly uses associated with protection of aquatic life (CCRWQCB, 2018a).

Best Practicable Treatment and Control (BPTC)

135. The Central Coast Water Board must ensure that agricultural orders require BPTC to avoid pollution or nuisance and to maintain the highest water quality consistent with the maximum benefit to the people of the state.

136. The Central Coast Water Board cannot dictate the manner of compliance with water quality orders (Water Code section 13360), and no single suite of management practices is appropriate for every field, ranch, or operation. Rather, BPTC must be implemented through a combination of practices, that sometimes may be site specific, that will ensure that discharges ultimately meet all water quality objectives and eliminate any unreasonable degradation.

137. This Order establishes numeric application, discharge, and receiving water limits and setback requirements with associated time schedules. In practice, to achieve these numeric limits and comply with the Order, Dischargers must implement management practices, including source control and treatment practices. The implementation of management practices that results in the achievement of the numeric limits in this Order constitutes BPTC.

138. On-farm management practices targeting nutrient, pesticide sediment and riparian area management that constitute BPTC may vary from one farm or ranch to another depending on site and operation specific conditions. Examples of

management practices that currently meet BPTC include: soil moisture testing, weather forecasting and irrigation system design and operation management practices to reduce water application, improve irrigation uniformity and reduce nitrogen leaching below the root zone and sediment discharges; soil, irrigation water and plant tissue nitrogen testing to reduce and better time nitrogen applications; slow release nitrogen fertilizer to better control nitrogen delivery and reduce nitrogen leaching; cover crops and compost to sequester nitrogen, carbon and soil moisture; biodynamic pesticide alternatives to reduce the use of chemical pesticides; grading practices, sediment retention basins and erosional control measures to reduce offsite runoff and sediment discharges; vegetated buffers to protect instream beneficial uses; etc.

139. Management practices that constitute existing BPTC may not be able to currently meet the ultimate discharge and water quality objectives (i.e., final numeric limits) required by this Order. However, the phasing-in of more stringent numeric limits over time per the schedules prescribed in the Order is intended to allow for ongoing research, testing, and advancement of new or improved management practices that will ultimately be able to achieve the numeric limits. In addition, the Order's monitoring and reporting requirements are intended to evaluate the effectiveness of management practices and their implementation.

140. This Order incorporates monitoring and reporting to detect any further degradation of high quality waters. The monitoring must include evaluating discharges of waste and confirming that the discharges are effectively controlled by management practices and to evaluate compliance with requirements. Monitoring and reporting required by this Order includes monitoring sources of waste (nitrogen applied), monitoring discharges of waste (nitrogen applied minus nitrogen removed, ranch-level groundwater discharge, and ranch-level surface discharge), receiving water monitoring (groundwater wells, surface receiving water, and follow-up surface receiving water), and monitoring of setbacks designed to reduce pollutant discharges and protect beneficial uses.

141. BPTC is an evolving concept that takes into account changes in the technological feasibility of deploying new or improved treatment or control methodologies, new scientific insights regarding the effect of pollutants and the effectiveness of management practices, and economic considerations. Because this concept evolves over time, standard industry practices that are considered BPTC today may not be considered BPTC in the future. This Order's time schedules account for evolving and improving BPTC.

142. Full implementation of the Irrigated Lands Regulatory Program will extend beyond the time schedules in this Order, at which point BPTC will have further improved

such that future iterations of the agricultural order can either include requirements that result in further protection of high quality waters or authorize degradation based on an analysis of the maximum benefit to the people of the state. Due to the evolving nature of BPTC, the Central Coast Water Board finds that it is premature to authorize degradation of high quality waters beyond the short-term, limited and reversable degradation described above through this Order.

Human Right to Water

143. Water Code section 106.3 declares that every human being has the right to safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes, and requires all relevant state agencies to consider this state policy when revising, adopting, or establishing policies, regulations, and grant criteria. Although Water Code section 106.3, by its terms, does not apply to the issuance of a water quality order, it is appropriate for the Central Coast Water Board to consider the human right to water in this context.

144. On February 16, 2016, the State Water Board adopted Resolution No. 2016-0010 which identifies the human right to water as a top priority and core value of the state and regional Water Boards. The resolution indicates the State Water Board "*Will continue to consider, and encourages the Regional Water Boards to continue considering, the human right to water in all activities that could affect existing or potential sources of drinking water (MUN), including, but not limited to, revising or establishing water quality control plans, policies, and grant criteria, permitting, site remediation, monitoring, and water right administration.*"

145. Similarly, on January 26, 2017, the Central Coast Water Board adopted the Human Right to Water Resolution No. R3-2017-0004 which states that protecting drinking water and human health, and preventing and addressing discharges that could threaten human health by causing or contributing to pollution or contamination of drinking water sources of waters of the state, are the Central Coast Water Board's highest priorities.

146. Resolution No. R3-2017-0004 "*Directs Central Coast Water Board staff to regulate discharges to minimize loading to attain the highest water quality which is reasonable, considering all demands being made on those waters and the total values involved. (Wat. Code, sections 13000, 13050, subds. (i)-(m), 13240, 13241, 13263; State Water Board Resolution No. 68-16.)*"

147. Although Resolution No. R3-2017-0004 does not expand the legal scope of the human right to water as described in Water Code section 106.3, alter the Central Coast Water Board's authority and obligations under applicable law, or impose new requirements on the regulated community, the Central Coast Water Board

resolved to continue to prioritize the human right to water in all activities that could affect existing or potential sources of drinking water, including in permitting.

148. Furthermore, through Resolution No. R3-2017-0004, the Central Coast Water Board resolved to promote policies that advance the human right to water and discourage actions that delay or impede opportunities for communities to secure safe, clean, affordable, and accessible water adequate for human consumption, cooking, and sanitary purposes; and that discharges shall be regulated to attain the highest water quality which is reasonable, considering all demands being made on those waters and the total values involved.

149. The Central Coast Water Board is implementing the Central Coast Water Board's human right to water resolution through this Order by establishing fertilizer application limits and nitrogen discharge limits designed to quantifiably and enforceably reduce the amount of nitrogen discharging to groundwater. This Order also requires monitoring of on-farm domestic wells and providing notification to the users of the wells of the results of the monitoring and of the health impacts associated with elevated nitrate concentrations in drinking water.

150. The Central Coast Water Board will continue to prioritize drinking water and replacement water activities in the ILRP, including shifting staff resources and requiring replacement water where necessary, working to obtain grant funding where possible, and focusing on ensuring safe drinking water for disadvantaged communities.

Climate Change

151. Current and future impacts of climate change include increasing frequency of extreme weather events, heat waves, and more frequent and longer droughts, which have consequent effect on water quality and water availability. Examples of water quality impacts include, but are not limited to, dry periods and drought lowering stream flow and reducing dilution of pollutant discharges and more erosion and sedimentation caused when an intense rainfall event occurs. Climate change also affects the habitat and prevalence of crop pests and weeds. These climate change impacts will affect agriculture in the central coast region and therefore the Regional Board's program activities. The Central Coast Water Board is making a concerted effort to begin identifying the nexus between climate change, its impacts on the agricultural industry and water quality in the central coast region, and programmatic planning.

152. On March 7, 2017, the State Water Board adopted Resolution No. 2017-0012 *Comprehensive Response to Climate Change.* The State Water Board resolved to mitigate greenhouse gases through reducing greenhouse gas emissions,

improving ecosystem resilience, responding to climate change impacts, relying on sound modeling and analyses, providing funding sources, outreach, and improving programmatic administration.

153. Related to improving ecosystem resilience, the resolution states *"Regional Water Boards are encouraged to, update plans, permits, and policies, and coordinate with other agencies to enhance ecosystem resilience to the impacts of climate change, including but not limited to actions that protect headwaters, facilitate restoration, enhance carbon sequestration, build and enhance healthy soils, and reduce vulnerability to and impacts from fires. Staff shall also collaborate with the California Department of Food and Agriculture, CalRecycle, and other agencies to advance carbon sequestration."*

154. Greenhouse gas emissions from irrigated agricultural lands include nitrous oxide emissions from the application of fertilizers, carbon dioxide emissions from operation of on-farm machinery, and methane emissions from saturated fields and anoxic decomposition of biological material. This Order is unlikely to have a direct impact on carbon dioxide and methane emissions, but the fertilizer application and nitrogen discharge limits may result in reduced nitrogen oxide emissions, and therefore may help mitigate greenhouse gas emissions.

155. This Order incentivizes the use of compost nitrogen by allowing Dischargers to use a compost "discount factor" that reduces the amount of compost nitrogen applied towards annual limits. The use of compost is incentivized in part due to its ability to improve soil health, including increasing carbon sequestration.

156. This Order requires the protection of existing riparian vegetation and establishes setback requirements and vegetation requirements for ranches in Riparian Priority areas, which will help improve the resiliency of ecological systems. Healthy riparian vegetation can sequester carbon and nitrogen, reducing their availability as greenhouse gases (Lewis et al., 2015). Riparian vegetation can also reduce adverse impacts associated with storm events by dispersing flows, storing floodwaters, and absorbing water (allowing for groundwater infiltration). More information on the functions and values of riparian areas is included in Section C.5 of this document.

Eastern San Joaquin Watershed Agricultural Order

157. On February 7, 2018, the State Water Board adopted Order WQ 2018-0002 (ESJ Order) which modified the Central Valley Water Board's Order No. R5-2012-0116 for irrigated agricultural discharges in the Eastern San Joaquin River Watershed. Several elements of the ESJ Order were identified by the State Water Board as

being precedential for all ILRPs throughout the state to incorporate into their agricultural orders within five years of adoption of the ESJ Order. This section discusses the elements of the ESJ Order identified as precedential and how they have been incorporated into this Order, as well as some other aspects of the ESJ Order that pertain to requirements in this Order.

158. This Order incorporates the precedential portions of the ESJ Order, as described below. In some instances, this Order differs from the precedential requirements to some extent based on differences between the facts before the Central Coast Water Board and the facts that were the basis for the State Water Board precedent, for example by building requirements that incentivize the use of compost and by establishing nitrogen discharge limits to protect water quality and beneficial uses. The requirements of this Order that deviate from precedential requirements of the ESJ Order are based on extensive nitrogen application and groundwater monitoring data the Central Coast Water Board has collected relative to the Central Valley Water Board, as well as recognition of the differences between the groundwater quality and reliance on groundwater in the central coast region relative to the central valley region. This Order uses the flexibility afforded to the regional boards through the ESJ Order but does not include requirements that are inconsistent with the minimum precedential requirements established through the ESJ Order (i.e., this Order uses ESJ as the regulatory minimum, or floor, as the basis for its requirements).

159. Outreach.

a. "*The requirement for participation by all growers in outreach events shall be precedential for irrigated lands regulatory programs statewide. The regional boards have the discretion over the precise form and frequency of the outreach events, as long as they are designed to reach all growers in the irrigated lands regulatory program*" (p. 28).

b. This Order requires that Dischargers participate in outreach and education events to obtain technical skills and assistance necessary to achieve compliance with the limits established in the Order. (Order, Part 2, Section B; ACF section in MRP).

160. Management practice reporting.

a. *"The requirement for submission by all growers of management practice implementation information shall be precedential for irrigated lands regulatory programs statewide, however, the regional water boards shall continue to have discretion as to the form and frequency of such submissions"* (p. 29).

b. *"The requirement to submit grower-specific field-level management practice implementation data to the regional water board shall be precedential statewide. For third-party programs only, the data shall be submitted with Anonymous Member IDs"* (p. 32).

c. This Order requires annual reporting of management practice implementation through the Annual Compliance Form (ACF). The ACF is submitted for each individual ranch enrolled in the Order. (Order, Part 2, Section B; ACF section in MRP). This Order does not allow for the use of Anonymous Member IDs to ensure transparency and accountability associated with individual discharger compliance with Order requirements. However, third party programs may develop follow-up monitoring above and beyond the requirements of this order to identify and mitigate discharges in a way that does not identify individual dischargers or ranches.

161. Sediment and erosion control practices.

a. *"The requirement for implementation of sediment and erosion control practices by growers with the potential to cause erosion and discharge sediment that may degrade surface waters shall be precedential for irrigated lands regulatory programs statewide; however, the regional water boards shall continue to have discretion as to how these practices are documented and reported"* (p. 32).

b. This Order requires all Dischargers to develop and implement a Sediment and Erosion Control Plan (SEMP). Dischargers must develop a SEMP for all ranches because all ranches have the potential to cause erosion and discharge sediment that may degrade surface waters and/or cause nuisance. The exact management practices included in the SEMP and implemented on the ranch will depend on the site-specific characteristics of the ranch. (Order, Part 2, Section C.4; ACF section of the MRP).

162. Irrigation management.

a. *"The requirement for incorporation of irrigation management elements into nitrogen management planning shall be precedential for irrigated lands regulatory programs statewide"* (p. 35).

b. This Order requires Dischargers to develop and implement an Irrigation and Nutrient Management Plan (INMP) and to monitor and report on irrigation management practices, including irrigation volume applied, evapotranspiration information, and the volume of irrigation water that discharges from the ranch. Dischargers are required to report on this information in the INMP Summary report. Submittal of the INMP report is based on the ranch's Groundwater Phase; ultimately, an INMP will be required for all ranches. (Order, Part 2, Section C.1 and C.2; INMP section of the MRP).

163. Certification of INMP

a. *"The requirement for all growers to submit summary data from the [INMPs] shall be precedential statewide. The regional water boards have discretion as to whether to require certification of all growers or just a subset of growers based on a risk categorization…For those INMPs that the regional water boards require to be certified, the certification language [that the ESJ Order specifies] shall be precedential statewide"* (p. 36).

b. This Order does not include the requirement for Dischargers or a subset of Dischargers to have their INMP certified. Regional boards were provided discretion regarding when INMP certification is required. Rather than requiring certification of the INMP, this Order instead establishes additional requirements when the INMP is insufficient to achieve the Order's numeric limits, such as increased monitoring and reporting. (Order, Part 2, Section C.1 and C.2).

164. Nitrogen applied and nitrogen removed reporting.

a. *"The requirement for field-level AR data submission to the regional water board consistent with the data sets and analysis of those data sets described in this section shall be precedential for irrigated lands regulatory programs statewide. The regional water boards have the discretion to require additional data related to irrigation and nitrogen management. For third-party programs only, the AR data shall be submitted with anonymous identifiers"* (p. 51).

b. *"The requirement for calculation of annual and multi-year A/R ratio and A-R difference parameters for each grower by field shall be precedential for irrigated lands regulatory programs statewide, except as described below. The regional water boards shall retain discretion as to the division of responsibilities among the growers, third parties, and regional water boards for determination of the values, provided that the values are known to both the growers and the third parties"* (p. 40). (Note: field, multi-year reporting, and exemptions are discussed in separate findings below).

c. This Order requires Dischargers to monitor and report on nitrogen applied from all sources (A) and nitrogen removed through all methods (R). All Dischargers are required to report A upon adoption of this Order; the requirement to report R is phased in for all Dischargers over time based on the ranch's Groundwater Phase. The A and R values will be reported to the Central Coast Water Board in the INMP report. A-R will be calculated in the report form based on these values and will be used to determine compliance with the numeric targets and limits established in the Order. (Order Part 2, Section C.1; INMP section of MRP).

d. A/R will also be calculated but will not be used to determine compliance with limits established in this Order. The calculation of A-R is a reasonable proxy for the amount of nitrogen discharge from a ranch, which can be correlated to potential discharges of nitrogen and impacts to water quality. The A/R calculation, a unitless ratio of the relative amount of nitrogen removed in the saleable portion of the crop versus the amount of nitrogen applied, does not consider the potential amount of nitrogen that could be discharged to surface water or groundwater. For example, one ranch could apply 100 pounds of nitrogen per acre per year and remove 50, and another ranch could apply 600 pounds of nitrogen per acre per year and remove 300. The A/R value for both ranches is 2, however, only 50 pounds of nitrogen per acre per year are available for discharge from the first ranch compared to 300 pounds of nitrogen per acre per year for the second ranch. Over time, the Central Coast Water Board will assess both A-R and A/R and will determine if the A-R targets or limits should be modified and whether A/R limits should also be incorporated into a future agricultural order.

e. Consistent with the ESJ Order, this Order requires Dischargers to report nitrogen applied from all sources, including fertilizer nitrogen, irrigation water nitrogen, compost nitrogen, nitrogen from all other sources, and the amount of nitrogen present in the soil. Based on previous nitrogen reporting information, compost applications account for approximately one percent of the total amount of nitrogen applied to ranches each year. The Order incentivizes the use of compost in recognition of its slow nitrogen release, carbon sequestration, moisture retention and overall healthy soil benefits, by allowing a portion of the compost nitrogen to be used in determining compliance with the Order's nitrogen-based targets and limits. The Order requires reporting of total compost nitrogen, but the amount compost nitrogen attributed to "A" will adjusted using a compost discount factor. The ESJ Order provides flexibility to the regional boards in determining the groundwater protection formula and targets. The incentivization of compost nitrogen application is consistent with the precedential requirements of the ESJ Order in addition to the state's Healthy Soils Initiative.

165. Removal coefficients.

a. *"The requirement for use of coefficients for conversion of yield to nitrogen removed values shall be precedential for irrigated lands regulatory programs statewide. The regional water boards will have discretion to determine the number of crops to be analyzed and the timeline for development of the coefficients"* (p. 42).

b. This Order requires Dischargers to use coefficients to convert the amount of plant material removed from the ranch to the amount of nitrogen removed.

Removal through other methods, such as treatment systems, is not calculated using conversion coefficients, but rather must be calculated using methods applicable to the type of removal being accounted for. (Order Part 2, Section C.1; INMP section of MRP).

c. This Order establishes a list of approved conversion coefficients. The public review process for this Order meets the public review process for approving conversion coefficients contemplated by the ESJ Order. Dischargers have the option of selecting from the list of approved conversion coefficients or determining their own operation-specific coefficient, as described in the MRP. The Central Coast Water Board is currently coordinating with CDFA to develop conversion coefficients for various central coast region crops over the next few years. As new conversion coefficients are developed or identified, they will be added to the list of approved coefficients for Dischargers to select from.

166. Definition of "field."

a. *"We are using the term" field" throughout this order to remain consistent with the terms used within the Eastern San Joaquin Agricultural General WDRs, but other regions may use different terms to refer to the same concept…Some growers in other regions engage in highly intensive cropping practices, including multiple rotations of different crops in the same location within a single year, unpredictable crop types and harvesting based on rapidly-shifting market demand, and variable management practices adjusting to weather and field conditions. The regional water boards have the flexibility to develop alternative reporting areas for these types of growers, as long as the regional water board determines that the alternative reporting area provides meaningful data and balances the level of detail with the reporting burden similar to the field approach. In no case should a reported area exceed a total size of 640 acres, and different crop types must always be reported separately even if they are within the same reporting area, to allow for evaluation of the effectiveness of management practices with regard to each individual crop type grown*" (footnote 88, p. 30-31).

b. The Central Coast Water Board has been collecting nitrogen application data through TNA reporting since 2014 under Agricultural Order 2.0. The TNA information is reported for each specific crop grown on each ranch. This Order continues crop-specific, ranch-level reporting for both nitrogen applied and nitrogen removed. As acknowledged in the ESJ Order, many ranches in the central coast region exhibit highly intensive cropping practices with multiple rotations of different crops within the same location each year. Some TNA reports have included nitrogen application information for dozens of different crops within a single ranch. For the purposes of this Order and protecting water quality, the Central Coast Water Board finds that it is appropriate to continue to require nitrogen reporting for each specific crop grown on each ranch. This level of reporting simplifies the recordkeeping and reporting requirements for Dischargers while still providing the regional board with the information necessary to determine the ranch's impacts to water quality and compliance with this Order through implementation of the crop-level nitrogen application limits and ranch-level nitrogen discharge targets and limits.

c. The Central Coast Water Board has also considered modifying the nitrogen reporting requirements to include only data aggregated for the entire ranch (i.e., no longer requiring reporting for each specific crop). This level of reporting diverges significantly from the State Water Board's field-level reporting requirement and does not provide sufficient detail for the regional board to determine compliance with the limits established in this Order or to adequately determine how a Discharger is improving their nutrient management over time to reduce impacts to water quality. The Central Coast Water Board finds that nitrogen applied and removed data reported for each specific crop on the ranch continues to be the most appropriate scale for determining impacts to water quality and compliance with this Order. (Order, Part 2, section C.1; INMP section of MRP).

167. Definition of "multi-year."

a. "*The Agricultural Expert Panel report recommends a 'multi-year' A/R approach, and we are here extending that approach's concept to use the term 'multi-cropping-cycle' as an alternate description that would apply to areas where multiple crop cycles are grown in the same location within a single growing season. We believe the Expert Panel's main* concept *was that it takes multiple cycles of growing crops in order to cancel out appropriate variations in nitrogen application and removal that happen between individual cycles. The Expert Panel expressed this approach as 'multi-year' since it is typical that only one crop cycle happens within a year. However, there are instances within California agriculture where multiple crops with short growing periods will be grown in the same location within the span of a single year, and therefore the same variation canceling effect can be seen in a period shorter than a multi-year period. The regional water boards will need to use their discretion in how they implement the multi-cropping-cycle period to ensure that it is appropriate to the circumstances*" (footnote 108, p. 38).

b. Many ranches in the central coast region grow several crops in the same location within a single year. Additionally, it is common for Dischargers in the central coast region to rotate between ranches, often staying at a particular ranch for only a few years or less than a year. This Order requires Dischargers to achieve nitrogen discharge targets and limits on an annual basis, accounting for all crops grown and harvested throughout the year. Annual limits are warranted because of the multiple cropping cycles implemented per acre per year for many of the high nitrogen requirement crops grown in the central coast region and the significant potential for nitrogen discharges. Central Coast Water Board staff will analyze A and R data overtime in a variety of ways, including the calculation of multiyear averages, running averages, etc. and will use this information to refine the requirements as needed to effectively evaluate compliance with the loading limits. Central Coast Water Board staff will also consider uncontrollable events like bacterial outbreaks resulting in the tilling-in of crops that could significantly reduce a ranch's annual nitrogen removal R value when evaluating compliance with the A-R limits.

168. AR outlier follow up.

a. *"The requirement for the third party to follow up with and provide training for AR data outliers and for identification of repeated outliers as set out above shall be precedential for irrigated lands regulatory programs statewide, except that the regional water boards will be responsible for the follow up and training for irrigated lands regulatory programs that directly regulate growers without a third-party intermediary."* (p. 53).

b. This Order uses the numeric application and discharge limits to identify outliers; that is, an outlier is a Discharger who applied nitrogen in excess of the relevant nitrogen application limits or who discharged nitrogen in excess of the annual nitrogen discharge target or limit. As described in the Order, Dischargers who exceed the targets or limits will be subject to additional requirements, such as the requirement to obtain additional education or implement additional monitoring. (Order, Part 2, Section C.1).

169. Exemption from nitrogen management requirements.

a. *"We recognize that there may be categories of uniquely-situated growers for whom the specific nitrogen management requirements made precedential in the following sections of this order are unnecessary because applied nitrogen is not expected to seep below the root zone in amounts that could impact groundwater and is further not expected to discharge to surface water. Any category of Members (such as growers of a particular crop or growers in a particular area) seeking to be exempted from the precedential nitrogen management requirements in the following sections of this order shall make a demonstration, for approval by the relevant regional water board, that nitrogen applied to the fields does not percolate below the root zone in an amount that could impact groundwater and does not migrate to surface water through discharges, including drainage, runoff, or sediment erosion. These criteria for* *determining categories of growers that may be exempted from the nitrogen management requirements shall also be precedential statewide"* (pp. 34-35).

b. *"The regional boards shall have discretion to determine that some or all growers in the following categories will have alternative requirements as specified:*
   i. Growers that (1) operate in areas with evidence of no or very limited nitrogen impacts to surface water or groundwater, (2) have minimal nitrogen inputs, and (3) have difficulty measuring yield, may report the A value only. The regional water board may exercise its discretion as to when, if at all, these growers will begin reporting R. An example of this grower category could be irrigated pastures.
   ii. Diversified socially disadvantaged growers, as defined by the Farmer Equity Act of 2017, with (1) a maximum total acreage of 45 acres, (2) gross annual sales of less than $350,000, and (3) a crop diversity greater than 0.5 crops per acre (one crop for every two acres), may initially report the A value only. The regional water board may exercise its discretion as to when these growers will begin reporting R and may accept alternative methodologies for estimating R. The regional water board may exercise its discretion as to whether these growers must receive targeted self-certification training.
   iii. Growers with (1) a maximum total acreage of 20 acres, and (2) a crop diversity greater than 0.5 crops per acre (one crop for every two acres), may initially report the A value only. The regional water board may exercise its discretion as to when these growers will begin reporting R and may accept alternative methodologies for estimating R. This category would include, for example, small growers with multiple crops that sell their crops primarily at farmers' markets" (p. 40-41).

c. Two provisions in section 2.C.1 of this Order allow Dischargers to submit technical reports, for Executive Officer approval, demonstrating that their ranch meets the criteria in item (a) above. This Order does not include explicit exemptions for Dischargers meeting the categories described in item (b) above, due primarily to the widespread scale and severity of groundwater degradation from nitrate contamination in the central coast region. However, Dischargers may still submit proposals for alternative monitoring and reporting requirements for approval by the Executive Officer. (Order Part 2, Section C.1)

170. Recordkeeping.

a. *"This recordkeeping requirement [for third-party programs to maintain required reports and records for ten years and to back up certain information in a secure offsite location managed by an independent entity] shall be precedential statewide for all third-party irrigated lands regulatory programs"* (p. 53).

b. Although third-party programs do not exist in the same form in the central coast region as they do in the central valley region, this Order still requires Dischargers and third-parties to retain records for a minimum of ten years to ensure that the Central Coast Water Board is able to assess compliance with the requirements of the Order. (Order Part 2, Section B). Further, data reported to the Central Coast Water Board is a public record and will be retained in accordance with applicable retention schedules.

171. Drinking water well sampling.

a. *"The requirement for on-farm drinking water supply well monitoring, in accordance with the provisions described above, shall be precedential for irrigated lands regulatory programs statewide. The regional water boards have the discretion to require sampling at a frequency that is similar, but not identical, to the frequency specified above"* (p. 62).

b. This Order meets the on-farm domestic well monitoring requirements set forth in the ESJ Order by requiring that all on-farm domestic wells be sampled for nitrate and several other constituents on an annual basis. As discussed in Section C.1 of this Attachment A, significant numbers of on-farm domestic wells exceed the drinking water standard for nitrate in the central coast region. Continued monitoring of the nitrate concentration in on-farm domestic wells is necessary to ensure well users are aware of the quality of their drinking water. (Order Part 2, Section C.1; Groundwater Monitoring and Reporting section of MRP).

172. Groundwater trend monitoring.

a. *"The requirement for groundwater quality trend monitoring shall be precedential for irrigated lands regulatory programs statewide; however, the specific requirements and the monitored constituents specified in the [Central Valley Water Board's Easter San Joaquin Agricultural] General WDRs shall not be precedential"* (p. 64).

b. This Order requires groundwater trend monitoring to be conducted either cooperatively or individually. The Central Coast Water Board encourages Dischargers to perform groundwater trend monitoring cooperatively to take advantage of cost savings associated with economies of scale. (Order Part 2, Section C.1; Groundwater Monitoring and Reporting section of MRP).

173. Groundwater protection formula, values, and targets.

a. *"The development of the Groundwater Protection Formula, Values, and Targets shall be precedential for the third parties that proposed the* *methodology. Even if the programs do not require [groundwater quality monitoring plans], all of the regional water boards shall apply this methodology or a similar methodology, designed to determine targets for nitrogen loading within high priority townships or other geographic areas, for the remaining irrigated lands regulatory programs in the state"* (p. 66).

b. *"The Groundwater Protection Formula, Values, and Targets are subject to Executive Officer approval following public review and comment"* (p. 66).

c. This Order establishes nitrogen discharge targets and limits based on the calculation of nitrogen applied (A) minus nitrogen removed (R). The Groundwater Protection Formula is therefore A-R. The Groundwater Protection Value that will be protective of the drinking water beneficial use is 50 pounds of nitrogen per acre per year. The ESJ Order contemplated a Groundwater Protection Formula and Groundwater Protection Value to be applied in aggregate at a township level but stated that the regional water boards could apply a "similar methodology." Setting Groundwater Protection Values at the farm level in this Order is equally or more effective in achieving the purpose of these values, (i.e., facilitating dischargers to collectively achieve compliance with the drinking water standard in their groundwater basin or sub-basin area). This Order establishes a step-down approach to achieving that final value, beginning with several years of nitrogen discharge targets and continuing into several years of nitrogen discharge limits. For the purposes of this Order, the difference between the nitrogen discharge targets and limits is that an exceedance of a target does not constitute non-compliance with the Order, whereas an exceedance of a limit does constitute non-compliance. This Order ultimately requires compliance with nitrogen discharge limits and the final Groundwater Protection Value, and therefore is protective of water quality. The adoption process for this Order, including its public comment period and public hearing satisfy the direction in the ESJ Order to approve the Groundwater Protection Formula, Values, and Targets following public review and comment. (Order Part 2, Section C.1; Order Part 2, Table C.1-2).

174. Regulatory approach for groundwater protection

c. *"It is premature at this point to project the manner in which the multi-year A/R ratio target values might serve as regulatory tools. That determination will be informed by the data collected and the research conducted in the next several years. If we move forward with a new regulatory approach in the future, we expect to do so only after convening an expert panel that can help evaluate and consider the appropriate use of the acceptable ranges for multi-year A/R ratio target values in irrigated lands regulatory programs statewide"* (p. 74).

d. The Central Coast Water Board has been receiving groundwater monitoring data for on-farm domestic wells and irrigation wells since 2012 and has documented widespread and severe nitrate contamination caused primarily by irrigated agricultural discharges. The Central Coast Water Board has also been receiving nitrogen application information since 2014 (over 6 years) demonstrating, in many cases, high application rates that contribute to the observed nitrate contamination in groundwater. Due to the nitrogen reporting information documenting high nitrogen application rates and the widespread scale and severity of nitrate contamination in the central coast region, the Central Coast Water Board finds that is appropriate to proceed with establishing enforceable nitrogen discharge limits that require Dischargers to reduce their discharge such that, over time, it will be protective of drinking water beneficial uses. This Order establishes those limits in a manner that is consistent with the requirements of the ESJ Order.

e. This Order establishes a limit for fertilizer nitrogen applied only (A_{FER}) beginning in 2022. A limit based on fertilizer nitrogen applied is not specifically contemplated in the ESJ Order. The fertilizer nitrogen application limit in this Order is established based on what the Central Coast Water Board has determined to be both feasible and protective after reviewing the nitrogen applied data reported to the Board since 2014. Additional discussion on the fertilizer nitrogen application limits is included in Section C.1 of this Attachment A.

f. The A-R data-based nitrogen discharge values established by this Order act only as targets until 2026 to allow for the learning curve associated with the new monitoring and reporting requirement, as well as to provide additional time for the State Board to convene an expert panel for review and evaluation of the AR values as regulatory tools. Beginning in 2026, the A-R values are implemented as limits, with the final limit of 50 pounds per acre not effective until 2050. Additional discussion on the nitrogen discharge targets and limits is included in section C.1 of this Attachment A.

g. If prior to 2026 or anytime thereafter an expert panel finds that another regulatory method would be more protective of water quality, or if the more protective regulatory methods are identified through other sources, the Central Coast Water Board will review the requirements of this Order and will make modifications as appropriate. (Order Part 2, Section C.1; Order Part 2, Table C.1-2).

Other Relevant Plans, Policies, and Regulations

State Water Resources Control Board, Resolution No. 68-16, *Statement of Policy with Respect to Maintaining High Quality of Waters in California,* October 1968.

State Water Resources Control Board, *Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California*, June 1972.

State Water Resources Control Board, Resolution No. 74-43, *Water Quality Control Policy for the Enclosed Bays and Estuaries of California*, May 1974.

State Water Resources Control Board, Resolution No. 88-63, *Sources of Drinking Water Policy*, May 1988. Amended February 1, 2006.

State Water Resources Control Board, *Policy for Implementation and Enforcement of the Nonpoint Source Pollution Control Program,* May 2004.

State Water Resources Control Board, Resolution No. 2015-0005, *Water Quality Control Policy for Developing California's Clean Water Act section 303(d) List,* February 3, 2015.

State Water Resources Control Board, *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP)*, February 2005

State Water Resources Control Board, Resolution No. 2008-0070, *Water Quality Control Plan for Enclosed Bays and Estuaries - Part 1 Sediment Quality,* August 25, 2009.

State Water Resources Control Board, *Water Quality Control Plan for Ocean Waters of California (CA Ocean Plan),* September 2009.

State Water Resources Control Board, Resolution No. 2009-0011, *Recycled Water Policy*, May 20, 2010.

State Water Resources Control Board, *Water Quality Enforcement Policy,* October 2017.

State Water Resources Control Board, Resolution No. 2016-0010, *Adopting the Human Right to Water as Core Value and Directing its Implementation in Water Board Programs and Activities*, February 16, 2016.

USEPA, *California Toxics Rule*, 40 CFR 131. 38, 65 FR 31682, May 2000.

Tables Related to Attachment A, Section B

Table A.B-1. Water Quality Objectives for Groundwater

GROUNDWATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
TOXICANTS	
Chemical Constituents Groundwaters shall not contain concentrations of chemical constituents in excess of federal or state drinking water standards.	MUN
Chemical Constituents Groundwaters shall not contain concentrations of chemical constituents in amounts that adversely affect such beneficial use. Interpretation of adverse effect shall be as derived from the University of California Agricultural Extension Service guidelines provided in Basin Plan Table 3-1. In addition, water used for irrigation and livestock watering shall not exceed the concentrations for those chemicals listed in Basin Plan Table 3-2.	AGR
Total Nitrogen Groundwater Basin Objectives for Median values range from 1-10 mg/L as nitrate as nitrogen. Refer to Basin Plan Table 3-6.	Specific Groundwater Basins
CONVENTIONALS	
Total Dissolved Solids (TDS) Groundwater Basin Objectives for median values range from 100-1500 mg/L TDS. Refer to Basin Plan Table 3-6.	Specific Groundwater Basins
Chloride (Cl) Groundwater Basin Objectives for median values range from 20-430 mg/L Cl. Refer to Basin Plan Table 3-6.	Specific Groundwater Basins

GROUNDWATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
Sulfate (SO_4) Groundwater Basin Objectives for median values range from 10-1025 mg/L SO_4. Refer to Basin Plan Table 3-6.	Specific Groundwater Basins
Boron (B) Groundwater Basin Objectives for median values range from 0.1-2.8 mg/L B. Refer to Basin Plan Table 3-6.	Specific Groundwater Basins
Sodium (Na) Groundwater Basin Objectives for median values range from 10-730 mg/L. Refer to Basin Plan Table 3-6.	Specific Groundwater Basins

Table A.B-2. Water Quality Objectives for Surface Water

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
TOXICITY	
Toxicity *Narrative Objective:* All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in, human, plant, animal, or aquatic life. *Indicators of Narrative Objective:* Chemical concentrations in excess of toxic levels for aquatic life.	All Surface Waters
TOXICANTS	
Nutrients	
Ammonia, Total (N) >30 mg/L NH4-N	AGR
Ammonia, Un-ionized 0.025 mg/L NH3 as N	All Surface Waters
Nitrate a. 10 mg/L NO3-N b. >30 mg/L NO3-N	a. MUN b. AGR
Organics	
Chemical Constituents Waters shall not contain concentrations of chemical constituents in excess of the limits specified in California Code of Regulations, Title 22, Article 4, Chapter 15, section 64435, Tables 2 and 3.	MUN
Chemical Constituents Waters shall not contain concentrations of chemical constituents in amounts which adversely affect the agricultural beneficial use.	AGR

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
Interpretation of adverse effect shall be as derived from the University of California Agricultural Extension Service guidelines provided in Basin Plan Table 3-1. In addition, waters used for irrigation and livestock watering shall not exceed concentrations for those chemicals listed in Table 3-2.	
Chemical Constituents Waters shall not contain concentrations of chemical constituents known to be deleterious to fish or wildlife in excess of the limits listed in Basin Plan Table 3-3 or Table 3-4.	COLD, WARM, MAR
Oil and Grease *Narrative Objective:* Waters shall not contain oils, greases, waxes, or other similar materials in concentrations that result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect beneficial uses.	All Surface Waters
Organic Chemicals All inland surface waters, enclosed bays, and estuaries shall not contain concentrations of organic chemicals in excess of the limiting concentrations set forth in California Code of Regulations, Title 22, Chapter 15, Article 5. 5, section 64444. 5, Table 5.	MUN
Other Organics and Phenol Waters shall not contain organic substances in concentrations greater than the following: Methylene Blue Activated Substances < 0. 2 mg/L Phenols < 0. 1 mg/L Phenol (MUN) ≤ 1. 0 µg/L PCBs < 0. 3 µg/L Phthalate Esters < 0. 002 µg/L	All Surface Waters

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
Metals	
Chromium ≤ 0. 01 mg/L	SHELL
Cadmium ≤ 0. 03 mg/L in hard water or ≤. 0. 004 mg/L in soft water (Hard water is defined as water exceeding 100 mg/L $CaCO_3$).	COLD, WARM
Chromium ≤ 0. 05 mg/L	COLD, WARM
Copper ≤ 0. 03 mg/L in hard water or ≤. 0. 01 mg/L in soft water (Hard water is defined as water exceeding 100 mg/L $CaCO_3$).	COLD, WARM
Lead ≤ 0. 03 mg/L	COLD, WARM
Mercury ≤ 0. 0002 mg/L	COLD, WARM
Nickel ≤ 0. 4 mg/L in hard water or ≤. 0. 1 mg/L in soft water (Hard water is defined as water exceeding 100 mg/L $CaCO_3$).	COLD, WARM
Zinc ≤ 0. 2 mg/L in hard water or	COLD, WARM

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
<u><</u>. 0. 004 mg/L in soft water (Hard water is defined as water exceeding 100 mg/L $CaCO_3$).	
CONVENTIONALS	
Biostimulatory Substances *Narrative Objective:* Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect beneficial uses. *Example Indicators of Narrative Objective:* Indicators of biostimulation include chlorophyll-a, dissolved oxygen, phosphorous, and nitrate. *(Source: Central Coast Water Board. April 2009. Central Coast Ambient Monitoring Program Technical Paper: Interpreting Narrative Objectives for Biostimulatory Substances Using the Technical Approach for Developing California Nutrient Numeric Endpoints)*	All Surface Waters
Boron Waterbody specific. Median values, shown in Table 3-7 for surface waters. Sub-Basins Objectives range from 0. 2 – 0. 5 mg/L.	Specific Surface Waters
Chloride Waterbody specific. Median values, shown in Table 3-7 for surface waters. Sub-Basins Objectives range from 150-1400 mg/L.	Specific Surface Waters
Color Waters shall be free of coloration that causes nuisance or adversely affects beneficial uses. Coloration attributable to materials of waste origin shall not be greater than 15 units or 10 percent above natural background color, whichever is greater.	All Surface Waters
Conductivity	AGR

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
>3. 0 mmho/cm	
Dissolved Oxygen For waters not mentioned by a specific beneficial use: DO ≥ 5. 0 mg/L DO Median values ≥ 85 percent saturation	All Surface Waters
Dissolved Oxygen DO ≥ 7. 0 mg/L	COLD, SPWN
Dissolved Oxygen DO ≥ 5. 0 mg/L	WARM
Floating Material *Narrative Objective:* Waters shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.	All Surface Waters
pH The pH value shall not be depressed below 7. 0 nor above 8. 5. Changes in normal ambient pH levels shall not exceed 0. 5 in fresh waters.	COLD, WARM,
pH The pH value shall not be depressed below 7. 0 or raised above 8. 5. Changes in normal ambient pH levels shall not exceed 0. 2 units.	MAR

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled “narrative”)	**BENEFICIAL USE**
pH The pH value shall not be depressed below 6. 5 nor above 8. 3.	MUN, REC-1, REC-2, AGR
Settleable Material *Narrative Objective:* Waters shall not contain settleable material in concentrations that result in deposition of material that causes nuisance or adversely affects beneficial uses.	All Surface Waters
Sediment *Narrative Criteria:* The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.	All Surface Waters
Sodium Waterbody specific. Median values, shown in Basin Plan Table 3-5 for surface waters. Sub-Basin Objectives range from 20-250 mg/L.	Waterbody Specific
Sulfate Waterbody specific. Median values, shown in Basin Plan Table 3-5 for surface waters. Sub-Basin Objectives range from 10-700 mg/L.	Waterbody Specific
Suspended Material *Narrative Criteria:* Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.	All Surface Waters
Taste and Odor *Narrative Criteria:*	All Surface Waters

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
Waters shall not contain taste or odor-producing substances in concentrations that impart undesirable tastes or odors to fish flesh or other edible products of aquatic origin, that cause nuisance, or that adversely affect beneficial uses.	
Temperature *Narrative Criteria:* Natural receiving water temperature of intrastate 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.	All Surface Waters
Temperature *Narrative Objective:* Natural receiving water temperature of intrastate 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. *a) Indicators of Narrative Objective for COLD Habitat:* Salmonids Upper optimal limit for growth and completion of most life stages for rainbow trout is 69.8ºF. *(Source: Moyle, 1976)* *b) Indicators of Narrative Objective for WARM Habitat:* Stickleback Upper optimal limit = 75ºF (This temperature is also the low end of the upper lethal limit for steelhead). *(Source: Moyle 1976)*	All Surface Waters a) COLD b) WARM

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled “narrative”)	**BENEFICIAL USE**
Temperature At no time or place shall the temperature be increased by more than 5°F above natural receiving water temperature.	COLD, WARM
Total Dissolved Solids (TDS) Waterbody specific. Median values, shown in Table 3-7 for surface waters. Sub-Basins Objectives range from 10-250 mg/L.	
Turbidity *Narrative Objective:* Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. *Indicators of Narrative Objective:* Turbidity greater than 25 NTU causes reduction in juvenile salmonid growth due to interference with their ability to find food. *(Source: Sigler et al.1984)* Turbidity greater than 40 NTU causes reduction in piscivorous fish (largemouth bass) growth due to interference with their ability to find food. *(Source: Shoup and Wahl, 2009)*	All Surface Waters

Table A.B-3. Antidegradation Water Quality Summary for Groundwater

SUB BASIN No.	SUB-BASIN NAME	COUNTY	CONSTITUENTS OF CONCERN HQ: High Quality, LQ: Low Quality, INSF: Insufficient Info											HIGH QUALITY WATER (for one or more constituents)
			Chloride	Conductivity	Nitrate	Sulfate	Total Dissolved Solids	Pesticides						
								Aldicarb	Chlorpyrifos	Diazinon	Imidacloprid	Permethrin	Glyphosate	
1.00	Soquel Valley	Santa Cruz	HQ	INSF	HQ	HQ	INSF	HQ	INSF	INSF	HQ	HQ	HQ	YES
2.00	Pajaro Valley	Monterey	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
2.00	Pajaro Valley	San Benito	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
2.00	Pajaro Valley	Santa Cruz	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
3.01	Llagas Area	San Benito	HQ	HQ	HQ	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	YES
3.01	Llagas Area	Santa Clara	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
3.02	Bolsa Area	San Benito	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
3.02	Bolsa Area	Santa Clara	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
3.03	Hollister Area	San Benito	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
3.03	Hollister Area	Santa Clara	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
3.04	San Juan Bautista Area	San Benito	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
4.01	180/400 Foot Aquifer	Monterey	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
4.02	East Side Aquifer	Monterey	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
4.04	Forebay Aquifer	Monterey	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
4.05	Upper Valley Aquifer	Monterey	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES

SUB BASIN No.	SUB-BASIN NAME	COUNTY	CONSTITUENTS OF CONCERN HQ: High Quality, LQ: Low Quality, INSF: Insufficient Info											HIGH QUALITY WATER (for one or more constituents)
								Pesticides						
			Chloride	Conductivity	Nitrate	Sulfate	Total Dissolved Solids	Aldicarb	Chlorpyrifos	Diazinon	Imidacloprid	Permethrin	Glyphosate	
4.06	Paso Robles Aquifer	Monterey	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
4.06	Paso Robles Aquifer	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
4.08	Seaside Aquifer	Monterey	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
4.09	Langley Aquifer	Monterey	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
4.10	Corral de Tierra Area	Monterey	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
5.00	Cholame Valley	Monterey	HQ	LQ	HQ	HQ	LQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
5.00	Cholame Valley	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	HQ	INSF	INSF	HQ	HQ	HQ	YES
6.00	Lockwood Valley	Monterey	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
7.00	Carmel Valley	Monterey	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
8.00	Los Osos Valley	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
9.00	San Luis Obispo Valley	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES

SUB BASIN No.	SUB-BASIN NAME	COUNTY	CONSTITUENTS OF CONCERN HQ: High Quality, LQ: Low Quality, INSF: Insufficient Info											HIGH QUALITY WATER (for one or more constituents)
								Pesticides						
			Chloride	Conductivity	Nitrate	Sulfate	Total Dissolved Solids	Aldicarb	Chlorpyrifos	Diazinon	Imidacloprid	Permethrin	Glyphosate	
12.00	Santa Maria River Valley	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
12.00	Santa Maria River Valley	Santa Barbara	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
13.00	Cuyama Valley	San Luis Obispo	HQ	LQ	HQ	HQ	LQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
13.00	Cuyama Valley	Santa Barbara	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
13.00	Cuyama Valley	Ventura	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
14.00	San Antonio Creek Valley	Santa Barbara	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
15.00	Santa Ynez River Valley	Santa Barbara	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
16.00	Goleta	Santa Barbara	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
17.00	Santa Barbara	Santa Barbara	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
18.00	Carpinteria	Santa Barbara	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
18.00	Carpinteria	Ventura	HQ	INSF	INSF	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	YES
19.00	Carrizo Plain	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
20.00	Ano Nuevo Area	San Mateo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES

SUB BASIN No.	SUB-BASIN NAME	COUNTY	CONSTITUENTS OF CONCERN HQ: High Quality, LQ: Low Quality, INSF: Insufficient Info											HIGH QUALITY WATER (for one or more constituents)
								Pesticides						
			Chloride	Conductivity	Nitrate	Sulfate	Total Dissolved Solids	Aldicarb	Chlorpyrifos	Diazinon	Imidacloprid	Permethrin	Glyphosate	
21.00	Santa Cruz Purisima Formation	Santa Cruz	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
22.00	Santa Ana Valley	San Benito	HQ	HQ	HQ	HQ	INSF	HQ	INSF	INSF	HQ	HQ	HQ	YES
23.00	Upper Santa Ana Valley	San Benito	INSF	INSF	INSF	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	INSF
24.00	Quien Sabe Valley	San Benito	INSF	INSF	INSF	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	INSF
25.00	Tres Pinos Valley	San Benito	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
26.00	West Santa Cruz Terrace	Santa Cruz	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
27.00	Scotts Valley	Santa Cruz	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
28.00	San Benito River Valley	San Benito	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
29.00	Dry Lake Valley	San Benito	INSF	INSF	INSF	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	INSF
30.00	Bitter Water Valley	San Benito	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
31.00	Hernandez Valley	San Benito	INSF	INSF	INSF	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	INSF

SUB BASIN No.	SUB-BASIN NAME	COUNTY	CONSTITUENTS OF CONCERN HQ: High Quality, LQ: Low Quality, INSF: Insufficient Info											HIGH QUALITY WATER (for one or more constituents)
								Pesticides						
			Chloride	Conductivity	Nitrate	Sulfate	Total Dissolved Solids	Aldicarb	Chlorpyrifos	Diazinon	Imidacloprid	Permethrin	Glyphosate	
32.00	Peach Tree Valley	Monterey	INSF	INSF	INSF	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	INSF
33.00	San Carpoforo Valley	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
34.00	Arroyo de la Cruz Valley	San Luis Obispo	INSF	INSF	INSF	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	INSF
35.00	San Simeon Valley	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
36.00	Santa Rosa Valley	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
37.00	Villa Valley	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
38.00	Cayucos Valley	San Luis Obispo	INSF	INSF	INSF	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	INSF
39.00	Old Valley	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
40.00	Toro Valley	San Luis Obispo	HQ	HQ	HQ	HQ	LQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
41.00	Morro Valley	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
42.00	Chorro Valley	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
43.00	Rinconada Valley	San Luis Obispo	INSF	INSF	HQ	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	YES
44.00	Pozo Valley	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
45.00	Huasna Valley	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	HQ	INSF	INSF	HQ	HQ	HQ	YES

SUB BASIN No.	SUB-BASIN NAME	COUNTY	CONSTITUENTS OF CONCERN HQ: High Quality, LQ: Low Quality, INSF: Insufficient Info											HIGH QUALITY WATER (for one or more constituents)
								Pesticides						
			Chloride	Conductivity	Nitrate	Sulfate	Total Dissolved Solids	Aldicarb	Chlorpyrifos	Diazinon	Imidacloprid	Permethrin	Glyphosate	
46.00	Rafael Valley	San Luis Obispo	INSF	INSF	INSF	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	INSF
47.00	Big Spring Area	San Luis Obispo	INSF	INSF	INSF	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	INSF
49.00	Montecito	Santa Barbara	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
50.00	Felton Area	Santa Cruz	INSF	INSF	INSF	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	INSF
51.00	Majors Creek	Santa Cruz	INSF	INSF	INSF	INSF	INSF	HQ	INSF	INSF	HQ	HQ	HQ	INSF
52.00	Needle Rock Point	Santa Cruz	HQ	INSF	HQ	HQ	INSF	HQ	INSF	INSF	HQ	HQ	HQ	YES
53.00	Foothill	Santa Barbara	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES

Table A.B-4. Antidegradation Water Quality Summary for Surface Water

SUB AREA No.	HYDRO-LOGIC SUB AREA NAME	COUNTY	CONSTITUENTS OF CONCERN (HQ: High Quality, ND: Non-Detect, INSF: Insufficient Information)													HIGH QUALITY WATER (for one or more constituents)
										Pesticides						
			Ammonia	Chloride	Nitrate	Sulfate	Total Dissolved Solids	Toxicity	Turbidity	Aldicarb	Chlorpyrifos	Diazinon	Imidacloprid	Permethrin	Glyphosate	
330420	Ano Nuevo	San Mateo	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
330413	Aptos - Soquel	Santa Cruz	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
330411	Davenport	Santa Cruz	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
330412	San Lorenzo	Santa Cruz	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
330600	Bolsa Nueva	Monterey	HQ	HQ	HQ	INSF	INSF	HQ	HQ	ND	INSF	INSF	ND	ND	ND	YES
330700	Carmel River	Monterey	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331100	Carrizo Plain	San Luis Obispo	HQ	INSF	HQ	INSF	INSF	INSF	INSF	ND	INSF	INSF	ND	ND	ND	YES
331031	Oceano	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331012	Arroyo de la Cruz	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES
331016	Cayucos	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES

SUB AREA No.	HYDRO-LOGIC SUB AREA NAME	COUNTY	CONSTITUENTS OF CONCERN (HQ: High Quality, ND: Non-Detect, INSF: Insufficient Information)													HIGH QUALITY WATER (for one or more constituents)
										Pesticides						
			Ammonia	Chloride	Nitrate	Sulfate	Total Dissolved Solids	Toxicity	Turbidity	Aldicarb	Chlorpyrifos	Diazinon	Imidacloprid	Permethrin	Glyphosate	
331017	Old	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES
331011	San Carpoforo	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES
331013	San Simeon	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331014	Santa Rosa	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331018	Toro	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES
331015	Villa	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES
331022	Chorro	San Luis Obispo	HQ	INSF	HQ	HQ	HQ	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331023	Los Osos	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331021	Morro	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES
331026	Pismo	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331025	Point San Luis	San Luis Obispo	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	INSF	INSF	ND	ND	ND	YES

SUB AREA No.	HYDRO-LOGIC SUB AREA NAME	COUNTY	CONSTITUENTS OF CONCERN (HQ: High Quality, ND: Non-Detect, INSF: Insufficient Information)													HIGH QUALITY WATER (for one or more constituents)
										Pesticides						
			Ammonia	Chloride	Nitrate	Sulfate	Total Dissolved Solids	Toxicity	Turbidity	Aldicarb	Chlorpyrifos	Diazinon	Imidacloprid	Permethrin	Glyphosate	
331024	San Luis Obispo Creek	San Luis Obispo	HQ	HQ	HQ	HQ	HQ	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331700	Estrella River	San Luis Obispo	HQ	HQ	HQ	INSF	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES
330540	Pacheco - Santa Ana Creek	Santa Clara	INSF	INSF	HQ	INSF	INSF	INSF	INSF	ND	INSF	INSF	ND	ND	ND	YES
330550	San Benito River	San Benito	HQ	HQ	HQ	INSF	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES
330520	Santa Cruz Mountains	Santa Cruz / San Benito / Santa Clara	HQ	HQ	HQ	INSF	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
330530	South Santa Clara Valley	San Benito / Santa Clara	HQ	HQ	HQ	INSF	HQ	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
330510	Watsonville	Monterey / Santa	HQ	HQ	HQ	HQ	HQ	HQ	HQ	ND	ND	ND	ND	ND	ND	YES

SUB AREA No.	HYDRO-LOGIC SUB AREA NAME	COUNTY	CONSTITUENTS OF CONCERN (HQ: High Quality, ND: Non-Detect, INSF: Insufficient Information)													HIGH QUALITY WATER (for one or more constituents)
										Pesticides						
			Ammonia	Chloride	Nitrate	Sulfate	Total Dissolved Solids	Toxicity	Turbidity	Aldicarb	Chlorpyrifos	Diazinon	Imidacloprid	Permethrin	Glyphosate	
		Cruz / San Benito														
330960	Arroyo Seco	Monterey	HQ	INSF	HQ	INSF	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES
330920	Chualar	Monterey	HQ	HQ	HQ	INSF	HQ	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
330970	Gabilan Range	Monterey	HQ	HQ	HQ	INSF	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES
330912	Moro Cojo	Monterey	HQ	INSF	HQ	INSF	HQ	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
330911	Neponset	Monterey	HQ	HQ	HQ	HQ	HQ	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
330950	Monterey Peninsula	Monterey	INSF	INSF	INS F	INSF	INSF	HQ	INSF	ND	ND	ND	ND	ND	ND	YES
330981	Atascadero	Monterey / San Luis Obispo	HQ	HQ	HQ	INSF	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
330990	Pozo	San Luis Obispo	INSF	INSF	INS F	INSF	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES
330930	Soledad	Monterey	HQ	HQ	HQ	INSF	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
330940	Upper Salinas valley	Monterey	HQ	HQ	HQ	INSF	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331300	San Antonio	Santa Barbara	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES

SUB AREA No.	HYDRO-LOGIC SUB AREA NAME	COUNTY	CONSTITUENTS OF CONCERN (HQ: High Quality, ND: Non-Detect, INSF: Insufficient Information)													HIGH QUALITY WATER (for one or more constituents)
										Pesticides						
			Ammonia	Chloride	Nitrate	Sulfate	Total Dissolved Solids	Toxicity	Turbidity	Aldicarb	Chlorpyrifos	Diazinon	Imidacloprid	Permethrin	Glyphosate	
331230	Cuyama Valley	San Luis Obispo / Santa Barbara / Ventura	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331210	Guadalupe	San Luis Obispo / Santa Barbara	HQ	HQ	HQ	HQ	HQ	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331220	Sisquoc	Santa Barbara	HQ	HQ	HQ	HQ	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES
330800	Santa Lucia	Monterey	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331430	Buellton	Santa Barbara	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331451	Santa Cruz Creek	Santa Barbara	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331410	Lompoc	Santa Barbara	HQ	HQ	HQ	HQ	HQ	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331420	Los Olivos	Santa Barbara	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331420	Santa Rita	Santa Barbara	HQ	HQ	HQ	HQ	INSF	INSF	HQ	ND	INSF	INSF	ND	ND	ND	YES

SUB AREA No.	HYDRO-LOGIC SUB AREA NAME	COUNTY	CONSTITUENTS OF CONCERN (HQ: High Quality, ND: Non-Detect, INSF: Insufficient Information)													HIGH QUALITY WATER (for one or more constituents)
										Pesticides						
			Ammonia	Chloride	Nitrate	Sulfate	Total Dissolved Solids	Toxicity	Turbidity	Aldicarb	Chlorpyrifos	Diazinon	Imidacloprid	Permethrin	Glyphosate	
331510	Arguello	Santa Barbara	HQ	HQ	HQ	HQ	HQ	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331534	Carpinteria	Santa Barbara / Ventura	HQ	HQ	HQ	HQ	HQ	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331531	Goleta	Santa Barbara	HQ	HQ	HQ	HQ	HQ	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331533	Montecito	Santa Barbara	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
331532	Santa Barbara	Santa Barbara	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES

Section C. Rationale for Requirements

Section C describes the rationale for the requirements included in the Order sections 2.C.1 through 2.C.5. Additional tables displaying to groundwater quality data and surface water quality data are included in Section D.

Section C.1. Irrigation and Nutrient Management for Groundwater Protection

Groundwater Phase Areas

1. This Order establishes and provides maps depicting Groundwater Phase areas based on the relative level of water quality impairment and risk to water quality.

    a. Groundwater Phase 1 areas are areas likely to exhibit high recharge rates based on the occurrence of vulnerable soils and young groundwater, as discussed below.

    b. Groundwater Phase 2 areas are groundwater basins with at least 20 on-farm domestic wells and an exceedance rate of the nitrate maximum contaminant level (MCL) of 10 mg/L nitrate as nitrogen in on-farm domestic wells of at least 10 percent. Section D.1 includes a table with the on-farm domestic well exceedance rates.

    c. Groundwater Phase 3 areas are all other areas located in the central coast region.

2. Groundwater Phase 1 areas are located at the intersection of two datasets: Department of Water Resources (DWR) designated Hydrogeologically Vulnerable Areas (HVAs) (SWRCB, 2000) and areas of relatively young groundwater age identified by Lawrence Livermore National Laboratory (LLNL) using isotopic dating (Visser et al., 2014). The intersection of these two datasets was used because 1) these areas are identified as being especially vulnerable to contamination from overlying and nearby land use practices, and 2) groundwater beneath these areas is relatively young (i.e., subject to more recent recharge) and therefore is expected to exhibit the fastest response to changes in land use practices, thereby providing the fastest evaluation of the effectiveness of this Order's groundwater requirements.

3. HVAs were identified by the State Water Board using information on soil types and aquifer geologic materials compiled from existing reports published by USGS and the Department of Water Resources. The HVAs take into account groundwater vulnerability posed by highly permeable geologic materials but does

not account for other hydrologic variables that affect recharge, such as precipitation. Because the HVA map layer shows only potential recharge rates, groundwater age maps produced by LLNL were also used.

4. Groundwater age is correlated with recharge rates because groundwater is typically young in areas where recharge is occurring rapidly (Visser et al., 2014; McMahon et al., 2011; Plummer and Friedman, 1999). The LLNL report indicates that mean and median groundwater ages in the central coast region are 35 years old; the oldest groundwater measured was 57 years old and the youngest measured was 11 years old. For the purposes of this Order, “young” groundwater was identified as groundwater with an estimated age of 20 years or less.

5. Several datasets reviewed but ultimately not used to establish the Groundwater Phase areas are described below.

    a. UC Santa Cruz researchers have quantified and mapped recharge rates in Santa Cruz and northern Monterey County (Fisher et al., 2017; Russo, et al., 2014). This dataset was not used because it does not provide coverage for the entire central coast region.

    b. UC Davis researchers developed the Soil Agricultural Groundwater Banking Index, or SAGBI (O’Geen et al., 2015). This dataset evaluates the suitability of agricultural lands throughout California for their ability to recharge groundwater when deliberately flooded as part of managed aquifer recharge projects. This dataset was not used because some of the factors that go into the index score are unrelated to groundwater recharge rates and are included because they impact the feasibility of artificial recharge. For example, some of the factors that impact a SAGBI score but do not impact naturally occurring recharge rates are the amount of salinity in the soil, the type of crop grown, the likelihood that the crop’s roots will be damaged by artificial recharge, and the amount of soil compaction that occurs when fields are flooded during managed recharge.

    c. The USGS developed a 2014 Basin Characterization Model (Flint et al., 2014). The goal of this study was to determine the fate of precipitation using a water balance approach based on climate data collected between 1980 and 2010. As part of the study, the authors produced a map layer of “potential recharge to aquifers” that represents the amount of precipitation lost to soils. The model also takes into account topography, geology, and soil type when determining potential recharge rates. This model was not used because the model-generated maps of “potential recharge” areas are more a function of precipitation directly infiltrating soil, which is a relatively small component of recharge relative to that which results from streamflow infiltration and therefore may not be fully representative of relative recharge rates in agricultural areas.

6. Based on current enrollment information, the number of ranches and the irrigated acreage within each Groundwater Phase area is provided below.

    a. Groundwater Phase 1 areas include approximately 380 ranches (9 percent) representing approximately 50,000 irrigated acres (12 percent).
    b. Groundwater Phase 2 areas include approximately 2400 ranches (53 percent) and 259,000 irrigated acres (60 percent).
    c. Groundwater Phase 3 areas include all other ranches that do not meet the criteria for the previous phases, with approximately 1700 additional ranches (38 percent) and 123,000 irrigated acres (28 percent).

7. Phasing in the requirements over time will allow for the expected learning curve associated with the nitrogen applied and removed reporting, as well as provide time for additional technical assistance capacity to develop in the central coast region.

Nitrate in Groundwater

Nitrate – Impacts to Groundwater

8. The May 2018 staff report (Item No. 8) titled *Groundwater Quality Conditions and Agricultural Discharges in the Central Coast Region* (CCRWQCB, 2018c) included a detailed discussion of current groundwater quality conditions and impacts of agricultural discharges on groundwater quality. Several analyses and tables included in that report have been updated to incorporate additional groundwater monitoring data received in 2018 and 2019. The updated tables are included in Section D.1 of this report and summary information from the updated tables is included in the findings below.

9. Of the over 2600 on-farm domestic wells sampled during Agricultural Orders 2.0 and 3.0 (2012 through 2019), 28 percent had mean concentrations that exceeded the nitrate MCL. The mean concentration in on-farm domestic wells was 11.0 mg/l NO3-N, which is 10 percent higher than the nitrate MCL. The concentrations in some groundwater basins was significantly higher than the regional average:

    a. In the Salinas Valley – Forebay sub-basin, 285 on-farm domestic wells were sampled; 64 percent had mean concentrations that exceeded the

MCL and the mean concentration of all on-farm domestic wells was 25.7 mg/L NO3-N.

b. In the Salinas Valley – East Side sub-basin, 123 on-farm domestic wells were sampled; 59 percent had mean concentrations that exceeded the MCL and the mean concentration of all on-farm domestic wells was 32.1 mg/L NO3-N.

c. In the Salinas Valley – Upper Valley sub-basin, 82 on-farm domestic wells were sampled; 42 percent had mean concentrations that exceeded the MCL and the mean concentration of all on-farm domestic wells was 16.3 mg/L NO3-N.

d. In the Salinas Valley – 180/400 Foot sub-basin, 200 on-farm domestic wells were sampled; 25 percent had mean concentrations that exceeded the MCL and the mean concentration of all on-farm domestic wells was 11.4 mg/L NO3-N.

e. In the Gilroy-Hollister Valley Llagas sub-basin, 191 on-farm domestic wells were sampled; 34 percent had mean concentrations that exceeded the MCL and the mean concentration of all on-farm domestic wells was 10.1 mg/L NO3-N.

f. In the Gilroy-Hollister Valley North San Benito sub-basin, 196 on-farm domestic wells were sampled; 25 percent had mean concentrations that exceeded the MCL and the mean concentration of all on-farm domestic wells was 8.2 mg/L NO3-N.

g. In the Corralitos – Pajaro Valley sub-basin, 259 on-farm domestic wells were sampled; 38 percent had mean concentrations that exceeded the MCL and the mean concentration of all on-farm domestic wells was 13.1 mg/L NO3-N.

h. In the Santa Maria basin, 183 on-farm domestic wells were sampled; 55 percent had mean concentrations that exceeded the MCL and the mean concentration of all on-farm domestic wells was 21.1 mg/L NO3-N.

i. In the San Luis Obispo Valley basin, 42 on-farm domestic wells were sampled; 36 percent had mean concentrations that exceeded the MCL and the mean concentration of all on-farm domestic wells was 11.2 mg/L NO3-N.

Nitrate – Trends

10. Analysis of nitrate trends in qualifying[6] individual wells indicates that regionwide, 13 percent of qualifying wells show increasing trends in nitrate concentration (water quality is getting worse for nitrate), while 8 percent show decreasing trends in nitrate concentrations (water quality is getting better for nitrate). In some basins, the number of wells with increasing trends greatly exceeds the number of wells with decreasing trends, indicating water quality is continuing to degrade for nitrate. For example:
    a. In the Salinas Valley – Forebay sub-basin, 15 percent of qualifying wells showed increasing nitrate concentration trends and 3 percent showed decreasing nitrate concentration trends.

    b. In the Salinas Valley – East Side sub-basin, 22 percent of qualifying wells showed increasing nitrate concentration trends and 6 percent showed decreasing nitrate concentration trends.

    c. In the Salinas Valley – Upper Valley sub-basin, 19 percent of qualifying wells showed increasing nitrate concentration trends and 6 percent showed decreasing nitrate concentration trends.

    d. In the Salinas Valley – 180/400 Foot sub-basin, 23 percent of qualifying wells showed increasing nitrate concentration trends and 3 percent showed decreasing nitrate concentration trends.

    e. In the Santa Maria basin, 17 percent of qualifying wells showed increasing nitrate concentration trends and 9 percent showed decreasing nitrate concentration trends.

Nitrate – Sources and Primary Drivers

11. The California Nitrogen Assessment documented that synthetic nitrogen fertilizer application rates per acre increased an average of 25 percent between 1973 and 2005, along with a shift from field crops to perennials and vegetable crops and the transition to multiple crop plantings within each year. The California Nitrogen Assessment estimated that over half of the nitrogen applied as fertilizer ends up as a waste discharge to the environment.

[6] More details on this analysis are included in Section D.1. It should be noted that, among other criteria, qualifying wells had to have a minimum of five sampling events. The criteria bias the dataset towards deeper municipal wells that are more likely to be pumping higher quality groundwater. Despite the inherent bias in the analysis, it provides insights into groundwater quality trends.

12. The primary drivers that cause groundwater nitrate contamination from irrigated agricultural discharges include the items listed below. This Order establishes requirements that address each of these drivers.

    a. Over-application of synthetic fertilizer nitrogen – addressed through fertilizer nitrogen application limits;
    b. Amount of nitrogen waste in the field after crops are harvested – addressed through nitrogen discharge targets and limits;
    c. Under-utilization of nitrate present in the soil – addressed through requirement to monitor soil nitrate;
    d. Under-utilization of nitrate present in irrigation water – addressed through requirement to monitor irrigation water nitrate concentration and volume;
    e. Inefficient irrigation that results in the over-application of irrigation water to some or all portions of fields, which causes increased nitrate leaching below the crop root zone and drives additional fertilizer applications – addressed through requirements to estimate crop evapotranspiration and monitor irrigation water volume, and through fertilizer nitrogen limits and nitrogen discharge targets and limits.

Importance of Irrigation Management

13. As described by the 2012 UC Davis report titled, *Addressing Nitrate in California's Drinking Water* (2012 UC Davis Nitrate Report): "Retention of soluble N within the root zone, where it is available for plant uptake, is achieved in part by good irrigation management. The amount of nitrate lost to leaching is related to the volume of water that percolates below the root zone, which in turn is related to the irrigation system performance (Letey et al. 1977; Allaire-Leung et al. 2001). Scheduling irrigation events such that the volume of applied water matches the crop water requirement (evapotranspiration or ET), and delivering water uniformly to the field, are both critical to increasing N use efficiency and reducing nitrate leaching. Non-uniform irrigation forces farmers to over-irrigate some parts of the field in order to ensure adequate delivery to the parts of the field receiving the least amount of water."

14. Irrigation efficiency is a performance measure of the irrigation system and refers to the beneficial use of the water applied. Practically speaking, beyond leaks and irrigation system malfunctions, the irrigation efficiency depends on two parameters: 1) uniform water application, (distribution uniformity, or DU), and 2) correct irrigation scheduling; that is, scheduling the frequency and duration of the irrigation events to match the soil water holding capacity and ultimately the crop water demand. If the water application is not uniform, the frequency and duration of irrigation events do not match the soil and crop water demand, or the irrigation

system is not performing correctly, irrigation surface runoff and percolation below the root zone may occur. Irrigation runoff and deep percolation have the potential to carry pollutants to surface and groundwater.

15. The distribution uniformity of an irrigation system is measured by taking field measurements, such as flow, pressure, and other parameters. A good distribution uniformity is around 75 percent or better (depending on the irrigation system); distribution uniformities in the range of 90 percent are possible for drip systems. There is a wide range of distribution uniformities found in the central coast region, with distribution uniformities ranging from as low as 20 percent to as high as 95 percent (CCRWQB, 2018c). When the distribution uniformity is low, the Discharger may increase the water application to compensate for the inefficiency and avoid under-irrigating portions of the field, which may also result in over-irrigating other portions. An increase in water application above evapotranspiration increases the amount of water that may runoff or deep percolate below the root zone.

16. Irrigation deep percolation and nitrogen applications above the amounts removed when crops are harvested, are the two main reasons why farming causes or contributes to nitrogen discharges to groundwater. The 2012 UC Davis Nitrate Report concluded that: "reducing deep percolation to groundwater from agricultural soil (by curbing inefficient or poorly practiced irrigation methods) is equally important as reducing excess levels of N fertilizer applied to cultivated lands...thus irrigation management is equally as important as nitrogen management in reducing groundwater contamination of agrichemicals." (Viers et al., 2012).

Fertilizer Nitrogen Application Limits

17. The Central Coast Water Board has received nitrogen application data through the Total Nitrogen Applied (TNA) reporting requirement since 2014. In the 2014, 2015, and 2016 reporting years, approximately 700 ranches representing 117,000 acres (28 percent of enrolled acres) submitted TNA reports. The reporting requirement was expanded under Agricultural Order 3.0 and about 1,700 ranches representing 230,000 acres (55 percent of enrolled acres) have been required to report since 2017. The majority of crops for which the Central Coast Water Board has received nitrogen application information include the following six crops, in descending order of prevalence, lettuce, broccoli, spinach, cauliflower, celery, and, strawberries, in total representing approximately 75 percent of all crops reported each year. The submitted data are periodically analyzed to determine if there have been significant changes in application rates or estimated loading rates. The results of these analyses are discussed in the sections below.

18. Table A.C.1-1 below displays the median application rates of fertilizer nitrogen (A_{FER}) to the top six crops based on the TNA data, in pounds of nitrogen per acre per crop. While there have been changes in the median rates from one year to the next, overall there have not been significant changes in application rates to these top six crops, even considering the expansion of the reporting requirement beginning in 2017.

Table A.C.1-1. Median Fertilizer Nitrogen Application Rates Over Time

	Lettuce	Broccoli	Spinach	Cauliflower	Celery	Strawberry
2014	174	201	155	199	246	236
2015	150	188	146	184	210	202
2016	162	189	141	198	220	178
2017	180	200	163	203	223	190
2018	169	193	163	213	230	164
All Years	169	196	157	199	222	186

All units are pounds of nitrogen per acre per crop.

19. As previously discussed, one of the causes of the severe groundwater nitrate contamination observed in groundwater basins in the central coast region is the over-application of synthetic fertilizer nitrogen. The application of nitrogen in excess of what is removed from the field (A-R) results in a potential nitrogen waste discharge. While it is possible in some situations that subsequent crops may uptake the excess nitrogen, the risk of discharge remains.

20. Based on TNA data from 2014 through 2018, fertilizer nitrogen application rates (A_{FER}) have not changed significantly in response to the TNA reporting requirement alone. To make progress towards reducing nitrogen waste discharges and reduce the risk of nitrogen discharge, this Order establishes fertilizer application limits.

21. UC Davis, with support from CDFA's Fertilizer Research and Education Program (FREP) publishes California Fertilization Guidelines (UC Davis, 2020). The website includes guidelines for lettuce, broccoli, cauliflower, celery, strawberries, and several other crops. Table A.C.1-2 summarizes fertilizer application recommendations from the California Fertilization Guidelines website[7] (the range for spinach is taken from a UCANR study, LeStrange 2011). The rates shown include both pre-plant recommendations and in-season applications. It is important to note that the fertilizer application recommendation for all these crops

[7] California Fertilization Guidelines: https://apps1.cdfa.ca.gov/FertilizerResearch/docs/Guidelines.html

include the recommendation to assess soil nitrate content and adjust fertilizer applications accordingly. For example, “Several studies carried out in commercial fields in the Salinas Valley found that when the pre-sidedress soil nitrate-N level is above 20 mg/kg (= 20 ppm), no fertilizer N is necessary. If the soil nitrate-N concentration is below 20 ppm, only enough N to increase soil available nitrate-N to 20 ppm is needed. Approximately 4 lbs N/acre need to be added to increase the soil nitrate level by 1 ppm” (UC Davis, 2020).

Table A.C.1-2. Recommended Fertilizer Application Rates

	Lettuce	**Broccoli**	**Spinach**	**Cauliflower**	**Celery**	**Strawberry**
Recommended Application	120-220	170-300	80-200	170-270	200-290	200

All units are pounds of nitrogen per acre per crop.

22. The fertilizer application limits apply only to fertilizer nitrogen (A_{FER}). This Order does not establish a limit on irrigation water applications or irrigation water nitrogen (A_{IRR}). Furthermore, as allowed for in provisions in section C.1 of the Order, if Dischargers can demonstrate that their removal rate is such that their total annual nitrogen discharge is already achieving the final discharge limit (A-R=50 pounds per acre per year), then the application limit no longer applies because the discharge has been mitigated despite the high-risk nitrogen application.

23. In establishing the nitrogen application limits, the approach presented in the ESJ Order was considered. The ESJ Order approach involves making comparisons among the population of Dischargers to determine “outliers.” The crop-specific application limits established in this Order follow that approach – the 90^{th} percentile of fertilizer nitrogen application for each crop is used to establish the application limits for the top six crops reported in the region. Similar to the median values, the 90^{th} percentile values have also not changed significantly over the course of 2014 through 2018 reporting. Table A.C.1-3 displays the 90^{th} percentile values and the established application limits for each crop.

Table A.C.1-3. 90th Percentile Fertilizer Nitrogen Application Rates

	Lettuce	Broccoli	Spinach	Cauliflower	Celery	Strawberry
2014	286	312	229	293	436	420
2015	254	292	226	279	310	314
2016	259	282	227	298	325	295
2017	284	288	260	306	399	326
2018	273	287	240	313	353	304
All Years	275	292	240	301	373	328
App. Limit	275	295	240	300	375	330

All units are pounds of nitrogen per acre per crop.

24. This Order only establishes a crop-specific application limit for the six most commonly reported crops. These crops have the most datapoints each year and have been studied by researchers more than other crops in the region. The fertilizer application limits are also near or greater than the application recommendations from the California Fertilization Guidelines. For all other crops, this Order establishes an application limit of 500 pounds of nitrogen per acre per crop. Over 98 percent of all crops are currently achieving the 500 pounds per acre per crop limit. It is anticipated that future iterations of this Order may establish crop-specific application limits for additional crops based on future reporting.

<u>Nitrogen Discharge Targets and Limits</u>

25. Nitrogen waste discharge rates are calculated on an annual basis, considering all crops grown and harvested from the ranch during the reporting year. Nitrogen waste discharge rates and the associated calculations were discussed in detail in the May 2018 staff report in the section on agricultural discharges in the central coast region (CCRWQCB, 2018c). The May 2018 staff report covered TNA reported from 2014 through 2016. **Table A.C.1-4** below displays the percentage of ranches currently achieving each of the nitrogen discharge targets and limits established in the Order based on TNA data from 2014 through 2018 and calculated estimates of nitrogen loading based on the amount of nitrogen applied minus available crop nitrogen removal literature values (Smith and Cahn, 2011; CSC, 2011; Heinrich et al., 2013; Smith et al., 2014; Smith, 2015; Smith and Cahn, 2016).

Table A.C.1-4. Percent of Ranches Achieving Discharge Targets and Limits

	Target or Limit (Pounds of Nitrogen per Acre per Year)						
	50	**100**	**150**	**200**	**300**	**400**	**500**
2014	7%	13%	20%	29%	50%	69%	82%
2015	6%	12%	22%	33%	53%	70%	80%
2016	6%	13%	22%	32%	52%	71%	83%
2017	13%	21%	33%	47%	64%	79%	87%
2018	14%	22%	31%	43%	65%	78%	87%
All Years	9%	16%	26%	37%	57%	73%	84%

26. The current average nitrogen waste discharge is approximately 340 pounds of nitrogen per acre per year. As discussed in the May 2018 staff report, this is approximately an order of magnitude greater than the nitrogen waste discharge rate identified by the 2012 UC Davis Nitrate Report as being protective of water quality and is the primary cause of the widespread and severe groundwater nitrate contamination observed in the central coast region (CCRWQCB, 2018c).

27. Irrigation water nitrogen (A_{IRR}) is included in the calculation of nitrogen discharge (A-R) because the nitrogen present in the irrigation water is "at least as effectively used by the crop as fertilizer [nitrogen]" (Cahn et al., 2017). However, Dischargers can comply with the nitrogen discharge targets and limits through one of two pathways: the standard A-R pathway that accounts for all nitrogen applied and removed,[8] or a second pathway that incentivizes the use of irrigation water nitrogen by not including it in the compliance calculation, instead essentially requiring Dischargers to ensure that their removal meets or exceeds the amount of fertilizer and compost nitrogen applied.[9]

28. When the source of a pollutant causing contamination in water resources is known, a common step is to require the discharge of the pollutant to cease and to begin cleanup activities to achieve applicable water quality objectives. However, irrigated agriculture provides significant economic and social value to the central coast region, as well as to California and the nation. Therefore, rather than requiring that the discharge cease, this Order requires reductions in the amount of nitrate discharged to groundwater over time. Over a period of many years, agricultural Dischargers will be required to reduce their discharge such that they are eventually discharging no more than 50 pounds of nitrogen per acre per year. The following findings discuss how the 50 pounds per acre value was established. The timeline is discussed in greater detail in *Nitrogen Discharge Timeframe* section.

[8] With the exception of a portion of the compost nitrogen when the compost discount factor is used.
[9] See previous footnote.

Basis for Final Nitrogen Discharge Limit

29. The concentration of nitrogen (as NO3-N) in an acre-foot of water (325,851 gallons) will increase from 0 to 10 mg/L, the nitrate MCL, when approximately 27.2 pounds of nitrogen is added.

30. The 2012 UC Davis Nitrate Report identified a number referred to as an “operational benchmark” that acts as a reference point to determine whether the amount of nitrogen leaching to groundwater has the potential to cause exceedances of the MCL. The 2012 UC Davis Nitrate Report determined that nitrogen discharge in excess of 31 pounds of nitrogen per acre per year would have the potential to cause exceedances of the MCL. This value accounts for the 27.2 value discussed above, and also includes an additional 4.5 pounds of nitrogen per acre per year to account for losses due to potential denitrification in the deep vadose zone or in shallow groundwater, thereby arriving at approximately 31 pounds of nitrogen per acre per year.

31. The typical groundwater recharge rate identified in the 2012 UC Davis Nitrate Report study area was approximately 1 acre-foot of water per acre per year. Based on information submitted in the TNA reports, and accounting for additional recharge due to rainfall, the typical groundwater percolation rate in irrigated agricultural areas in the central coast is likely closer to 1.66 acre-feet per acre per year, as opposed to the 1 acre-foot value identified in the 2012 UC Davis Nitrate Report. This allows for the loading limit to be increased: 27.2 x 1.66 + 4.5 = 49.7, which rounds to 50 pounds of nitrogen per acre per year.

32. The actual discharge volume from any given ranch will likely be different from the 1.66 acre-feet per acre per year average, meaning particular ranches could be assigned higher or lower nitrogen discharge limits if individual limits were assigned to each ranch. Individual limits would be overly complicated given that there are over 4,200 ranches in the region, and are not appropriate for general orders; this Order is a general order and therefore establishes general requirements for all Dischargers that will collectively result in the achievement of water quality objectives and the protection of beneficial uses. Furthermore, given that the nitrogen and irrigation water discharges will mix as they travel through the soil profile and enter groundwater, the overall basin- and sub-basin-scale effect should ultimately result in a collective discharge that is protective of the drinking water beneficial use.

33. This Order includes the requirement for Dischargers to report the volume of irrigation water applied to the ranch, the approximate evapotranspiration from

each crop, and an estimate of the volume of water discharged to surface water and groundwater. The current discharge limit is based on the best data currently available; the additional irrigation water reporting information will allow the regional board to revisit the discharge limit in the future and adjust the limit higher or lower or develop different limits for different areas within the region.

European Union – Similarities and Differences

34. In 2014, several experts (12 from science, 4 from policy, and 3 from industry) convened the European Union Nitrogen Expert Panel. The panel created a set of recommended metrics for countries in the European Union to develop requirements to address varying degrees of groundwater and surface water nitrate pollution. The panel's recommendation included four targets: a maximum surplus (nitrogen applied minus nitrogen removed, or A-R), a maximum and minimum nitrogen use efficiency (nitrogen applied divided by nitrogen removed, or A/R), and a minimum productivity (nitrogen removed, or R). Their report included numbers for each of these metrics, however the numbers were included largely for conceptual purposes with the expectation that specific values would be developed for specific countries or regions (EU Nitrogen Expert Panel, 2015).

35. The maximum surplus value (A-R) is the value most directly related to environmental pollution and was included in their recommendation because "N surplus is a proxy for potential N losses to the environment." Values of A/R greater than the maximum nitrogen use efficiency present a risk of soil mining; values less than the maximum nitrogen use efficiency present a risk of inefficient nitrogen use. Finally, the minimum productivity (R) was included because "some minimum yield level should be achieved, given the need to produce a desired amount of food, feed and biofuel…" (EU Nitrogen Expert Panel, 2015).

36. The Central Coast Water Board does not have the authority to require a minimum productivity, so that metric (R on its own) is not appropriate for this Order. Similarly, the Central Coast Water Board does not have the authority to require A/R be retained above the level that might result in soil mining. As previously discussed, A and R data will be collected and A/R values will be analyzed to determine if creating a metric for maximum A/R presents additional regulatory value in conjunction with the value presented by the maximum nitrogen surplus calculated through A-R.

37. In 2007, Germany identified a value of approximately 54 pounds of nitrogen per acre per year as the maximum allowable surplus (A-R). Germany did see improvements in water quality in response to the established regulations, however the progress eventually slowed. In 2017, in response to pressure related to the

slowed rate of improvement, Germany reduced the allowable surplus to approximately 45 pounds of nitrogen per acre per year. It should be noted that Germany's regulatory framework includes requirements beyond the maximum allowable surplus, including restrictions on the timing of nutrient applications and an application limit on organic nitrogen, but the allowable surplus was identified as one of the most important measures of their fertilizer ordinances (Kuhn, 2017).

38. Denmark's approach has not included establishing a nitrogen surplus maximum, although it has included other restrictions such as limiting nitrogen application to below the economic optimum, mandatory cover crops, and nitrogen application buffer zones around streams, lakes, and sensitive habitats. Denmark has a robust monitoring program that allows for the analysis of nitrogen surplus rates relative to average groundwater nitrate concentrations. Based on their monitoring program results, their restrictions have resulted decreases to the nitrogen surplus. As the nitrogen surplus has decreased, the average groundwater nitrate concentration has also decreased. The annual surplus decreased to approximately 89 pounds of nitrogen per acre per year from 1998 to 2012, and there has been an associated decrease in average groundwater nitrate concentration from approximately 12.4 mg/L NO3-N to 10.2 mg/L NO3-N (Hansen et al., 2017).

Compost Discount Factor

39. Dischargers have the option of applying a compost discount factor to effectively reduce the amount of compost nitrogen that is included in their annual nitrogen discharge target or limit calculation (A-R). The compost discount factor applies only to finished compost products, as described in the Order and MRP. Using the discount factor results in only the amount of compost nitrogen that is mineralized during the year that it was applied being included in the A-R calculation.

40. Compost nitrogen mineralization rates were studied as part of the governor's Healthy Soils Initiative. The study performed by Gravuer (2016) discusses how compost nitrogen that is organically bound in the soil and has not yet been mineralized is not yet mobile in the environment:

   a. For finished compost products with higher amounts of nitrogen in the carbon to nitrogen ratio (C:N $\leq$ 11), approximately 5 to 15 percent (10 percent on average) of the organically bound nitrogen is mineralized in the first year of application. Each subsequent year, additional organically bound nitrogen is mineralized at declining rates.

   b. For finished compost products with lower amounts of nitrogen in the carbon to nitrogen ratio (C:N > 11), approximately 2 to 7 percent (5 percent on average) of the organically bound nitrogen is mineralized in the first year of application. Each subsequent year, additional organically bound nitrogen is mineralized at declining rates.

c. Compost generally improves water holding capacity and nutrient retention capacity of the soil, resulting in less water, which has a high potential to carry nitrate in agricultural settings, moving below the root zone

41. This Order incentivizes the use of compost nitrogen through the compost nitrogen discount factor because land application of compost directly stimulates biological processes, including increases in soil microbial and plant biomass that sequester carbon into stable long-term organic matter (Gravuer, 2016; Kong et al., 2005; Cotrufo et al., 2013). Increases in organic matter offer benefits such as increasing the soil's water holding capacity and nutrient retention capacity, providing a reservoir of nutrients for plants, improving aeration, improving water infiltration, reducing soil erosion, and supporting the abundance and diversity of soil organisms, which can improve plant health (Gravuer, 2016).

CropManage – Free Online Irrigation and Nutrient Management Tool

42. CropManage is a free online decision support tool developed by UC Cooperative Extension to assist Dischargers in making water and fertilizer application decisions on a field-by-field basis[10]. As of 2019, there are more than 1600 registered users and CropManage has provided more than 1200 fertilizer and water application recommendations per month. CropManage currently supports the following crops: alfalfa, almond, broccoli, brussels sprouts, cabbage, cauliflower, cilantro, celery, lettuce (romaine, leaf, iceberg, baby), mizuna, bell pepper, raspberry, spinach, strawberry, and processing tomato. It is anticipated that crops will continue to be added to the system.

43. Dischargers can use the CropManage system to enter information on their crop, location, soil, water and fertilizer applications, and soil and tissue sample analyses to receive field-specific water and fertilizer application recommendations based on crop-specific algorithms, CIMIS station data (including evapotranspiration), soil type, and other factors. The information is stored in the system and can be accessed by employees within the operation and exported, for example to support submittal of the INMP Summary report.

[10] CropManage can be accessed online at https://cropmanage.ucanr.edu/

Nitrogen Removal Conversion Coefficients

44. The conversion coefficients established in the Order were developed using information from the following sources:
    a. Report developed for a Central Valley agricultural coalition titled *Nitrogen Concentrations in Harvested Plan Parts – A Literature Overview* (Geisseler, 2016).
    b. Additional research on nitrogen removed at harvest performed by Geisseler and Horwath for crops including citrus, avocados, and grapevines.[11]
    c. Information provided to Central Coast Water Board staff by UC Cooperative Extension researchers at the March 2019 board meeting (Smith and Cahn, 2019).

45. The California Department of Food and Agriculture's (CDFA) Fertilizer Research and Education Program (FREP) released a Special Request for Proposals to seek high-quality research that determines nitrogen accumulation and removal coefficients for specific crops grown in the central coast region (including Santa Cruz, Santa Clara, San Benito, San Luis Obispo, Santa Barbara and Ventura Counties). This special request focused on 21 priority crops identified by the Central Coast Water Board as requiring additional research to determine or improve nitrogen removal coefficients appropriate to cropping systems in the central coast region. Full proposals were due January 31, 2020 for projects that will begin in July 2020.

46. The following crops were identified requiring additional research to determine or improve nitrogen removal coefficients appropriate to cropping systems in the central coast: lettuce (all types); onions; arugula; broccolini; pepper, fruiting, jalapeno; beets; chard, baby; fennel; leek; parsley; radish; blueberry; radicchio; frisee; endive; shallots; chard, swiss bunch; tung ho (edible chrysanthemum); yam (leaves); gai choy (mustard greens); Chinese celery.

Nitrogen Discharge Timeframe

47. The findings below include a discussion of groundwater cleanup timeframes based on literature review and analyses performed by Central Coast Water Board staff. "Cleanup" in this discussion refers to the amount of time it will take for nitrate in groundwater to decrease to levels protective of human health (i.e., the water quality objective for the nitrate MCL of 10 mg/L nitrate as nitrogen) once nitrogen loading reduction requirements are instated. This Order requires Dischargers to reduce their discharge such that it no longer causes or contributes to

[11] See CDFA's website https://apps1.cdfa.ca.gov/FertilizerResearch/docs/N_Uptake.html

exceedances of water quality objectives but does not require Dischargers to clean up contaminated groundwater to achieve the water quality objectives, for example through remediation measures. Cleanup will be achieved by the recharge of increasingly better-quality agricultural return flows and reduced nitrogen loading over time. This discussion is nevertheless included to establish the impact and role of this Order in ultimately achieving water quality objectives in groundwater.

48. The cleanup timeframe for a particular groundwater basin or well will be highly site-specific. Understanding cleanup timeframes highlights the consequences of further postponing the changes in agricultural management practices that are needed to correct the current groundwater quality problems observed in the central coast region.

49. Improvements in groundwater quality will require either a substantial reduction in nitrogen loading beneath the crop root zone, the addition of high-quality water that can dilute the currently contaminated groundwater, or ideally a combination of both approaches. Augmenting the volume of clean recharge is beyond the scope of this Order. Regulating the discharge, or threat of discharge, of waste from irrigated agricultural lands is within the regulatory scope of this Order.

50. The amount of time needed to achieve the MCL for nitrate is a function of the transport rates through two discreet hydrologic zones: 1) transport from the contaminant source on the ground surface through the unsaturated zone to the water table, and 2) transport through the saturated zone to the discharge point (e.g., domestic well). Although calculating the amount of time needed to clean up groundwater involves incorporation of significant amounts of information, it is possible to estimate groundwater cleanup timeframes using the thickness of the unsaturated zone, the flow path distance through the saturated zone, and basic hydrogeologic parameters available in existing literature. In general, thick unsaturated zones and long saturated flow paths result in long cleanup times.

Case Study of Cleanup Time for a Large Contaminant Plume

51. Groundwater cleanup times exhibited at the Olin site near Morgan Hill, California provide a valuable analogue for understanding how quickly nitrate concentrations could respond to reductions in loading. Although the Olin site is a point source of perchlorate pollution, plume behavior in response to active cleanup, hydraulic control, dispersion, and aquifer dilution provides insights into how nitrate concentrations in central coast groundwater basins may respond to loading reductions.

52. Nitrate and perchlorate move similarly in groundwater; both constituents are soluble and therefore migrate along with groundwater. In the early 2000s, when perchlorate contamination caused by Olin was discovered in groundwater, the perchlorate plume was over ten miles long and about a mile wide; this plume size represents basin-scale impacts similar to nitrate pollution that currently exist in many central coast basins. At the Olin site, the source of the perchlorate contamination was removed and perchlorate in the plume was actively remediated via soil excavation and in situ bioremediation. Elsewhere within the plume, perchlorate continues to decrease via dispersion and dilution from clean recharge water entering the multi-aquifer system. By 2013 (seven years after source control and active remediation were conducted), only 8 of 188 domestic wells originally impacted by perchlorate above the MCL (6 micrograms per liter) still showed MCL exceedances. Perchlorate in the shallow unconfined aquifer (less than 50 feet deep) that is not used for drinking water had also largely been remediated.

53. The Olin case illustrates that domestic wells and shallow portions of the aquifer cleaned up relatively quickly due to active remediation of the pollutant source coupled with clean recharge entering the groundwater system. Similarly, in agricultural areas where nitrate pollution is moderate, it may be possible to meet the nitrate MCL relatively quickly if appropriate nitrogen loading reductions are implemented (i.e., source control), groundwater is shallow, and clean recharge water is able to infiltrate water-bearing zones.

Literature Review of Groundwater Cleanup Timeframes

54. A technical report jointly funded by the Monterey County Water Resources Agency and the USGS evaluated the amount that fertilizer application in the Salinas Valley must be reduced to achieve the nitrate MCL (Fogg et al., 1995). The authors also investigated how long it would take for groundwater nitrate concentrations to decrease to the MCL given a reduction in nitrogen application. The authors used a numerical model to simulate nitrogen loading and transport through both the saturated and unsaturated zones to receptor wells. Unsaturated zone transport times were corroborated using geochemical tracers.

    Two study areas with the Salinas Valley were chosen for the unsaturated zone transport time component of the study: one area near the city of Salinas and another near the city of Chualar. For areas where groundwater was 75-120 feet below ground surface, transport times through the unsaturated zone were determined to be on the order of 10 to 30 years. Additional modeling of transport through both the unsaturated and saturated zones indicated that for areas of the Salinas Valley where groundwater depth was 180 feet or less, there would be a 40 to 60 year lag between nitrogen loading at the ground surface and the arrival of nitrogen at the receptor wells. Thus, the benefits of reduced nitrogen application and loading reductions would not be reflected in water quality improvements for several decades, and nitrate concentrations may continue to increase for many years after the loading reductions are implemented. Additional model simulations indicated that nitrate concentrations will continue to increase over 100 to 200 years if nitrogen loading remains constant.

55. A subsequent study performed by Fogg et al. (1999) investigated the impacts of current (1999) nitrogen loading on future concentrations and concluded that "… the quality of groundwater is not sustainable under significant non-point source contamination created by current and past land use. The chances of ultimately destroying the groundwater resources would be reduced substantially by reductions in contaminant loading today." The authors concluded that historical loading created the current problem and current loading is exacerbating both a current and future problem.

56. A geochemical age-dating study from the Llagas sub-based on the Gilroy-Hollister Valley basin in San Benito County found that young groundwater (approximately 10 years old) typically had higher nitrate concentrations than old groundwater and that the source of this nitrate was most likely fertilizer from recent agricultural practices (Moran et al., 2005). A later geochemical age-dating study from the Salinas Valley found more mixed results whereby both old and young groundwater contained nitrate with a fertilizer chemical signature and high concentrations (Moran et al., 2011). Nitrate found within central coast groundwater basins likely reflects nitrogen application associated with agricultural practices from both the recent and distant past.

Numerical Modeling of Nitrate Transport

57. Researchers at UC Davis have used numerical modeling to better understand nitrate transport and cleanup times in central valley alluvial aquifers (Kourakos and Harter, 2013). Although these studies do not specifically address central coast groundwater basins, the land use and hydrogeologic nature of these central valley aquifers are similar to alluvial aquifers of the central coast. For example, basins included in the UC Davis studies are comprised of alluvial fill overlain by intensive commercial agriculture. As such, conclusions and lessons learned from these studies provide relevant context for estimating groundwater nitrate cleanup timeframes in central coast basins. However, it should be noted that central coast cropping patterns and crop types result in substantially higher volumes of nitrogen and water applied to crops than volumes applied to crops in the central valley. As a result, nitrate concentrations are typically higher in agriculturally dominated central coast groundwater basins relative to central valley analogs. The higher

nitrogen loading and resulting nitrate concentrations may give rise to longer groundwater cleanup timeframes relative to central valley counterparts.

58. UC Davis researchers used a numerical model to evaluate how quickly the nitrate concentration in groundwater responded to nitrogen loading at the ground surface (Kourakos and Harter, 2013). This study simulated transport to 1500 wells in the alluvial Modesto sub-basin of the southern San Joaquin Valley. Well depths in this study ranged from 10 feet to more than 300 feet below ground surface. The response times in these wells to nitrogen loading ranged from 5 to 50 years, with a mean response time of 30 years. This study did not account for the transport time through the unsaturated zone. Combining the modeled transport times from the UC Davis study with Salinas Valley unsaturated zone transport time estimates describes above (Fogg et al., 1995) results in transport times on the order of 15 to 80 years for changes in nitrogen loading practices to be reflected in nitrate concentrations in receptor wells.

59. Another UC Davis study modeled the impact of nitrogen loading on groundwater in the alluvial Tule River groundwater sub-basin in the central valley region (Kourakos et al., 2012). In this study, researchers simulated nitrogen loading and the resulting response in shallow domestic wells and deep irrigation wells. Simulated domestic well depths ranged from approximately 10 to 75 feet below ground surface and irrigation well depths ranged from 75 to 700 feet below ground surface. The average time it took for concentrations in domestic wells to exceed 10 mg/L nitrate as nitrogen (the MCL) was 41 years; for irrigation wells, it took an average of 386 years. Although this study did not explicitly investigate cleanup times, the observed response times are useful to inform the response times that could be expected from reductions in nitrogen loading. The UC Davis study results are in agreement in terms of time scale with the results of Fogg et al. in the Salinas Valley. Due to the time it takes for nitrate to travel through the unsaturated zone to the saturated zone, nitrate concentrations will likely continue to increase for decades even after nitrogen loading reductions have been implemented; however, this research also demonstrates that, on average, shallower domestic wells can be cleaned up within the lifetime of the people who use those wells.

Analytical Modeling of Central Coast Basins

60. Information on groundwater age can be useful for estimating the time needed to flush contaminants through a groundwater system (Plummer and Friedman, 1999). In general, young groundwater will respond more quickly to changes in land use practices and can be expected to clean up faster compared to older groundwater. Visser et al., 2014) compiled statewide groundwater age data from all California groundwater basins into maps that reveal groundwater ages in

central coast basins range from approximately 12 to 57 years old. It is important to note that these ages reflect only the amount of time groundwater has existed in the saturated zone and do not account for travel time from a recharge source through the unsaturated zone. After accounting for unsaturated zone transport times determined by Fogg et al. (1995; 10 to 30 years), it is estimated that cleanup times for the Salinas Valley are on the order of 22 to 87 years.

61. For other basins in the central coast region, unsaturated zone transport times are estimated based on published values for recharge rates, effective porosity of the unsaturated zone material, and the thickness of the unsaturated zone. The water-bearing portions of the Santa Maria groundwater basin are primarily comprised of unconsolidated sands and gravels (Worts, 1951. Recharge in the Santa Maria basin is dominated by irrigation return flows and was estimated using data submitted in the TNA reports. Cleanup times for the Santa Maria area were estimated using these values, groundwater age data, and equations for determining the velocity of transport time and travel time through the unsaturated zone, groundwater elevations compiled from the Department of Water Resources CASGEM[12] Program. For areas of southern Santa Maria near the Santa Maria airport, groundwater is approximately 30 years old, depth to groundwater is approximately 200 feet, and the estimated cleanup timeframes are on the order of 44 years. Using the same approach in the northern part of the basin, near the city of Santa Maria and the Santa Maria river (which provides the benefit of groundwater recharge), groundwater age is approximately 16 years, the depth to groundwater is approximately 100 feet, and the estimated cleanup timeframe is on the order of 23 years.

62. The timeframe estimates for areas of the Salinas and Santa Maria groundwater basins areas shown in **Table A.C.1-5** are based on immediately reducing nitrogen loading rates to the rates specified in each section of the table. However, this Order phases in nitrogen loading reductions over time, so the actual cleanup timeframes will be longer than what is estimated due to additional years of loading at rates greater than the 50 pounds of nitrogen per acre per year value.

63. Results of the analytical model simulations in **Table A.C.1-5** indicate that, at the current average nitrogen loading rate (approximately 340 pounds of nitrogen per acre per year), groundwater nitrate concentrations will increase through time and the nitrate MCL will never be achieved; concentrations reach a modeled steady-state concentration greater than the MCL after 120 years of simulation. This result

[12] The California Statewide Groundwater Elevation Monitoring (CASGEM) is a collaboration between local monitoring parties and the Department of Water Resources to collect groundwater elevations statewide and share the information publicly. https://water.ca.gov/Programs/Groundwater-Management/Groundwater-Elevation-Monitoring--CASGEM

agrees with the 1995 Fogg et al. study which concluded that nitrate concentrations would continue to increase for 100 to 200 more years if nitrogen loading remained constant.

Table A.C.1-5. Analytical Model Results in Santa Maria and Salinas-Forebay

	Santa Maria Basin	**Salinas-Forebay Basin**
Initial Nitrate Concentration (mg/L nitrate as nitrogen)	15 mg/L	35 mg/L
Distance from Recharge Area (Miles)	**Resulting Nitrate Concentrations at Various Nitrogen Loading Rate**	
50 pounds/acre/year Nitrogen Loading		
0.5	<10 mg/L (3 years)	<10 mg/L (19 years)
1	<10 mg/L (6 years)	<10 mg/L (39 years)
2	<10 mg/L (15 years)	<10 mg/L (85 years)
100 pounds/acre/year Nitrogen Loading		
0.5	<10 mg/L (5 years)	12 mg/L (120 years)
1	<10 mg/L (23 years)	15 mg/L (120 years)
2	13 mg/L (120 years)	18 mg/L (120 years)
150 pounds/acre/year Nitrogen Loading		
0.5	<10 mg/L (9 years)	17 mg/L (120 years)
1	14 mg/L (120 years)	22 mg/L (120 years)
2	20 mg/L (120 years)	27 mg/L (120 years)
340 pounds/acre/year Nitrogen Loading		
0.5	19 mg/L (120 years)	40 mg/L (120 years)
1	31 mg/L (120 years)	52 mg/L (120 years)
2	46 mg/L (120 years)	61 mg/L (120 years)

64. Loading rates of 50, 100, and 150 pounds of nitrogen per acre per year were also simulated. The results showed that the maximum loading rate at which the nitrate MCL could be achieved in less than 120 years was 150 pounds of nitrogen per acre per year for the modeled portion of the Santa Maria basin nearest the freshwater recharge provided by the Santa Maria river. In the Salinas-Forebay sub-basin, modeling results indicate that the nitrate MCL will only be achieved in less than 120 years if loading is reduced to 50 pounds of nitrogen per acre per year. This result is due in part to the higher saturated zone background concentrations in the Salinas-Forebay relative to Santa Maria (35 mg/L nitrate as nitrogen in Forebay versus 15 mg/L nitrate as nitrogen in Santa Maria). Because the analytical model does not account for unsaturated zone transport times, the cleanup times shown in the table should be considered minimum cleanup times. As previously discussed, unsaturated zone transport times in the Salinas Valley are likely on the order of 10 to 30 years, while in Santa Maria these unsaturated zone transport times may be on the order of 5 to 15 years.

65. **Table A.C.1-5**, above, demonstrates that there are a variety of factors influencing the amount of time it will take for groundwater to achieve the nitrate MCL, including the starting concentration, the loading volume and rate, and the distance from a clean recharge source. However, these results are generally consistent with the studies previously described which found that it will take decades, or in some cases more than a century, to meet the nitrate MCL even under reduced loading scenarios. These results also show that in some cases, cleanup may occur relatively quickly, especially if loading is substantially reduced and there is a source of clean recharge nearby.

Groundwater Cleanup Timeframe Conclusions

66. Existing literature from studies conducted in the Salinas Valley and central valley region and analytical modeling results demonstrate that reductions in nitrogen loading are required in order to achieve the groundwater MCL for nitrate. If nitrogen loading continues at current rates, there is strong agreement that groundwater nitrate concentrations will continue to increase into the foreseeable future.

67. The timeframe for groundwater to achieve the nitrate MCL is highly site-specific. Some parts of an aquifer may achieve the nitrate MCL more quickly than others and may be able to cleanup in as little as a few years or decades. The studies and analytical modeling results discussed above demonstrate that shallow groundwater and shallow domestic wells can achieve the nitrate MCL relatively quickly, possible as soon as a few decades, as long as reductions in nitrogen loading are implemented.

68. There is strong consensus that if current nitrogen loading rates continue, the current problem will continue into the future; in this case, future attempts to address the water quality problem will require more drastic reductions. There is also strong consensus that loading reductions will result in groundwater quality improvement over time. Delays in loading reductions will result in compounded delays in the cleanup timeframe, both due to the amount of time delay itself, as well as the amount of continuing degradation during the delay time period. For example, 10 years of delay in loading reductions will result in significantly more than 10 years of delay in the groundwater cleanup timeframe due to the additional loading and water quality degradation that occurs before the loading reductions are realized.

Pesticides in Groundwater

69. As discussed in the May 2018 staff report, monitoring data for pesticides in groundwater in the central coast region is limited, meaning the potential impacts to groundwater resources are largely unknown (CCRWQB, 2018c).

70. The primary state agencies monitoring pesticides in groundwater include the Department of Pesticide Regulation (DPR) and the State and Regional Water Boards. DPR's mission is to protect human health and the environment by regulating pesticide sales and use, and by promoting reduced-risk pest management. DPR prevents pollution by agricultural pesticides to groundwater and drinking water supplies by identifying pesticides that have the potential to pollute groundwater, conducting sampling to determine if those pesticides are present in groundwater, and conducing formal reviews to determine whether the use of the detected pesticides can be monitored to protect groundwater (DPR, 2016).[13]

71. While pesticide groundwater information is generally very limited, project specific data in the central coast region have been collected by the State Water Board's Division of Drinking Water (DDW) and Groundwater Ambient Monitoring and Assessment (GAMA) Program, DPR, or required by regulatory actions related to a specific facility regulated by the Central Coast Water Board (e.g., Site Cleanup Program).

72. The EPA has established primary MCLs for a number of pesticides. The EPA has also updated its Human Health Benchmarks for Pesticides[14] (HHBPs) in drinking water to reflect the latest scientific information. EPA develops these benchmarks as screening levels for use by states and water systems in determining whether the detection of a pesticide in drinking water or a drinking water source may indicate a potential health risk. A total of 394 HHBPs are now available for pesticides that are currently registered for use on food crops or could result in exposure through food or drinking water. The EPA developed these benchmarks to help determine whether the detection of a pesticide in drinking water or source waters for drinking water may indicate a potential health risk and to help prioritize monitoring efforts. The HHBP list includes pesticide active ingredients for which Health Advisories or enforceable National Primary Drinking Water Regulations (e.g. MCLs) have not been developed.

[13] A factsheet, video, and additional background information on DPR's groundwater protection program can be found on the DPR groundwater protection website: https://www.cdpr.ca.gov/docs/emon/grndwtr/
[14] The database of HHBPs can be found online: https://iaspub.epa.gov/apex/pesticides/f?p=HHBP:home:28116553285476

73. In general, all public water systems are required to be monitored for Title 22 chemicals, including synthetic organic chemicals such as pesticides (identified in Title 22, Table 64444-A). When justified, DDW has the authority to waive monitoring for one or more of the chemicals. For example, DDW Monterey District conducted an evaluation of pesticide use and waived the monitoring requirements for Monterey, San Benito, and Santa Cruz Counties, with the exception of chemicals used for roadside vegetation control and those specifically used on crops grown in these counties which also were known to travel easily through soil to the water table. Additionally, DDW Santa Barbara District conducted a similar analysis and established a similar waiver of pesticide monitoring requirements, with the exception of Atrazine and Simazine, which are required to be sampled at all public water systems on a nine-year cycle for San Luis Obispo, Santa Barbara, and Ventura Counties.

74. In 1985, the Legislature passed the Pesticide Contamination Prevention Act (PCPA). The PCPA was designed to prevent pesticide pollution of groundwater by agricultural use pesticides, with emphasis on the protection of public water supplies. DPR established a Groundwater Protection List which identifies specific chemicals that are designated as having the potential to pollute groundwater. This list is known as the Groundwater Protection List and is included in section D.1 of this Attachment A. The PCPA requires DPR to conduct groundwater monitoring for all pesticides labeled for agricultural, outdoor institutional, or outdoor industrial use that contain any of the chemicals identified on the Groundwater Protection List.

Historical Groundwater Pesticide Monitoring Results

75. Historical sampling results collected by DPR from 1986 to 2016 indicate a total of 178 verified/confirmed detections for central coast counties.[15] The data indicate that confirmed/verified detections of pesticides/degradates occurred in Monterey County (70 detections), Santa Clara County (30 detections), Santa Cruz County (40 detections), San Luis Obispo County (24 detections), and Santa Barbara County (14 detections).

76. Of the 178 agricultural use pesticide/degradate detections reported, 7 are pesticides/degradates listed on DPR's Groundwater Protection List (3 CCR 6800a-b). Other pesticides/degradates detected during this evaluation period include Dacthal degradates (51 detections), xylene (24 detections), TPA

[15] Of the 178 pesticide detections, 18 are confirmed or verified isolated detections. DPR protocol indicates that at least 2 detections of a pesticide in different wells within a mile are normally required to make an agricultural use determination.

degradates (21 detections), Naphthalene (13 detections), Ortho-dichlorobenzene (10 detections), DBCP (9 detections), Heptachlor and carbon disulfide (6 detections each), Ethylene dibromide (5 detections), and Picloram (4 detections).

77. DPR's 2017 Well Sampling Report includes well sampling data for the sampling period January through December 2016, as well as sampling performed under DPR study Z588 (Nordmark, 2016). The report includes data collected statewide, including for the central coast region. The principal agencies contributing groundwater monitoring data for this annual Well Sampling Report included DPR, State Water Board, and USGS.

78. The State Water Board's GAMA Program has conducted studies in the central coast region that indicate a higher incidence of pesticide detections in groundwater at very low levels (Kulongoski and Belitz, 2007, revised 2011) (Mathany et al., 2010). GAMA studies implement analytical techniques that achieve ultra-low detection levels between 0.004 and 0.12 micrograms per liter (generally less than 0.01 micrograms per liter), a fraction of the respective regulatory thresholds. Out of 54 wells sampled on a random grid in groundwater basins in the south coast range study unit (Los Osos Valley, San Luis Obispo, Santa Maria River Valley, San Antonio Creek Valley, and Santa Ynez River Valley groundwater basins/sub-basins), 28 percent of the wells had 11 pesticides/degradates detected in groundwater samples, with the three most abundant detections being deethylatrazine (18.5 percent), atrazine (9.3 percent), and simazine (5.6 percent). Of 97 wells sampled in the Monterey Bay and Salinas Valley Basins, 28 percent had pesticide detections, including simazine (18 percent), deethylatrazine (11 percent), and atrazine (5 percent). None of the pesticides detected as part of the GAMA program exceeded a health-based threshold value.

<u>Recent Groundwater Pesticide Monitoring Results</u>

79. DPR's 2017 Well Sampling Report included data for approximately 4,000 wells statewide that were sampled for one or more of the 133 agricultural use pesticides/degradates monitored. While monitoring is limited, the results identified verified detections[16] of pesticides/degradates in Monterey County. In Monterey County, 9 wells had reported detections of Dacthal degradates at concentrations ranging from 0.1 to 11.0 µg/L.

80. Recent monitoring for imidacloprid has resulted in detections in Fresno, Tulare, and Santa Barbara counties. In 2017, DPR sampled for imidacloprid in

[16] A verified detection is detected by two different laboratories or independent samples.

groundwater in parts of the Salinas and Santa Maria Valleys where historically high imidacloprid application rates occurred. In the Salinas Valley, 13 wells were sampled for imidacloprid and there were no detections. In the Santa Maria Valley, 18 wells were sampled for imidacloprid and one well had a detection at trace concentrations while another well had a high concentration detection. DPR is currently in the process of expanding this study into high imidacloprid use areas where groundwater depths are less than 130 feet below ground surface and domestic wells are available for sampling. In addition to targeted areas in six central and southern California counties, DPR will sample wells in San Luis Obispo, Santa Barbara, Monterey, and San Benito counties.

81. Throughout 2019, DPR partnered with the Central Coast Domestic Well Sampling effort to collect groundwater samples from private domestic wells in Monterey and San Benito counties. In Monterey County, 10 out of 20 private domestic wells had low detections of 2,3,5,6-tetrachloroterephthalic acl (TPA; a degradate of the herbicide DCPA). Bromocil was also detected in one of these wells, as was a trace amount of mefenoxam/metalaxyl in another well with a TPA detection.

82. Results from San Benito County sampling reveal 9 out of 18 wells had TPA detections. One of these wells also contained a trace detection of tebuthiuron. All TPA detections were well below a health level (2,500 µg/L) determined by the Office of Environmental Health Hazard Assessment (OEHHA), and bromocil was detected just slightly above DPR's reporting limit. DPR will continue to partner with this effort in 2020 when private domestic well sampling will occur in Santa Cruz County.

<u>Future Groundwater Pesticide Monitoring</u>

83. The Central Coast Water Board will continue to coordinate with DPR by inviting DPR staff to accompany personnel from the Central Coast Domestic Well Sampling Program when Central Coast Water Board staff obtain permission to sample private domestic wells in agricultural areas. This partnering allows DPR to access wells that may have otherwise been inaccessible to them. In addition, this partnering facilitates DPR's collection of groundwater samples for pesticide analyses, thereby expanding its pesticide database and better characterizing the extent and magnitude of pesticides in groundwater in the central coast region.

84. Based on consultation with DPR and other relevant agencies, the Central Coast Water Board will continue to identify data gaps in pesticide information and/or determine where further investigation of DPR's information is appropriate. In such cases, Central Coast Water Board staff will confirm potential sample locations with DPR and will require specific Dischargers enrolled in this Order to conduct

groundwater monitoring for specific pesticides in specific groundwater basins. Dischargers are responsible for conducting their own sampling and reporting; however, there will be situations where Dischargers may opt to coordinate with DPR for sample collection and analysis. Dischargers will continue to be required to report analytical results to the GeoTracker database in accordance with Water Code section 13267 requirements.

85. Currently available central coast groundwater pesticide data exist mainly due to access to specialized laboratories by DPR and the GAMA program studies. However, such specialized laboratories are not accessible to the general public, and many commercial laboratories are not capable of analyzing for currently used pesticides with the potential to migrate to groundwater. In addition, for commercial laboratories that can conduct analyses for relevant pesticides, the analyses are costly, and many laboratories have difficulty achieving sufficiently low detection and reporting limits. Based on these limitations and considerations, Dischargers are encouraged to work with DPR staff to help facilitate pesticide monitoring required by this Order and Water Code section 13267 requirements.

1,2,3-TCP in Groundwater

86. 1,2,3-Trichloropropane (1,2,3-TCP) is an organic compound that easily migrates with groundwater and has been detected in some public water systems and private domestic wells throughout California, including within the central coast region. Common sources of 1,2,3-TCP in groundwater include solvent-related discharges. Although 1,2,3-TCP is not a pesticide per se, among other uses, 1,2,3-TCP was formulated with dichloropropenes in the manufacturing of a soil fumigant (specifically, a nematicide) that is no longer available in the United States.

87. 1,2,3-TCP has a low MCL of 0.005 micrograms per liter (µg/L), or five parts per trillion, which is based on 1,2,3-TCP's classification as a human carcinogen.

88. The State Water Board's Division of Drinking Water (DDW) published a report entitled *1,2,3-Trichloropropane (1,2,3-TCP) Sampling in Q1 201*8 (SWRCB, 2018),[17] in which DDW concluded there was a clear correlation between the location of drinking water sources that exceed the 1,2,3-TCP MCL and agricultural/industrial activities.

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[17]DDW's 1,2,3-TCP website includes hyperlinks to water quality reports and data: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/123TCP.html

89. Inclusion of 1,2,3-TCP in domestic well monitoring is also substantiated by recent data from the Central Coast Water Board's Domestic Well Sampling Program (DWSP), which includes 1,2,3-TCP in its suite of analytes for sampled wells. As of December 2019, 18 out of 249 private domestic wells sampled in central coast counties by the DWSP tested positive for 1,2,3-TCP. All detections are in Monterey County and 17 exceeded the MCL. All 1,2,3-TCP detections are co-located with nitrate detections above the 10 mg/L nitrate as nitrogen MCL. These detections have warranted an alternate drinking water supply for users of the wells with 1,2,3-TCP MCL exceedances, and state and local entities are involved with providing impacted residents with bottled water while a long-term solution is being developed.

Monitoring and Reporting

90. This Order's MRP (Attachment B) requires all Dischargers to record and report the amount of nitrogen applied to crops and removed from the field and irrigation management information. This Order expands the requirement to report nitrogen applied from a subset of ranches required under Agricultural Order 3.0 to all ranches. This Order also phases in the requirement to report nitrogen removed and irrigation management information over several years. The cost of this reporting has a reasonable relationship to the benefits obtained from identifying, addressing, and reducing the nitrogen discharges at highest risk of degrading water quality and verifying compliance with the fertilizer application limits and nitrogen discharge targets and limits. Findings in section C.1 of this Attachment A document the impacts of agricultural nitrogen discharges on groundwater and demonstrate the need for fertilizer application and nitrogen discharge limits and provide the evidence that supports requiring Dischargers to submit the reports.

91. The MRP requires all Dischargers to conduct groundwater monitoring, including domestic well monitoring, irrigation well monitoring, trend monitoring, and groundwater discharge monitoring, and submit reports with the results. The costs of groundwater monitoring have a reasonable relationship to the need for and benefits obtained from groundwater monitoring, its role in protecting public health, and given the extent of exceedances of the human health standard for nitrate in the central coast region. Dischargers can reduce their costs by joining a third-party group for groundwater monitoring in lieu of individual monitoring. The Central Coast Water Board needs these reports to document and ensure compliance with this Order. Findings in section C.1 of this Attachment A document the impacts of agricultural discharges on groundwater that demonstrate the need for groundwater monitoring reports and provide the evidence that supports requiring Dischargers to submit the reports.

Section C.2. Irrigation and Nutrient Management for Surface Water Protection

Surface Water Priority Areas and Magnitude Exceedance Quotients

1. The findings in this sub-section apply to all three surface water sections: C.2, C.3, and C.4; this sub-section describes the method used to establish this Order's Surface Water Priority areas, including the Magnitude Exceedance Quotient (MEQ) method developed by the Surface Water Ambient Monitoring Program (SWAMP).

2. This Order establishes Surface Water Priority areas based on the relative level of water quality impairment and risk to water quality. All ranches are assigned a Surface Water priority of 1, 2, 3, or 4 based on the water quality impairment identified at monitoring sites, the number of miles of impaired waterbodies, and the percent of irrigated agricultural land located within each HUC-8[18] watershed area.

3. The water quality data used to establish the Surface Water Priority areas was submitted by Central Coast Water Quality Preservation, Inc. (CCWQP) Cooperative Monitoring Program (CMP) between 2005 and 2019. The data was downloaded from the State Water Board's California Environmental Data Exchange Network (CEDEN).

4. Section D of this Attachment A includes a complete list of all parameters and threshold comparison values used to analyze the CMP data, tables of MEQ scores, and tables of exceedance rates for various surface water quality parameters.

5. The SWAMP MEQ scoring methodology was used to calculate scores for each individual parameter at each of the 55 CMP monitoring sites during the dry season (May 1 to September 30) and wet season (October 1 through April 30). The MEQ approach considers the magnitude of each measurement relative to a parameter's applicable water quality threshold and the frequency of samples exceeding the threshold. These factors are then combined into a single score between 0 and 100. Total wet and dry season MEQ scores were calculated for each parameter category and the MEQ scores were then combined, resulting in an overall MEQ score for each CMP monitoring site. The significance of each score is shown below. The scores were used to represent water quality impairment.

[18] The National Hydrography Dataset (NHD) Plus Watershed Boundary Dataset (WBD) defines Hydrologic Unit Code 8 (HUC-8) watershed drainage areas.

   a. 100 to 90: Excellent water quality
   b. 89.9 to 80: Good water quality
   c. 79.9 to 65: Fair water quality
   d. 64.9 to 45: Poor water quality
   e. 44.9 to 0: Very Poor water quality

6. Spatial data associated with the California 2014 and 2016 Integrated Report Clean Water Act 303(d) Impaired Water Bodies List (303(d) List) were used to calculate the total miles of impaired surface waterbodies as an additional indication of water quality impairment.

7. The California Department of Conservation's Farmland Mapping and Monitoring Program (FMMP) data was used to determine the percentage of irrigated agricultural land draining to each CMP monitoring site as a proxy for risk to water quality.

8. The National Hydrography Dataset (NHD) Plus Watershed Boundary Dataset (WBD) Hydrologic Unit Code 8 (HUC-8) layers were used to define hierarchical watershed boundaries that encompass the entire region. Each HUC-8 watershed area was assigned a Surface Water Priority based on the area's scores in the three parameters listed above: MEQ, miles of impaired waterbodies, and percentage of irrigated agricultural land.

9. The following criteria were considered but not selected for inclusion in the parameters determining the Surface Water Priority areas. A sensitivity analysis was performed to determine the impact of excluding items a, b, and c below, and it was found that the final HUC-8 rankings were not impacted by including or excluding those parameters. Item d was excluded because it is largely duplicative of the 303(d) List, and the 303(d) List is more comprehensive because it includes all impaired waterbodies, rather than only waterbodies with approved TMDLs in place.
   a. Miles of steelhead critical habitat designated by the National Oceanic and Atmospheric Administration (NOAA);
   b. Acres of wetlands and deep-water habitat (National Wetlands Inventory);
   c. Downstream influence on major estuaries or areas of special biological significance, as defined by the Basin Plan; and
   d. Presence of TMDLs with agricultural discharges listed as a pollutant source.

10. Based on current enrollment information, the number of ranches and the irrigated acreage within each Surface Water Priority area is provided below.

a. Surface Water Priority 1 includes approximately 430 ranches (10 percent) representing approximately 48,000 irrigated acres (11 percent).
b. Surface Water Priority 2 includes approximately 1300 ranches (29 percent) and 200,000 irrigated acres (46 percent).
c. Surface Water Priority 3 includes approximately 1700 ranches (38 percent) and 100,000 irrigated acres (23 percent).
d. Surface Water Priority 4 includes approximately 1000 ranches (23 percent) and 83,000 irrigated acres (19 percent).

11. Prioritizing watershed areas and requiring follow-up implementation plans to be developed over time will allow time for third-party groups and technical assistance providers to increase their capacity to provide compliance assistance to Dischargers.

Impacts to Surface Water – General

12. The findings in this sub-section relate to surface water impairments and monitoring efforts in general, and so apply to all three surface water sections of this Order: C.2, C.3, and C.4.

13. The March 2018 staff report titled *Surface Water Quality Conditions and Agricultural Discharges in the Central Coast Region* (CCRWQCB, 2018b) included a detailed discussion of current surface water quality conditions and impacts from agricultural discharges on surface water quality. Several analyses included in that report have been updated to incorporate additional surface water monitoring data received through 2019 and are incorporated into findings in this Attachment A.

14. The 2014-2016 303(d) List identified surface water impairments for 224 waterbodies related to a variety of pollutants (e.g., salts, nutrients, pesticides/toxicity, and sediment/turbidity). Of those 224 surface water listings, 29 percent listed agriculture as one of the potential sources of water quality impairment (SWRCB, 2017).

15. Sections C.2 through C.4 in this Attachment A reference water quality data collected through June 2019 and stored in CEDEN. When analyzing CEDEN data, all samples assigned “non-detect” values were replaced with that sample’s Method Detection Limit (MDL) value. In the case where the MDL value was greater than the threshold the sample data was being compared to, the sample was not considered to be exceeding the threshold. All samples assigned “Detection, Not Quantifiable” (DNQ) values were assigned the sample’s Reporting Limit (RL) value. In the case there the RL value was greater than the threshold the

sample data was being compared to, the sample was not considered to be exceeding the threshold.

16. The central coast region includes a diverse landscape of agricultural row crops, orchards, and vineyards, rapidly expanding urban areas, and many miles of paved roadways. As discussed in detail in the March 2018 staff report, chemicals applied to the land include synthetic and organic forms of fertilizers, pesticides, herbicides, petroleum products and others; the constituents of these applications are routinely discharged to surface waters, and ultimately the ocean. Pesticides and nutrients are causing widespread degradation of water quality and beneficial uses in the central coast region. Research projects and monitoring programs have shown high concentration and mass loading of chemicals discharged from agricultural areas and entering the waterways of the region through irrigation, tile drain, and stormwater discharges. CCAMP data and the Agricultural Order-specified monitoring conducted by the CMP provide extensive documentation of these significant water quality impacts (CCRWQCB, 2018b).

17. The impacts from agricultural discharges on surface water quality is and has been monitored by various programs, including:

    a. The Central Coast Ambient Monitoring Program (CCAMP): The CCAMP study design includes 193 core program monitoring sites throughout the central coast region. Each year, CCAMP staff conduct monthly monitoring at 60 to 66 sites, including 33 “coastal confluence” sites an annual rotation of 30 to 33 watershed sites. Monthly monitoring conducted at core CCAMP sites includes analysis for approximately 30 parameters (nutrients, major ions, metals, dissolved and suspended solids, and fecal indicator bacteria), as well as field measurements for flow (discharge), dissolved oxygen, turbidity, pH, temperature, and salinity. At a subset of the 193 core program sites, additional monitoring is conducted, including toxicity (at 125 total sites to date), organic chemistry (pesticide) analyses (123 sites), bioassessment for benthic invertebrate and algal community structure and physical habitat (119 sites), and Riparian Rapid Assessment Method (RipRAM) (103 sites).
    b. Cooperative Monitoring Program (CMP): CMP monitoring began in 2005 and is focused on waterbodies currently on the 303(d) List in agricultural areas. Since 2005, the CMP has focused on assessing agricultural water quality for Agricultural Order 1.0, 2.0, and 3.0, and has collected and analyzed data for multiple parameters from 55 sites in multiple watersheds. CMP data show widespread toxicity and pollution in agricultural areas

Impacts to Surface Water – Nutrients

Nitrate

18. Nitrate pollution in surface water is widespread in agricultural areas in the central coast region, with 65 waterbodies listed as impaired for nitrate on the 2014-2016 303(d) List. Of these nitrate listings, 60 percent are located in the major agricultural watersheds of the central coast region: Salinas River area (15 waterbodies listed), Pajaro River (13 waterbodies), and Santa Maria River (15 waterbodies) (SWRCB, 2017). Other significant nitrate listings exist in small drainages in areas of intensive agriculture or greenhouse activity along the south coast, including Arroyo Paredon, Franklin Creek, Bell Creek and Glen Annie creeks (CCRWQCB, 2009a).

19. For surface waters with the municipal and domestic supply beneficial use, the applicable numeric water quality objective for nitrate is the primary drinking water standard, or MCL, developed by the Division of Drinking Water. The MCL for nitrate as nitrogen, 10 mg/L. The focus of the MCL is on protecting human health, not aquatic life. The Central Coast Water Board estimates that concentrations on the order of 1.0 mg/L nitrate as nitrogen are necessary to protect aquatic life beneficial uses from biostimulation based on an evaluation of CCAMP data (CCRWQCB, 2010). The Central Coast Water Board used these criteria to evaluate surface water quality impairments to aquatic life beneficial uses in the 2014-2016 303(d) List.

20. Discharge from even a single agricultural operation can result in adjacent creek concentrations exceeding the nitrate MCL and the much lower concentrations necessary to protect aquatic life. Many heavily urbanized creeks show only slight impacts from nitrate, with most urban impact associated with wastewater discharges (CCAMP, 2010a).

21. Agricultural discharges result in significant nitrate pollution in the major agricultural areas of the central coast region (CCAMP, 2010a). More than 64 percent of all sites from 2005-2019 CMP datasets have average nitrate concentrations that exceed the nitrate MCL and concentrations necessary to protect aquatic life. Over 42 percent of all CMP sites have a total average nitrate concentration that exceeds the nitrate MCL by two-fold or more; three CMP sites have average nitrate concentrations that exceed the drinking water standard by five-fold or more. Some of the most seriously polluted waterbodies include the waterbodies listed below. Section D.2 of this Attachment A includes tables displaying nitrate concentrations and exceedance rates at CMP monitoring sites.

a. Lower Santa Maria River (including Orcutt-Solomon Creek and Bradley Channel);
b. Oso Flaco Watershed (including Oso Flaco Creek and Little Oso Flaco Creek);
c. Pajaro River (including Llagas Creek, San Juan Creek, and Furlong Creek);
d. Lower Salinas River (including Quail Creek, Chualar Creek, and Blanco Drain); and
e. Tembladero Slough system (including Old Salinas River, Alisal Slough, Espinosa Slough, Gabilan Creek, and Natividad Creek).

22. Based on data collected during Agricultural Order 3.0 (2017-2019), the average nitrate concentration at 56 percent of all CMP sites exceeds the nitrate drinking water standard; 44 percent of all sites 3.0 have an average nitrate concentration that exceeds the drinking water standard by two-fold or more; and two CMP sites have an average nitrate concentration that exceeds the drinking water standard by five-fold or more.

23. Section D.2 of this Attachment A includes tables of nitrate MEQ scores for CMP monitoring sites based on data collected under Agricultural Order 1.0 (2005-2012), Agricultural Order 2.0 (2012-2017), and Agricultural Order 3.0 (2017-2019).

24. Dry season flows have decreased over the last decade in some agricultural areas that historically have had significant tailwater runoff. Detailed flow analysis by the CMP shows that 18 of 27 sites in the lower Salinas and Santa Maria watersheds had statistically significant decreases in dry season flow over the first 5 years of the monitoring program. Some sites that show increasing concentrations of nitrate have coincident declining trends in flow, possibly due to reductions in tailwater (CCWQP, 2009a). CCAMP monitoring has detected declining flows at other sites elsewhere in the Region through the end of 2009 (CCAMP, 2010a), likely attributable to drought.

25. Nitrate concentrations in Oso Flaco Lake exceed the levels that support aquatic life beneficial uses, threatening remaining populations of two endangered plants, marsh sandwort and Gambel's watercress. In 25 water samples taken from Oso Flaco Lake in 2000-2001 and 2007, levels of nitrate/nitrite (as nitrogen) averaged 30.5 mg/L with a minimum of 22.0 mg/L and a maximum of 37.1 mg/L (CCAMP, 2010a). Biostimulation in Oso Flaco Lake has caused the rapid and extreme growth of common wetland species, which are now crowding out sensitive species that have not become similarly vigorous (USFWS, 2010). CMP data collected in Oso Flaco Creek and Little Oso Flaco Creek, tributaries to Oso Flaco Lake, show average concentrations greater than 30 mg/L nitrate as nitrogen based on 2005

through 2019 data and show consistent “very poor” MEQ scores based on data collected under each agricultural order (see tables in Section D.2).

26. A CMP site located in Furlong Creek has exceeded the 10 mg/L nitrate MCL in 100 percent of all 32 samples taken between 2005-2019.

27. Based on data collected during Agricultural Order 3.0 (2017-2019), 7 CMP sites at Furlong Creek, Alisal Slough, Blanco Drain, Little Oso Flaco Creek, Oso Flaco Creek, Orcutt Solomon Creek, and the Santa Maria River had 100 percent of samples taken exceed the nitrate MCL of 10 mg/L.

28. Elevated levels of nitrate degrade water quality and impair beneficial uses for surface water, groundwater (drinking water), and aquatic habitat. Nitrate pollution is a widespread threat to human health in the central coast region. USEPA reported that nitrogen and phosphorus pollution, and the associated degradation of drinking and environmental water quality, has the potential to become one of the costliest and most challenging environmental problems the nation faces (USEPA, 2011) (CCRWQCB, 2018b).

Nitrate MEQ and Changes Over Time

29. Based on data collected during Agricultural Oder 1.0 (2004 to 2012):
    a. 34 CMP sites received poor or very poor nitrate MEQ scores during the dry season; 5 sites received fair scores; 8 sites received good or excellent scores.
    b. 32 CMP sites received poor or very poor nitrate MEQ scores during the wet season; 7 sites received fair scores; 9 sites received good or excellent scores.

30. Based on data collected during Agricultural Order 2.0 (2012 to 2017):
    a. 34 CMP sites received poor or very poor nitrate MEQ scores during the dry season; 3 sites received fair scores; 13 sites received good or excellent scores.
    b. 32 CMP sites received poor or very poor nitrate MEQ scores during the wet season; 9 sites received fair scores; 12 sites received good or excellent scores.

31. Based on data collected during Agricultural Order 3.0 (2017 to 2019):
    a. 35 CMP sites received poor or very poor nitrate MEQ scores during the dry season; 7 sites received fair scores; 11 sites received good or excellent scores.

   b. 30 CMP sites received poor or very poor nitrate MEQ scores during the wet season; 10 sites received fair scores; 15 sites received good or excellent scores.

32. Tables of nitrate MEQ scores are included in Section D.2.

Un-Ionized Ammonia

33. The Basin Plan numeric water quality objective for un-ionized ammonia, protective against toxicity in surface waters, states "the discharge of wastes shall not cause concentrations of un-ionized ammonia (NH3) to exceed 0.025 mg/L (as N) in receiving waters."

34. Agricultural discharges result in un-ionized ammonia concentrations at levels that are toxic to salmonids at some sites in areas dominated by agricultural activity (USEPA, 1999). The waterbodies where these sites are located are on the 2014-2016 303(d) List of Impaired Waterbodies due to un-ionized ammonia, particularly in the lower Salinas and Santa Maria river areas (SWRCB, 2017). These waterbodies include:
   a. Lower Salinas River area (including Salinas Reclamation Canal, Santa Rita Creek, Chualar Creek, and Quail Creek);
   b. Santa Maria River area (including Bradley Canyon Creek, Bradley Channel, Main Street Canal, Oso Flaco Creek, and Orcutt-Solomon Creek).

35. More than 27 percent of all sites from 2005-2019 CMP datasets have average un-ionized ammonia concentrations that exceed the Basin Plan numeric objective of 0.025 mg/L; 20 percent of CMP sites have average un-ionized ammonia concentrations that exceeds the numeric objective by two-fold or more; two CMP sites have average un-ionized ammonia concentrations that exceed the Basin Plan numeric objective by five-fold or more. Some of the waterbodies most seriously polluted by un-ionized ammonia include the following:
   a. Santa Maria River area (including Bradley Canyon Creek, Bradley Channel, Orcutt Creek, and the Main Street Canal);
   b. Salinas River Area (including Salinas Reclamation Canal, Santa Rita Creek, Natividad Creek, Chualar Creek, and Quail Creek); and
   c. Oso Flaco Watershed (including Oso Flaco Creek).

36. Based on data collected during Agricultural Order 3.0 (2017 to 2019), the average un-ionized ammonia concentrations at 27 percent of all CMP sites exceed 0.025 mg/L Basin Plan numeric objective; 19 percent of all CMP sites during Ag Order

3.0 have an average un-ionized ammonia concentration that exceeds the numeric objective by two-fold or more; and 4 CMP sites have average un-ionized concentrations that exceed the numeric objective by five-fold or more.

Orthophosphate

37. Analysis of CMP Data collected between 2005-2019 indicate that 58 percent of all CMP sites with orthophosphate load allocations[19] have a total average orthophosphate concentration that exceed the 0.3 mg/L reference number[20] (USEPA, 1988)). Additionally, 21 percent of all CMP sites have a total average orthophosphate concentration that exceeds the 0.3 mg/L reference number by two-fold or more; 1 CMP site has an average orthophosphate concentration that exceeds the reference number by five-fold or more. Some of the waterbodies most seriously polluted by orthophosphate include the following:
    a. Santa Maria River area (including Main Street Canal, Santa Maria River, and Green Valley Creek);
    b. Salinas River area (including Quail Creek, Chualar Creek, Gabilan Creek, Salinas River Reclamation Canal, Old Salinas River, and Natividad Creek); and
    c. Pajaro River area (including San Juan Creek, Furlong Creek, and Salsipuedes Creek).

38. Based on data collected during Agricultural Order 3.0 (2017 to 2019), the average orthophosphate concentration at 55 percent of CMP sites with orthophosphate load allocations exceeds the 0.3 mg/L reference number; 11 percent of sites with orthophosphate load allocations have a total average orthophosphate concentration that exceed the reference number by two-fold or more; one CMP site has an average orthophosphate concentration that exceeds the reference number by five-fold or more.

Nutrient Limits and Time Schedules

39. This Order establishes numeric limits for nutrients in the receiving waters. If ongoing monitoring shows that an applicable receiving water limit is not being met in a waterbody segment prior to the compliance date for the limit, in accordance with the surface water follow-up monitoring described in the MRP, Dischargers must submit a workplan that proposes implementation measures to address the

[19] As of November 2019, the following TMDLs with orthophosphate load allocations are in place: Lower Salinas River Watershed Nutrient TMDL, Pajaro River Watershed Nutrient TMDL, and Santa Maria River Watershed Nutrient TMDL.
[20] The reference number is the State of Nevada phosphate criteria for streams.

exceedances, as well as perform additional follow-up monitoring for source identification purposes. If the receiving water limit is not met by the compliance date, Dischargers are subject to a numeric discharge limit that is the same as the receiving water limit. Dischargers may also be required to perform additional ranch-level surface discharge monitoring and reporting to confirm that they are achieving the numeric discharge limit.

40. Many waterbodies in the central coast region have established nutrient TMDLs. In those cases, the numeric limits and time schedules established in this Order are equivalent to those defined in the TMDLs.

41. Waterbodies that do not have established TMDLs for nitrate or un-ionized ammonia are assigned numeric limits based on the Basin Plan: 10 mg/L nitrate as nitrogen and 0.025 mg/L un-ionized ammonia as nitrogen. This Order does not establish orthophosphate limits for non-TMDL areas because there is not a numeric objective for orthophosphate in the Basin Plan.

42. The numeric limits established in this Order will be updated as future TMDLs are adopted or updated and waterbody-specific load allocations are defined. For example, numeric limits for orthophosphate will be incorporated if they are defined through a TMDL.

43. In establishing the time schedules for achieving the numeric limits, the typical time schedules included in TMDLs were considered. Nutrient TMDLs have historically provided between 3 and 13 years to achieve the nitrate MCL and Basin Plan un-ionized ammonia water quality objective, providing an average of 8 years. This Order requires the nutrient numeric limits to be achieved within 11 years. This time schedule is reasonable given the similarity to TMDL time schedules, the degree of impairment to surface water quality and impacts on aquatic life beneficial uses, and the fact that agricultural orders regulating agricultural discharges have been in place since 2004.

Monitoring and Reporting

44. The monitoring and reporting requirement discussed in the following finding applies to all surface water monitoring; therefore, the finding applies to Sections C.2, C.3, and C.4.

45. The MRP requires all Dischargers to conduct surface water monitoring and some Dischargers to sample waste discharges that leave enrolled ranches and submit reports with the results. The costs of surface water monitoring have a reasonable relationship to the benefits of surface water monitoring and its role in protecting

aquatic life beneficial uses given the significant toxicity and water quality exceedances already observed in monitoring data in the central coast region. Dischargers can reduce their costs by joining a third-party group for surface water monitoring in lieu of individual monitoring. The Central Coast Water Board needs these reports to document and ensure compliance with this Order. Findings in section C.2, C.3, and C.4 of this Attachment A document the impacts of agricultural discharges on surface water that demonstrate the need for surface water monitoring reports and provide the evidence that supports requiring Dischargers to submit the reports.

Section C.3. Pesticide Management for Surface Water Protection

1. The sections on *Surface Water Priority Areas and Magnitude Exceedance Quotients (MEQ)*, *Impacts to Surface Water – General*, and *Monitoring and Reporting* in Section C.2 also apply to Section C.3.

Impacts to Surface Water – Pesticides and Toxicity

General Information

2. The Basin Plan general objective for toxicity states: "*All waters shall be* maintained *free of toxic substances in concentrations which are toxic to, or which produce detrimental physiological responses in human, plant, animal, or aquatic life*."

3. The Basin Plan general objective for pesticides states: "*No individual pesticide or* combination *of pesticides shall reach concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediments or aquatic life.*"

4. Toxicity in surface water is widespread in agricultural areas of the central coast region, with 57 waterbodies on the 2014-2017 303(d) List due to toxicity (SWRCB, 2017). Of these waterbodies, 68 percent are in the Salinas River watershed, including the Gabilan/Tembladero Slough, Santa Maria River, and Pajaro River watersheds.

5. Elevated pesticide concentrations are widespread in agricultural areas of the central coast region, with 45 waterbodies on the 2014-2017 303(d) List due to elevated pesticide concentrations (SWRCB, 2017). Of these waterbodies, 71 percent are in lower Pajaro River, Santa Maria River, and Salinas River watersheds. Several waterbodies are on the 2014-2016 303(d) List for multiple pesticides.

6. The 2014-2016 303(d) List does not include any neonicotinoid data and has very limited pyrethroid data, and therefore does not reflect the shift in pesticide usage towards these two classes of pesticides. The Central Coast Water Board anticipates several additional listings when those data are included in the future assessment (CCRWQCB, 2018b).

7. Many of the findings included below demonstrate that the Basin Plan objectives for toxicity and pesticides are not being achieved in central coast waters.

8. Based on CCAMP, CMP, and other monitoring data, multiple pesticides (listed in **Table A.C.3-1** below) have been detected in central coast surface waterbodies. However, many currently applied pesticides have not been monitored for. Additional monitoring for individual pesticides is needed to identify changes in pesticide loading and to identify concentrations of toxic and/or bioaccumulating substances not previously identified.

Table A.C.3-1. Pesticides Detected in Central Coast Waterbodies

2,4-D	Ethalfluralin	Oryzalin
Acephate	Ethoprop	Oxadiazon
Acetamiprid	Fenamidone	Oxamyl
Alachlor	Fenamiphos	Oxyfluorfen
Aldicarb	Fenoxycarb	Paraquat dichloride
Allethrin	Fenpropathrin	PCNB
Atrazine	Fenthion	Pendimethalin
Azinphos-methyl	Fenvalerate	Permethrin
Azoxystrobin	Fipronil	Phorate
Benefin	Fludioxonil	Phosmet
Bensulide	Flonicamid	Prallethrin
Bentazon, sodium salt	Fluopicolide	Prodiamine
Bifenthrin	Fluvalinate	Prometon
Boscalid	Gamma cyhalothrin	Prometryn
Bromacil	Glyphosate	Propanil
Bromoxynil octanoate	Hexazinone	Propargite
Butylate	Hydramethylnon	Propiconazole
Carbaryl	Imidacloprid	Propoxur
Carbendazim (methyl 2-benzimidazolecarbamate)	Indoxacarb	Propyzamide
Carbofuran	Lambda cyhalothrin	Pyriproxyfen
Chlorantraniliprole	Linuron	Pyraclostrobin
Chlorpyrifos	Malathion	S.S.S-tributyl
Chlorthal-dimethyl	Mandipropamid	Sulprofos
Clothianidin	MCPA	Phosphorotrithioate

Cycloate	MCPA, dimethylamine salt	Siduron
Cyfluthrin	Metalaxyl	Simazine
Cypermethrin	Methidathion	Tebuconazole
DDVP	Methiocarb	Tebuthiuron
Deltamethrin	Methomyl	Terbuthylazine
Desulfinyl fipronil	Methoxyfenozide	Tetraconazole
Diazinon	Methyl isothiocyanate	Tetrachlorvinphos
Dicamba	Methyl parathion	Thiacloprid
Dicofol	Metribuzin	Thiamethoxam
Dimethoate	Mevinphos	Thiobencarb
Dinotefuran	Molinate	Triallate
Disulfoton	Myclobutanil	Triadimefon
Diuron	Naled	Triadimenol
Endosulfan	Napropamide	Triclopyr
EPTC	Norflurazon	Trifluralin
Esfenvalerate	Novaluron	

9. Recent data show several relatively new fungicides (azoxystrobin, pyraclostrobin, and boscalid) in fish tissue and sediment of lagoons in the central coast region (Anderson et al., 2010).

10. Multiple studies, including some using Toxicity Identification Evaluations (TIEs), have shown that organophosphate pesticides and pyrethroid pesticides in central coast waters are likely causing toxicity to fish and invertebrate test organisms (CCAMP, 2010a; CCWQP, 2008a; CCWQP, 2009a; CCWQP, 2010d; Hunt et al., 2003, Anderson, et al. 2003; Anderson et al., 2006a; Anderson et al., 2006b).

11. Agriculture-related toxicity studies conducted in the central coast region since 1999 indicate that toxicity resulting from agricultural waste discharges of pesticides has caused declining aquatic insect and macroinvertebrate populations in central coast streams (Anderson et al., 2003a; Anderson et al., 2003b, Anderson et al., 2006a; Anderson et al., 2006b; Anderson et al., 2010).

12. Fish and sand crabs from the Salinas, Pajaro, and Santa Maria estuaries had detectable levels of currently applied fungicides, herbicides, and legacy pesticides like DDT based on a recently completed study of these central coast lagoons (Anderson et al., 2010). Multiple samples from the Santa Maria Estuary, the most impacted of the three estuaries, also contained chlorpyrifos, diazinon, and malathion (organophosphate pesticides), and bifenthrin and cyfluthrin (pyrethroid pesticides). Department of Public Health human consumption guideline levels for these pesticides in fish tissue are not available. This is the first study in this region documenting these currently applied pesticides in fish tissue.

13. Agricultural use rates of pesticides in the central coast region and associated toxicity is among the highest in the state. In a statewide study of four agricultural areas conducted by the DPR, the Salinas study area had the highest percent of surface water sites with pyrethroid pesticides detected (85 percent), the highest percent of sites that exceeded levels expected to be toxic and lethal to aquatic life (42 percent), and the highest rate (by three-fold) of active ingredients applied (113 lbs/acre) (Starner et al., 2006).

14. Creek bottom sediments are most consistently toxic in the lower Salinas and Santa Maria watersheds, areas dominated by intensive agricultural activity. Of sites sampled for sediment toxicity, 70 percent have been toxic at least once (sites selected for sediment toxicity sampling typically represent higher risk areas) (CCAMP, 2010a).

15. Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), a pesticide must obtain USEPA registration prior to being sold or distributed in the United States. A pesticide may be registered if, when used in accordance with any limitations imposed by USEPA, it will not cause unreasonable adverse effects on the environments (FIFRA section 3(c)(5), 7 U.S.C. section 136a(c)(5)). Such adverse effects on the environment include impacts to groundwater and surface water and their beneficial uses. When USEPA determines that use limitations are necessary, such as specified application methods, geographical use restrictions, or precautionary measures, those limitations must appear on the product's labeling. It is a violation of FIFRA to use a pesticide in a manner inconsistent with its labeling (FIFRA section 12(a)(2)(G), 7 U.S.C. section 136j(a)(2)(G)).

Organophosphates

16. The breakdown products of organophosphate pesticides are more toxic to amphibians than are the products themselves (Sparling and Fellers, 2007).

17. The National Oceanic Atmospheric Administration National Marine Fisheries Service (NMFS) issued a Biological Opinion that concluded that USEPA's registration of pesticides containing chlorpyrifos, diazinon, and malathion is likely to jeopardize the continued existence of 27 endangered and threatened Pacific salmonids and is likely to destroy or adversely modify designated critical habitat for 25 threatened and endangered salmonids because of adverse effects on salmonid prey and water quality in freshwater rearing, spawning, migration, and foraging areas (NMFS, 2008).

18. In October 2019, the California EPA announced that virtually all chlorpyrifos sales in California will end in the year 2020 (CalEPA, 2019).

Neonicotinoids and Pyrethroids

19. Data on current commercial application of pesticides indicate that neonicotinoid and pyrethroid pesticide use in the central coast region and statewide is generally increasing in urban and agricultural areas. These pesticides have been detected at toxic levels at a number of locations in the central coast region in recent years. Both the EPA and DPR are reevaluating uses of pyrethroid and neonicotinoid pesticides because of environmental impacts. Neonicotinoids are also of concern because of their known impacts to honeybees and other pollinators.

20. DPR data from 2010 to 2014 for Monterey and Santa Barbara Counties show an annual increase of neonicotinoid pesticide active ingredient applied (thiamethoxam, imidacloprid, thiacloprid, dinotefuran, acetamiprid) from 43,351 pounds applied in 2010 to 70,824 pounds applied in 2014. For the same time period, pounds of active ingredient applied of pyrethroid pesticides (gamma-cyhalothrin, lambda-cyhalothrin, bifenthrin, beta-cyfluthrin, cyfluthrin, esfenvalerate, permethrin, cypermethrin, fenvalerate) increased from 46,638 pounds applied in 2010 to 70,378 pounds applied in 2014.

21. In September 2014, a collaborative study between CCAMP, DPR, and the Granite Canyon Marine Pollution Studies Laboratory evaluated nine sites in the Santa Maria and Salinas watersheds for a broad suite of pesticides and two different toxicity test organisms (Anderson et al., 2017). These sites are also sampled by the CMP.

    The study data showed frequent detections of imidacloprid and pyrethroid pesticides, with toxicity commonly found to Hyalella (an amphipod sensitive to pyrethroids) and Chironomus (a fly larvae sensitive to neonicotinoids). All but one site (89 percent) were toxic to one or both test species. CMP sampled the same sites one month earlier in August 2014, using the traditional toxicity test species required by Agricultural Order 2.0 - Ceriodaphnia (waterflea), Selenastrum (algae), and Pimephales (fat-head minnow). No toxicity was found at any of the sites using these test species. These findings demonstrate the importance of selecting test organisms that are sensitive to the chemicals found at the site and also suggest that monitoring requirements for the CMP need to be adjusted in response to changes in pesticide use patterns.

22. DPR's *Surface Water Monitoring for Pesticides in Agricultural Areas of California, 2015* (Deng, 2015) found that two of the four pesticides with the highest detection

frequencies included imidacloprid (a neonicotinoid pesticide) and bifenthrin (a pyrethroid pesticide). The study also found that 47 percent of the 30 bifenthrin samples exceeded an aquatic life benchmark and that 21 percent of the 77 imidacloprid samples exceeded an aquatic life benchmark. The areas studied included agricultural areas in Monterey, San Luis Obispo and Santa Barbara counties of the central coast region.

23. A CMP follow-up study on sediment toxicity (CCWQP, 2010d) showed pyrethroid pesticides to be the most prevalent and severe source of toxicity in sediments. Santa Maria area sites averaged 7.5 toxic units (TUs)[21] from pyrethroid pesticides and 1.3 TUs from chlorpyrifos. All Santa Maria area sites were toxic to test organisms. The second highest pesticide levels were found in Salinas tributaries and the Salinas Reclamation canal, averaging 5.4 TUs pyrethroids and 0.8 TUs chlorpyrifos. Organochlorine pesticides were present, but not at levels sufficient to cause toxicity.

24. Peer-reviewed research has also shown pyrethroid pesticides are a major source of sediment toxicity in agricultural areas of the Central Coast Region (Ng et al., 2008; Anderson et al., 2006a; Phillips et al., 2006; Starner et al., 2006).

Imidacloprid in the Water Column

25. CMP monitoring data collected between 2017 and 2018 show imidacloprid, a neonicotinoid pesticide, with one of the highest detection frequencies of all pesticides analyzed. Imidacloprid was detected in 45 percent of all samples taken (multiple samples are typically taken at a given monitoring site). In every sample where imidacloprid was detected, the concentration exceeded the USEPA benchmark value of 0.01 µg/L.

26. Based on data collected during Agricultural Order 3.0 (2017 to 2019), more than 72 percent of all CMP sites monitored in 2017 and 2018 show average imidacloprid concentrations that exceed the 0.01 µg/L EPA benchmark.; 64 percent of sites have a total average imidacloprid concentration that exceeds the benchmark by two-fold or more. Some of the waterbodies most significantly polluted by imidacloprid include the following:
    a. Pajaro River area (including Carnadero Creek);
    b. Salinas River area (including Gabilan Creek, Salinas Reclamation Canal, and Santa Rita Creek); and

[21] When calculated using the LC50, as the TUs in this study were, one TU is sufficient to kill 50 percent of the test organisms.

c. Santa Maria River area (including Bradley Canyon Creek, Green Valley Creek, Orcutt-Solomon Creek, and that Santa Maria River).

Bifenthrin in the Water Column

27. More than 26 percent of all CMP sites monitored from 2010 to 2018 have an average bifenthrin concentration o.c.[22] that exceeds the LC50 (lethal concentration impacting 50 percent of test organisms) value of 0.52 µg/g o.c.; nine percent of sites have an average concentration that exceeds the LC50 by two-fold or more. Some of the waterbodies most significantly polluted by bifenthrin include the following:
    a. Salinas River area (including Salinas Reclamation Canal, Old Salinas River, Santa Rita Creek, Tembladero Slough, and Merritt Ditch);
    b. Santa Maria River area (including Main Street Canal);
    c. Pajaro River area (including Watsonville Slough);
    d. Oso Flaco watershed (including Oso Flaco Creek).

28. Based on data collected during Agricultural Order 3.0 (2017 to 2019), the average bifenthrin concentration o.c. exceeds the LC50 value of 0.52 µg/g o.c.; six percent of sites have an average concentration that exceeds the LC50 value by two-fold or more.

Bifenthrin in Sediment

29. Bifenthrin was detected in 51 percent of all CMP sediment samples taken between 2010-2018. The LC50 value of 0.52 µg/g o.c. was exceeded in 18 percent of all sediment samples taken. At a CMP site located in Oso Flaco Creek, the LC50 value was exceeded in 100 percent of all samples taken between 2010-2018.

30. Bifenthrin was detected in sediment in 100 percent of all samples from 2010 to 2018 at 17 CMP sites. These sites are located in the Pajaro River area (three sites), the Salinas River area (8 sites), the Santa Maria River area (six sites), and Santa Barbara area (one site).

31. Based on data collected during Agricultural Order 3.0 (2017 to 2018), bifenthrin was detected in 100 percent of all sediment samples taken at 16 CMP sites. These sites are located in the Pajaro River area (three sites), the Salinas River area (eight sites), and the Santa Maria River area (five sites).

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[22] "o.c." means total organic carbon corrected.

32. Based on data collected during Agricultural Order 3.0 (2017 to 2018), the bifenthrin LC50 value was exceeded in 100 percent of all sediment samples taken at two CMP sites, located in the Salinas Reclamation Canal and Oso Flaco Creek.

Pesticide MEQ and Changes Over Time

33. Based on data collected during Agricultural Oder 1.0 (2004 to 2012):
    a. During the dry season, 16 CMP sites received poor or very poor organophosphate pesticide MEQ scores; 17 CMP sites received poor or very poor pyrethroid pesticide or chlorpyrifos in sediment MEQ scores.
    b. During the wet season, 14 CMP sites received poor or very poor organophosphate pesticide MEQ scores; no CMP sites received poor or very poor pyrethroid pesticide or chlorpyrifos in sediment MEQ scores.

34. Based on data collected during Agricultural Order 2.0 (2012 to 2017):
    a. During the dry season, four CMP sites received poor or very poor organophosphate pesticide MEQ scores; six CMP sites received poor or very poor pyrethroid pesticide or chlorpyrifos in sediment MEQ scores.
    b. During the wet season, nine CMP sites received poor or very poor organophosphate pesticide MEQ scores; 4 CMP sites received poor or very poor pyrethroid pesticide or chlorpyrifos in sediment MEQ scores.

35. Based on data collected during Agricultural Order 3.0 (2017 to 2019):
    a. During the dry season, 11 CMP sites received poor or very poor organophosphate pesticide MEQ scores; 11 CMP sites received poor or very poor pyrethroid pesticide or chlorpyrifos in sediment MEQ scores; 16 CMP sites received poor or very poor neonicotinoid pesticide MEQ scores.
    b. During the wet season, 12 CMP sites received poor or very poor organophosphate pesticide MEQ scores; 20 CMP sites received poor or very poor pyrethroid pesticide or chlorpyrifos in sediment MEQ scores; 36 CMP sites received poor or very poor neonicotinoid pesticide MEQ scores.

36. Tables of organophosphate pesticide, pyrethroid pesticide and chlorpyrifos in sediment, and neonicotinoid pesticide MEQ scores are included in Section D.2.

Metals and Phenols

37. Agricultural sources of metals are particulate emissions, irrigation water, pesticides, biosolids, animal manure, and fertilizer applied directly to the soil (Chang et al, 2004). Metals, including arsenic, boron, cadmium, copper, lead,

nickel, and zinc are common active ingredients in many pesticides (Fishel, 2008; Nesheim et al., 2002; Holmgren, 1998; Reigart and Roberts, 1999). Metals can be present in subsurface drainage discharge and may be associated with sediment in tailwater discharge. Some phosphate fertilizers contain cadmium, which can lead to an increase in the concentration of cadmium in soil. Past studies have found soils containing high concentrations of cadmium and lead in major vegetable production areas of the Salinas Valley (Chang et al., 2004; Page et al., 1987; USEPA, 1978; Jelinek and Braude, 1978).

38. Phenols are components or breakdown products of a number of pesticide formulations, including 2,4 D, MCPA, carbaryl, propoxur, carbofuran, and fenthion (Crespin et al., 2001, Agrawal et al., 1999). Phenolic compounds can cause odor and taste problems in fish tissue, some are directly toxic to aquatic life, and some are gaining increasing notice as endocrine disruptors (e.g., bisphenol A and nonylphenol). The Basin Plan includes a 100 µg/L water quality objective for phenols. The original water quality standards were developed in response to concerns about odor, taste, and direct toxicity.

39. One phenolic compound of known concern in the central coast region is nonylphenol. Agricultural sources of nonylphenol and the related nonylphenol ethoxylates include “inert” ingredients in pesticide products and as adjuvants added by the pesticide user. Adjuvant ingredients are not reported in California's Pesticide Use Database. Adjuvants enhance a chemical’s effect. Nonylphenol and related compounds are used as surfactants to make the pesticide product more potent and effective (Cserhati, 1995). Nonylphenol and its ethoxylates are acutely toxic to a wide variety of animals, including aquatic invertebrates and fish. In some cases, the nonylphenol is more toxic to aquatic species than the pesticide itself (National Research Council of Canada, 1982). Additional concern exists about nonylphenol and its ethoxylates because these compounds also bioaccumulate in algae, mussels, shrimp, fish, and birds (Ahel et al., 1993; Ekelund 1990).

40. The San Luis Obispo Science and Ecosystem Alliance (SLOSEA) at California Polytechnic State University has found nonylphenol at elevated concentrations in fish tissue and has linked the occurrence to gonadal abnormalities and liver damage in fish in Morro Bay and other central coast locations (Lech, 1996). The Basin Plan numeric objective of 100 µg/L for phenols is relatively protective for direct toxicity of nonylphenol to rainbow trout, which have an LC50 of 194 µg/L. However, this numeric objective is not protective for endocrine disruption purposes, which for rainbow trout is estimated at an EC50 (estrogenic concentration impacting 50 percent of test organisms) of 14.14 µg/L (Lech, 1996). Regardless of the limitations of the Basin Plan standard, it is important to assess this chemical in areas that are heavily influenced by agricultural activity.

Toxicity Evaluation and Toxic Unit Calculations

41. Toxicity testing determines the effects to living organisms when exposed to chemicals in sample water or sediment and compares their response to test organisms exposed to clean sample water or sediment (a control group). Toxicity test results were evaluated for test organism survival, growth, and/or reproduction to determine if aquatic life beneficial uses are supported throughout the central coast region.

42. Toxic Units (TUs) are calculated by dividing each measured chemical concentration by that chemical's Median Lethal Concentration (LC50) or Inhibitory Condition (IC50) and summing those values. When calculated using the LC50, one TU is sufficient to kill 50 percent of the test organisms.

Toxic Units for Pyrethroid Pesticides and Chlorpyrifos in Sediment

43. Pyrethroid TUs were calculated using CMP data collected for the following pesticides: bifenthrin, cyfluthrin, cyhalothrin-gamma, cyhalothrin-lambda, cypermethrin, esfenvalerate, fenpropathrin, fenvalerate, and permethrin.

44. CMP data collected from 2013 to 2018 indicate that 29 percent of all samples exceeded one Total TU for pyrethroids and chlorpyrifos in sediment (multiple samples are typically taken at a given monitoring site).
    a. 22 percent of samples exceeded one pyrethroid TU;
    b. Six percent of samples exceeded one chlorpyrifos TU; and
    c. At 5 CMP sites, 100 percent of samples exceeded one Total TU for pyrethroids and chlorpyrifos in sediment; these sites are in the Salinas Reclamation Canal, Santa Rita Creek, Green Valley Creek, Oso Flaco Creek, and Los Carneros Creek.

45. More than 35 percent of all sites sampled from 2013 to 2018 exceeded one TU for pyrethroids and chlorpyrifos in sediment; 21 percent of sites exceeded two TU. Some of the waterbodies with the most significant pyrethroid and chlorpyrifos in sediment TUs include the following:
    a. Salinas River area (including Salinas Reclamation Canal, Santa Rita Creek, and Old Salinas River);
    b. Santa Maria River area (including Oso Flaco Creek, Main Street Canal, and Bradley Channel);
    c. Santa Ynez River; and
    d. Los Carneros Creek.

46. Based on data collected during Agricultural Order 3.0 (2017 to 2019), 33 percent of all CMP sites averaged greater than one TU for pyrethroids and chlorpyrifos in sediment (based on all samples taken from the site); 18 percent of all sites averaged more than two TU.

Toxic Units for Noenicitinoids in the Water Column

47. Neonicotinoid TUs were calculated using CMP data collected for the following pesticides: acetamiprid, clothianidin, dinotefuran, imidacloprid, and thiamethoxam.

48. Based on data collected during Agricultural Order 3.0 (2017 to 2019), one CMP site (Bradley Canyon Creek) has a total average neonicotinoid TU calculation that exceeds one TU.

49. Neonicotinoid monitoring has only been required since Agricultural Order 3.0 (2017 to 2019). Because the neonicotinoid monitoring dataset is so temporally limited, there may not be enough data to identify the waterbodies with the most significant neonicotinoid TUs.

Toxic Units for Herbicides in the Water Column

50. Organophosphate TUs were calculated using CMP data collected for the following pesticides in the water column: chlorpyrifos, diazinon, and malathion.

51. More than 27 percent of all CMP sites monitored from 2006 to 2018 have a total average organophosphate TU calculation that exceeds one TU; 19 percent of all sites have a total organophosphate TU calculation that exceeds two TU. Some of the waterbodies with the most significant organophosphate TUs include the following:
    a. Salinas River area (including Natividad Creek and Quail Creek); and
    b. Santa Maria River area (including Green Valley Creek and Main Street Canal).

52. Based on CMP data collected during Agricultural Order 3.0 (2017 to 2019), six percent of all sites exceeded one organophosphate TU; four percent of sites exceeded two organophosphate TUs.

Toxicity and Pesticides in Sediment – Hyalella Azteca

53. CMP data collected from 2006 to 2019 indicate significant toxic effects to *Hyalella* azteca survival were observed in 44 percent of all samples.

54. In 2018, significant toxicity to *Hyalella azteca* survival was observed in 25 percent of all samples (multiple samples are typically taken at a given monitoring site). Additionally, 100 percent of samples taken at 7 CMP sites showed significant toxicity to *Hyalella Azteca* survival, all of which are in the Salinas River area and the Santa Maria area. Some of the waterbodies with the most significant toxicity to *Hyalella azteca* survival include the following:
    a. Lower Salinas River (including Quail Creek, Chualar Creek, and Blanco Drain); and
    b. Tembladero Slough system (including Old Salinas River, Alisal Slough, Espinosa Slough, Gabilan Creek, and Natividad Creek).

Toxicity and Pesticides in the Water Column – Chironomus Dilutus

55. CMP data collected from 2017 to 2019 indicate significant toxic effects to Chironomus *dilutus* survival in 34 percent of all samples.

56. In 2018, significant toxicity to *Chironomus dilutus* survival was observed in 40 percent of samples. Additionally, 100 percent of samples taken at 12 CMP sites showed significant toxicity to *Chironomus dilutus* survival. Some of the waterbodies showing the most significant toxicity to *Chironomus dilutus* survival include:
    a. Santa Maria River area (including Bradley Canyon Creek, Orcutt-Solomon Creek, Green Valley Creek, and the Santa Maria River);
    b. Tembladero Slough system (including Alisal Slough, Gabilan Creek, and Natividad Creek); and
    c. Lower Salinas River (including Quail Creek and Chualar Creek).

Toxicity and Pesticides in the Water Column – Ceriodaphnia Dubia

57. CMP data collected from 2005 to 2019 indicate significant toxicity to *Ceriodaphnia* dubia survival in 22 percent of all samples. Additionally, 100 percent of samples (10 out of 10) showed significant toxicity to *Ceriodaphnia dubia* survival at a site in Chualar Creek.

58. In 2018, significant toxicity to *Ceriodaphnia dubia* survival was observed in 11 percent of all samples. Additionally, 5 sites had 50 percent or more samples demonstrate significant toxicity to *Ceriodaphnia dubia* survival; a site located in Quail Creek had 100 percent of samples demonstrate significant toxicity to *Ceriodaphnia dubia* survival.

59. In 2017, significant toxicity to *Ceriodaphnia dubia* survival was observed in 7 percent of all samples. Additionally, one site had 50 percent of samples demonstrate significant toxicity to *Ceriodaphnia dubia* survival; no sites had 100 percent of samples demonstrate significant toxicity to *Ceriodaphnia dubia* survival.

60. Some of the waterbodies showing the most significant toxicity to *Ceriodaphnia dubia* survival include the following:
    a. Santa Maria River area (including Orcutt-Solomon Creek, Main Street Canal, and Green Valley Creek);
    b. Tembladero Slough system (including Alisal Slough, Gabilan Creek, and Natividad Creek);
    c. Salinas River area (including the Salinas River, Quail Creek, and Chualar Creek); and
    d. Franklin Creek.

Pesticide and Toxicity Limits and Time Schedules

61. This Order establishes numeric limits for pesticide concentrations, toxicity, and additive toxicity in the form of toxic units (TUs) in the receiving waters. If ongoing monitoring shows that an applicable receiving water limit is not being met in a waterbody segment prior to the compliance date for the limit, in accordance with the surface water follow-up monitoring described in the MRP, Dischargers must submit a workplan that proposes implementation measures to address the exceedances, as well as perform additional follow-up monitoring for source identification purposes. If the receiving water limit is not met by the compliance date, Dischargers are subject to a numeric discharge limit that is the same as the receiving water limit. Dischargers may also be required to perform additional ranch-level surface discharge monitoring and reporting to confirm that they are achieving the numeric discharge limit

62. Several waterbodies in the central coast region have established toxicity and/or pesticide TMDLs for some types of pesticides. In those cases, the numeric limits and time schedules established in this Order are equivalent to those defined in the TMDLs.

63. Waterbodies that do not have established TMDLs toxicity for particular pesticides are assigned numeric limits based on values from the sources shown in **Table A.C.3-2**.

Table A.C.3-2. Source of Numeric Limits for Pesticides, Toxicity, and Toxic Units

Constituent	Matrix	Limit	Units[1]	Source
Acetamiprid	Water Column	2.10	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Atrazine	Water Column	60.0	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Bifenthrin	Sediment	0.52	µg/g o.c.	TOC-Normalized LC50 (*Hyalella azteca*) 10-day sediment - Amweg et al., 2005
Chlorpyrifos	Water Column	0.023	µg/L	Ceriodaphnia LC50, 4-day Deanovic et al. 2013
Chlorpyrifos	Sediment	1.77	µg/g o.c.	TOC-Normalized LC50 (*Hyalella azteca*) 10-day sediment - Brown et al., 1997; Amweg and Weston, 2007
Clothianidin	Water Column	0.05	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Cyanazine	Water Column	27.0	µg/L	EC50 (*Selanastrum Capricornutum*) 96-hr water column - Fairchild et al., 1995
Cyfluthrin	Sediment	1.08	µg/g o.c.	TOC-Normalized LC50 (*Hyalella azteca*) 10-day sediment - Amweg et al., 2005
Cypermethrin	Sediment	0.38	µg/g o.c.	TOC-Normalized LC50 (*Hyalella azteca*) 10-day sediment - Maund et al., 2002, mean value
Danitol (fenpropathrin)	Sediment	1.10	µg/g o.c.	TOC-Normalized LC50 (*Hyalella azteca*) 10-day sediment - Ding et. al 2010
Demeton-s-methyl sulfoxide (oxydemeton-methyl)	Water Column	46	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects

Constituent	Matrix	Limit	Units[1]	Source
Diazinon	Water Column	0.105	µg/L	Ceriodaphnia LC50, 4-day Deanovic et al. 2013
Dichlorvos	Water Column	0.0058	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Dimethoate	Water Column	0.50	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Dinotefuran	Water Column	23.5	µg/L	Chironomus LC50 4-day, Raby et al. 2018
Disulfoton (Disyton)	Water Column	0.01	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Diuron	Water Column	80.0	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Acute Effects
Esfenvalerate	Sediment	1.54	µg/g o.c.	TOC-Normalized LC50 (*Hyalella azteca*) 10-day sediment - Amweg et al., 2005
Fenvalerate	Sediment	1.54	µg/g o.c.	TOC-Normalized LC50 (*Hyalella azteca*) 10-day sediment - Amweg et al., 2005
Glyphosate	Water Column	26,600	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Acute Effects
Imidacloprid	Water Column	0.01	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Cyhalothrin, lambda	Sediment	0.45	µg/g o.c.	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Linuron	Water Column	0.09	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Acute Effects

Constituent	Matrix	Limit	Units[1]	Source
Malathion	Water Column	0.049	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Methamidophos	Water Column	4.50	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Methidathion	Water Column	0.66	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Paraquat	Water Column	< 36.9	µg/L	TOC-Normalized LC50 (*Hyalella azteca*) 10-day sediment - Amweg et al., 2005
Parathion-methyl	Water Column	0.25	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Permethrin	Sediment	10.83	µg/g o.c.	TOC-Normalized LC50 (*Hyalella azteca*) 10-day sediment - Amweg et al., 2005
Phorate	Water Column	0.21	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Phosmet	Water Column	0.80	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Simazine	Water Column	40.0	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Thiacloprid	Water Column	0.97	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Thiamethoxam	Water Column	0.74	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects

Constituent	Matrix	Limit	Units[1]	Source
Trifluralin	Water Column	2.40	µg/L	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
Sediment Toxicity	Sediment	No chronic or acute toxicity to applicable test organism	Survival, growth, and reproduction endpoints[2]	Basin Plan Narrative Objectives
Water Column Toxicity	Water Column	No chronic or acute toxicity to applicable test organism	Survival, growth, and reproduction endpoints[2]	Basin Plan Narrative Objectives[4,5]
Toxic Units	Sediment	Sum of additive toxicity ≤ 1	Toxic Unit (TU)[3]	Basin Plan Narrative Objectives[4,5]
Toxic Units	Water Column	Sum of additive toxicity ≤ 1	Toxic Unit (TU)[3]	Basin Plan Narrative Objectives[4,5]

[1]µg/L is micrograms per liter; µg/kg is micrograms per kilogram; ng/g is nanograms per gram; o.c. means normalized for sediment organic carbon content; ppb is parts per million.
[2]Toxicity determinations will be pass/fail based on a comparison of the test organism's response (survival, growth, and reproduction) to the water sample compared to the control using the Test of Significant Toxicity (TST statistical approach), or a statistical t-test, based on the toxicity provisions in the State Water Board *Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries in California* (in draft). If a sample is declared "fail" (i.e., toxic) for any endpoint, then the limit is not met. The most sensitive test species for each constituent must be used when evaluating toxicity.
[3]Toxic Units (TU) are calculated by dividing each measured chemical concentration by that chemical's 50 percent effect concentration (e.g., LC50) (carbon corrected for sediment measurements) and summing those values for all chemicals in the class (e.g. summing all pyrethroid values).
[4]No individual pesticide or combination of pesticides shall reach concentrations that adversely affect beneficial uses. There shall be no increase in pesticide concentrations found in bottom sediment or aquatic life.
[5]All waters shall be maintained free of toxic substances in concentrations which are toxic to, or which produce detrimental physiologic responses in human, plan, animal, or aquatic life.

64. The numeric limits established in this Order will be updated as future TMDLs are adopted or updated and waterbody-specific load allocations are defined.

65. In establishing the time schedules for achieving the numeric limits, the typical time schedules included in TMDLs were considered. Pesticide and toxicity TMDLs have historically provided between two and 15 years to achieve load allocations for currently applied pesticides to comply with the Basin Plan narrative objectives for pesticides and toxicity, providing an average of seven years. Significantly more time was provided for legacy pesticides such as dichloro-diphenyl-trichloroethane (DDT) in the Santa Maria Toxicity and Pesticides TMDL; this Order does not

establish load allocations for legacy pesticides, beyond what is established through TMDLs. This Order requires the pesticide, toxicity, and toxic units limits to be achieved within 11 years. This time schedule is reasonable given the similarity to TMDL time schedules, the degree of impairment to surface water quality and impacts on aquatic life beneficial uses, and the fact that agricultural orders regulating agricultural discharges have been in place since 2004.

Section C.4. Sediment and Erosion Management for Surface Water Protection

1. The sections on *Surface Water Priority Areas and Magnitude Exceedance Quotients (MEQ)*, *Impacts to Surface Water – General*, and *Monitoring and Reporting* in Section C.2 also apply to Section C.4.

Impacts to Surface Water – Sediments, Turbidity, and Impermeable Surfaces

2. Turbidity is a cloudy condition in water due to suspended silt or organic matter. Elevated turbidity during the dry season is an important measure of discharge across bare soil, and thus can serve as an indicator of systems with heavy irrigation runoff to surface waters. In a well-functioning stream, elevated turbidity caused by sediment or eutrophication should be absent or short-lived in the dry season.

3. The Basin Plan includes the following language related to sediment and erosion control:

    a. "Waters shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses" (Basin Plan section 3.3.2 Objectives for All Inland Surface Waters, Enclosed Bays, and Estuaries).
    b. "Adverse impacts of sediment are identified, in part, as: impairment of water supplies and groundwater recharge, siltation of streams and reservoirs, impairment of navigable waters, loss of fish and wildlife habitat, degradation of recreational waters, transport of pathogens and toxic substances, increased flooding, increased soil loss, and increased costs associated with maintenance and operation of water storage and transport facilities" (Basin Plan section 4.8.5 Land Disturbance Activities).
    c. "The discharge or threatened discharge of soil, silt, bark, slash, sawdust, or other organic and earthen materials into any stream in the basin in violation of best management practices for timber harvesting, construction, and other soil disturbance activities and in quantities deleterious to fish, wildlife, and other beneficial uses is prohibited" (Basin Plan section 4.8.5.1 Land Disturbance Prohibitions).

d. “The placing or disposal of soil, silt, bark, slash, sawdust, or other organic and earthen materials from timber harvesting, construction, and other soil disturbance activities at locations above the anticipated high water line of any stream in the basin where they may be washed into said waters by rainfall or runoff in quantities deleterious to fish, wildlife, and other beneficial uses is prohibited” (Basin Plan section 4.8.5.1 Land Disturbance Prohibitions).

e. “All necessary control measures for minimizing erosion and sedimentation, whether structural or vegetal, shall be properly established prior to November 15 each year” (Basin Plan section 5.5.6 Erosion and Sedimentation).

f. “All structural and vegetal measures taken to control erosion and sedimentation shall be properly maintained” (Basin Plan section 5.5.6 Erosion and Sedimentation).

g. “A filter strip of appropriate width and consisting of undisturbed soil and riparian vegetation or its equivalent, shall be maintained, wherever possible, between significant land disturbance activities and watercourses, lakes, bays, estuaries, marshes, and other water bodies. For construction activities, minimum width of the filter strip shall be thirty feet, wherever possible as measured along the ground surface to the highest anticipated water line” (Basin Plan section 5.5.6 Erosion and Sedimentation).

h. “Cover crops shall be established by seeding and/or mulching, or other equally effective measures, for all disturbed areas not otherwise protected from excessive erosion” (Basin Plan section 5.5.6 Erosion and Sedimentation).

Turbidity and Sedimentation

4. Elevated turbidity levels are widespread in agricultural areas of the central coast region, with 55 waterbodies on the 2014-2016 303(d) List due to elevated turbidity (SWRCB, 2017). Of those waterbodies, 78 percent are in the watersheds of the Salinas River, Gabilan Creek/Tembladero Slough, Santa Maria River, and Pajaro River.

5. Elevated sedimentation/siltation is widespread in agricultural areas of the central coast region, with 31 waterbodies on the 2014-2016 303(d) List due to elevated sedimentation/siltation (SWRCB, 2017). Of those waterbodies, 13 percent are in the Pajaro River watershed.

6. Waters that exceed 25 Nephelometric Turbidity Units (NTU) can cause a reduction in juvenile salmonid growth due to interference with their ability to find food (Sigler et al., 1984). Additionally, 25 NTU is the evaluation guideline value used by the Central Coast Water Board to assess whether a waterbody with a cold freshwater habitat (or both cold and warm freshwater habitat) beneficial use designation should be listed as impaired for turbidity in the 303(d) List.

7. Waters that exceed 40 NTU can cause a reduction in piscivorous fish (largemouth bass) growth due to interference with their ability to find food (Shoup and Wahl, 2009). Additionally, 40 NTU is the evaluation guideline value used by the Central Coast Water Board to assess whether a waterbody with a warm freshwater habitat (but not also cold freshwater habitat) beneficial use designation should be listed as impaired for turbidity in the 303(d) List.

8. Most CCAMP sites outside of agricultural areas have a median turbidity value less than 5 NTU (CCAMP, 2010a).

9. Agricultural discharges cause and contribute to sustained turbidity throughout the dry season at many sampling sites dominated by agricultural activities. Resulting turbidity greatly exceeds levels that impact the ability of salmonids to feed. Many of these sites are located in the lower Santa Maria and Salinas-Tembladero watersheds. The CMP detected some increasing trends in turbidity on the main stem of the Salinas River (CCRWQCB, 2009a; CCAMP, 2010a; CCWQP, 2009a).

10. Agricultural land use practices, such as removal of vegetation and stream channelization, and discharges from agricultural fields, can cause the deposition of fine sediment and sand over stream bottom substrate. This problem is especially prevalent in areas dominated by agricultural activity (lower Salinas and Santa Maria rivers) (CCWQP, 2009b; CCWQP, 2009c, CCWQP, 2009d; CCWQP, 2009e; CCAMP, 2010a). This deposition of fine sediment and sand in streams causes major degradation of aquatic life beneficial uses by eliminating pools and by clogging gravel where fish eggs, larvae, and benthic invertebrates that serve as a food source typically live (CCAMP, 2010a). Effective erosion control and sediment control management practices include but are not limited to cover crops, filter strips, and furrow alignment to reduce runoff quantity and velocity, hold fine particles in place, and increase filtration to minimize the impacts to water quality (USEPA, 1991).

11. More than 91 percent of all CMP sites monitored from 2005 to 2019 have an average turbidity that exceeds 25 NTU; 75 percent of sites have an average turbidity that exceeds 25 NTU by two-fold or more; 53 percent of sites have an

average turbidity that exceeds 25 NTU by four-fold or more. Some of the waterbodies most significantly polluted by elevated turbidity include:

i. Santa Maria River area (including the Santa Maria River, Bradley Canyon Creek, Orcutt-Solomon Creek, and Oso Flaco Creek);
j. Salinas River area (including Chualar Creek, Santa Rita Creek, Quail Creek, Salinas Reclamation Canal);
k. Tembladero Slough system (including Old Salinas River, Espinosa Slough, Gabilan Creek, and Natividad Creek); and
l. San Antonio Creek.

12. CMP data collected during Agriculture Order 3.0 from 2017 to 2019 show that 72 percent of sites have turbidity values that exceed 25 NTU; 53 percent of sites have an average turbidity value that exceeds 25 NTU by two-fold or more; 44 percent of all CMP sites have an average turbidity value that exceeds 25 NTU by four-fold or more.

Turbidity MEQ and Changes Over Time

13. Based on data collected during Agricultural Oder 1.0 (2004 to 2012):
    a. 32 CMP sites received poor or very poor turbidity MEQ scores during the dry season; 5 sites received fair scores; 11 sites received good or excellent scores.
    b. 45 CMP sites received poor or very poor turbidity MEQ scores during the wet season; 3 sites received fair scores; no sites received good or excellent scores.

14. Based on data collected during Agricultural Order 2.0 (2012 to 2017):
    a. 31 CMP sites received poor or very poor turbidity MEQ scores during the dry season; 7 sites received fair scores; 12 sites received good or excellent scores.
    b. 49 CMP sites received poor or very poor turbidity MEQ scores during the wet season; 4 sites received fair scores; no sites received good or excellent scores.

15. Based on data collected during Agricultural Order 3.0 (2017 to 2019):
    a. 29 CMP sites received poor or very poor turbidity MEQ scores during the dry season; 10 sites received fair scores; 14 sites received good or excellent scores.
    b. 47 CMP sites received poor or very poor turbidity MEQ scores during the wet season; 3 sites received fair scores; 4 sites received good or excellent scores.

16. Tables of turbidity MEQ scores are included in Section D.2.

<u>Impermeable Surfaces</u>

17. Surface runoff occurs when excess water leaves land surfaces when rainfall or irrigation rates exceed the land's infiltration rate. The volume of surface runoff from agricultural fields is determined by infiltration rates relative to rainfall and irrigation intensity (Rice et al., 2001).

18. Impermeable soil surface cover, removal of topsoil and vegetation, and compaction of soil reduce infiltration and retention of water and increase surface runoff (Miller et al., 2014).

19. Sloped fields with uninterrupted runs and impermeable surface cover have increased surface runoff and relatively high rates of erosion (Monterey County RCD, 2014).

20. On agricultural fields, erosion is affected by the exposure, permeability, texture, and structure of the soil. Erosion is the gradual destruction of land surface by wind or water and is intensified by land clearing practices related to farming, residential and industrial development, road building, and logging.

21. In the central coast region, erosion and surface runoff from irrigated agriculture carry sediments and pesticides that impact aquatic life beneficial uses (Anderson et al., 2010). Sedimentation, or the deposition of sediments carried from surface runoff, occurs when the velocity of water is not great enough to keep sediments in suspension. Deposition of sediment and pesticides that attach to sediment particles negatively impact aquatic life beneficial uses (Anderson et al., 2010).

22. Comparative studies of surface runoff from bare soil, vegetative mulch, and polyethylene mulch in agricultural fields show that the use of polyethylene mulch results in the greatest surface runoff, soil loss, and pesticide runoff (Rice et al., 2001). Polyethylene mulch can reduce permeable surface in a field's production area by over 90%, and high tunnels result in the concentration of rainfall and runoff along roof edges. The volume of water likely to runoff in a storm event is dramatically increased (Monterey County RCD, 2014).

23. In the central coast region, the use of impermeable surfaces includes polyethylene mulch (also called plastic mulch) and high tunnels (also called hoop houses). Polyethylene mulch and high tunnels present challenges for managing runoff, especially on sloped lands (Monterey County RCD, 2014). Impermeable

surfaces are most commonly used for berry crops, including strawberries, blackberries, blueberries, and raspberries.

24. Literature sources and increasing complaints received by the Central Coast Water Board provide evidence of increased surface runoff, erosion, and sedimentation resulting from impermeable surface cover on sloped lands. Berry operations account for much of the impermeable soil cover in the central coast region; however, other crop types are grown using polyethylene mulch and high tunnels as well.

25. The Resource Conservation District (RCD) of Monterey County characterized typical rates of stormwater runoff and soil erosion under different crop patterns within Pajaro and Salinas valleys. In comparing pasture, row crops, strawberries, and hoop houses on 4% slope, strawberries and hoop houses had the highest peak flows across design storm intensities. Fields partially covered with plastic, including strawberries and hoop houses, had much higher surface runoff rates and this generally caused higher erosion rates. Alternatively, fields with soil conservation practices like minimizing plastic cover, maximizing vegetative cover, and increasing soil organic matter and tilth had reduced erosion and surface runoff to sustainable rates, and in some cases eliminated them all together. Undisturbed soil with perennial pasture allowed water to infiltrate at large quantities, while bare soil and plastic cover substantially increased surface runoff. The RCD noted that surface runoff rates would likely be higher for land sloped above 5% (Monterey County RCD, 2014).

26. Berry production and the use of impermeable surfaces in the central coast region has increased. For strawberries alone, data from 2002 by the California Strawberry Commission and grower-reported data collected through previous agricultural orders shows an increase in acres of strawberries of 43 percent, from 16,000 to 28,000 acres. High tunnel usage from 2005 to 2017 was analyzed using aerial images of the Corralitos Creek Watershed in Santa Cruz County and demonstrated a localized increase of 350 percent, from 470 acres to 2,130 acres. For all berry types in the central coast region, the most current grower-reported data show approximately 760 farms growing berries, covering approximately 77,290 acres, representing approximately 17 percent of enrolled ranches and 16 percent of enrolled irrigated acres. Dischargers who report growing berry crops may grow other crops as well, and ranches may use impermeable surfaces for non-berry crops, but the reported acreage of ranches growing berries provides an estimate for impermeable surface cover.

27. Between January 2015 and March 2019, the Central Coast Water Board received 64 public complaints related to irrigated agricultural discharges. Of these

complaints, 48 percent were related to berry farms. In further categorizing complaints by issue type, 75 percent of silt and sediment discharge complaints were related to berry farms, 42 percent of irrigation discharge complaints were related to berry farms, and 60 percent of erosion complaints were related to berry farms.

28. Complaints identifying the most severe surface runoff, erosion, and sedimentation in the central coast region were for berry operations using impermeable surface cover on sloped lands. These complaints were received during a major storm event in February 2017, from members of the public and the California Department of Fish and Wildlife (CDFW) regarding discharges to Elkhorn Road and into Elkhorn Slough in Monterey County. Upon investigation by Central Coast Water Board staff, the discharges were traced to two berry operations (CCRWQCB, 2018a).

    a. The first operation was located on a parcel that sloped 7.25 percent north to south and 13 percent east to west. The sediment basin was undersized and in need of immediate maintenance, showing evidence of sediment-laden surface runoff. CDFW reported that the operation had not controlled flows of sediment into Elkhorn Slough for many years and estimated that in this one event 5,000 cubic yards of sediment had been discharged into the Slough (CCRWQCB, 2018a).
    b. The second operation was located on a parcel that sloped 1.2 percent north to sound and 8.6 percent east to west. The sediment basin was improperly designed and in need of immediate maintenance and repair (CCRWQCB, 2018a).

29. A slope analysis was completed using 2019 data submitted to the Central Coast Water Board by Dischargers growing berries, 2018 county parcel data, and 2018 USGS elevation data. The analysis provided a rough estimate of mean slope values where impervious surfaces are likely present. Approximately 68 percent of land where berries are grown have a mean slope value less than 5 percent, and approximately 32 percent of land where berries are grown have a mean slope value equal to or greater than 5 percent.

30. Existing regulatory programs for agricultural and non-agricultural sectors in California contain performance requirements to control erosion and stormwater runoff that are triggered by slope and impermeable surface cover. Napa County requires an approved Erosion Control Plan for agricultural earthmoving activity, grading, improvement, and vineyard replanting on land with slopes over 5 percent. The Central Coast Water Board Post-Construction Requirements (PCRs) include

stormwater performance standards for development based on impermeable surface cover thresholds starting at 2,500 square feet, about 0.06 acre.

31. Stormwater performance standards are established by using watershed processes and precipitation data to determine how much water impervious surfaces must retain and handle to maintain or restore pre-development hydrology and reduce pollutant loading to receiving waters. Where a project is located determines the absolute volume and/or intensity of a storm they will be required to design for, called the design storm. The Central Coast PCRs require mitigation of runoff volumes for the 95th percentile, 24-hour storm and mitigation of peak runoff intensity for the 2 through 10-year storm from impermeable surfaces. This approach is transferrable to agricultural development in the central coast region, where polyethylene mulch and high tunnels can reduce the available permeable surface in a field’s production area by over 90 percent, concentrate rainfall, and dramatically increase stormwater runoff (Monterey County RCD, 2014).

Sediment and Turbidity Limits and Time schedules

32. This Order establishes numeric limits for turbidity in the receiving water. If ongoing monitoring shows that an applicable receiving water limit is not being met in a waterbody segment prior to the compliance date for the limit, in accordance with the surface water follow-up monitoring described in the MRP, Dischargers must submit a workplan that proposes implementation measures to address the exceedances, as well as perform additional follow-up monitoring for source identification purposes. If the receiving water limit is not met by the compliance date, Dischargers are subject to a numeric discharge limit that is the same as the receiving water limit. Dischargers may also be required to perform additional ranch-level surface discharge monitoring and reporting to confirm that they are achieving the numeric discharge limit

33. Two waterbodies in the central coast region have established sediment TMDLs where irrigated agriculture is identified as a source. For Dischargers in those watersheds, sediment-related numeric limits and time schedules established in this Order are equivalent to those defined in the TMDLs.

34. No waterbodies in the central coast region currently have established turbidity TMDLs. However, many waterbodies are on the 2014-2016 303(d) List for impairment due to turbidity. This Order establishes numeric limits for turbidity based on the evaluation guideline values used by the Central Coast Water Board to assess whether a waterbody should be listed as impaired for turbidity: 25 NTU for waterbodies with a cold freshwater habitat (or both cold and warm freshwater habitat) beneficial use designation; and 40 NTU for waterbodies with a warm

freshwater habitat (but not also cold freshwater habitat) beneficial use designation.

35. The numeric limits established in this Order will be updated as future turbidity TMDLs are adopted and waterbody-specific load allocations are defined.

36. In establishing the time schedules for achieving the numeric limits, the time schedules provided for nutrients, pesticides, toxicity, and toxic units were considered. For non-TMDL areas, this Order requires Dischargers to achieve those limits within 11 years. Management practices that result in the achievement of the other limits in this Order are likely to have significant beneficial effects on turbidity levels as well. Therefore, this Order requires the turbidity numeric limits to be achieved within 11 years. This time schedule is reasonable given the degree of impairment to surface water quality, impacts on aquatic life beneficial uses, and the fact that agricultural orders regulating agricultural discharges have been in place since 2004.

Section C.5. Riparian Area Management for Water Quality Protection

1. This section includes findings that discuss how the Riparian Priority areas were established, impacts to water quality and beneficial uses related to the setback requirements, how the setback requirements were developed, time schedules, and monitoring and reporting.

Riparian Priority Areas

2. The analysis performed to establish the Riparian Priority areas included two steps: first, HUC-8[23] watershed areas were prioritized based on surface water quality data and risk to water quality (see the section on *Surface Water Priority Areas and Magnitude Exceedance Quotients (MEQ))* in section C.2 of this document*)*. The HUC-8 watershed areas were then further prioritized at the HUC-12 level (HUC-8 watersheds are larger than HUC-12 watersheds; multiple HUC-12 watersheds occur within each HUC-8 watershed). This Order only requires the riparian setback management measure requirements described in these findings for a subset of HUC-12 areas and a subset of ranches. The rest of the ranches are still required to comply with the operational setback, which consists of a smaller setback area and does not include specific vegetation requirements, although Dischargers must ensure that bare soil vulnerable to erosion is minimized. This Order will need to be updated at some point in the

[23] The National Hydrography Dataset (NHD) Plus Watershed Boundary Dataset (WBD) defines Hydrologic Unit Code 8 (HUC-8) areas, as well as smaller Hydrologic Unit Code 12 (HUC-12) areas.

future to implement full riparian setback management measure requirements to achieve beneficial use protection for all waterbodies on or adjacent to agricultural operations in the region.

HUC-12 Prioritization

3. The goal of the prioritization at the HUC-12 level was to reduce the scope of the requirements included in this Order, but still require protection of the highest quality waterbodies and their associated high-quality riparian areas, and also restore the most severely degraded waterbodies.

4. The highest quality HUC-12 areas were determined based on CMP and CCAMP monitoring data. Monitoring sites that show limited or no degradation from nutrients, pesticides, and sediments are considered high quality. In general, most of the HUC-12 areas in Surface Water Priority 4 areas are high quality waterbodies.

5. The most severely degraded HUC-8 watershed areas were determined based on CMP monitoring data (see the section on *Surface Water Priority Areas and Magnitude Exceedance Quotients (MEQ)* in section C.2 of this document*)*. CMP monitoring sites are focused on areas where agriculture is a dominant source of discharge. To further prioritize within the HUC-8 areas, water quality data was assessed at each CCAMP and CMP site. Sites upstream of the core CMP monitoring sites along a waterbody generally demonstrated better water quality than the downstream locations. When a high quality CCAMP or CMP site was observed upstream of a degraded site in the major waterbodies in agricultural areas (Salinas River, Santa Maria River, Pajaro River, and Santa Ynez River), all HUC-12 areas downstream of the high quality site were included as Riparian Priority areas, and therefore required to comply with the riparian setback management measure requirements established in this Order, and all HUC-12 areas upstream of the high quality site were excluded from the riparian setback management measure requirements (ranches in these areas must have an operational setback).

6. There are 188 HUC-12 watershed areas in the central coast region with ranches enrolled in the agricultural order. Of those 188 watershed areas, 78 (41 percent) were prioritized as Riparian Priority areas. Based on current enrollment information, the number of ranches and the irrigated acreage within each Riparian Priority area is provided below.

    a. Riparian Priority 1 includes approximately 400 ranches (9 percent) representing approximately 41,000 irrigated acres (10 percent).

b. Riparian Priority 2 includes approximately 800 ranches (18 percent) and 164,500 irrigated acres (38 percent).
c. Riparian Priority 3 includes approximately 830 ranches (19 percent) and 47,000 irrigated acres (11 percent).
d. Riparian Priority 4 includes approximately 750 ranches (17 percent) and 38,000 irrigated acres (9 percent).
e. In total, approximately 2800 ranches (62 percent) and 291,000 irrigated acres (67 percent) are included in Riparian Priority areas.

Impacts to Water Quality and Beneficial Uses

7. Riparian and wetland areas increase groundwater recharge, reduce erosion, and reduce the transport of sediment, nutrients, and other pollutants from agriculture. The restoration and protection of riparian and wetland areas are important for aquatic life and beneficial uses. For the purposes of this Order, except where described otherwise, the term riparian area is inclusive of wetland area.

8. Agricultural discharges and vegetation removal along riparian areas cause and contribute to water temperatures that exceed levels that are necessary to support salmonids at some sites in areas dominated by agricultural activity. Several of these sites are in major river corridors that provide rearing and/or migration habitat for salmonids. An example of this is Orcutt Creek (CCAMP, 2010a), where upstream shaded areas are cooler than downstream exposed areas, despite lower upstream flows. Tailwater discharge and removal of riparian vegetation in downstream areas cause temperatures to rise above levels safe for trout. Several locations impacted by temperature are in major river corridors that provide rearing and/or migration habitat for salmonids. These include the Salinas, Santa Maria, and Santa Ynez rivers (CCAMP, 2010a).

9. Biological sampling shows that benthic biota are impaired in the lower Salinas and Santa Maria watersheds, and also shows that several measures of habitat quality, such as in-stream substrate and canopy cover, are poor compared to upper watersheds and to other high quality streams in the central coast region (CCWQP, 2009b; CCWQP, 2009c, CCWQP, 2009d; CCWQP, 2009e; CCAMP, 2010a).

10. Orchards, vineyards, and row crops have the greatest erosion rates in irrigated agriculture, especially those that are managed with bare soil between tree or vine rows (ANR, 2007). A vegetative filter strip offers one way to control erosion rates and sediment discharge rather than letting it be carried off site in drainage water. A vegetative filter strip is an area of vegetation that is planted intentionally to help remove sediment and other pollutants from runoff water (Dillaha et al., 1989).

Vegetative filter strips intercept surface water runoff and trap as much as 75 to 100 percent of the water's sediment (ANR, 2007). They capture nutrients in runoff, both through plant uptake and adsorption to soil particles. Filter strips promote degradation and transformation of pollutants into less toxic forms and remove over 60 percent of certain pathogens from the runoff (ANR, 2007).

Current Conditions

11. California has lost an estimated 91 percent of its historic wetland acreage between the 1780's and 1980's, the highest loss rate of any state (Dahl, 1990; SWRCB, 2008). Similarly, prior to the gold rush of the mid-1800's, California lost between 85 and 98 percent of its historic riparian areas. Owners and operators of commercial irrigated agricultural operations historically removed riparian and wetland areas to plant cultivated crops (NRCS, 2010).

12. Two methodologies were used to assess riparian area condition in the central coast region: Riparian Rapid Assessment Method (RipRAM) for riparian habitat and the Physical Habitat Index of Physical Integrity (PHab) derived from the SWAMP bioassessment methodologies for riparian habitat and waterbodies. These methodologies are reasonable for assessing current riparian area condition in the central coast region because they use individual metrics or overall site scores, compare relative riparian health between sites in different landscapes, identify specific habitat concerns at the site level to inform decisions at the reach and site level and thereby have utility for identifying and prioritizing sites for preservation and restoration. These assessment methodologies can be easily incorporated into monitoring and reporting requirements.

13. Other methodologies that exist but were not used include the RipZET tool, monthly visual observations made by CCAMP and CMP field staff, and bioassessments of benthic macroinvertebrates. The RipZET tool (a GIS-based modeling tool) was not used because some required data inputs for the RipZET model are not readily available for the central coast region (e.g., GIS vegetation data is spotty), the hydrologic connectivity module requires LIDAR and roughness information from scientific literature, the hillslope module is not useful since most irrigated agricultural lands in the central coast region are areas with slopes less than ten percent, and the model requires significant staff time to run. The most current CCAMP and CMP field staff visual observations and benthic macroinvertebrate scores (i.e., CSCI scores) collected in accordance with the SWAMP bioassessment methodology are not currently electronically available and there is no date certain when it will become available.

Riparian Rapid Assessment Method

14. The Central Coast Wetlands Group (CCWG) provided the information discussed below (CCWG, 2019). The Riparian Rapid Assessment Method (RipRAM) is a cost-effective ambient monitoring and assessment tool that can be used to assess riparian condition on a variety of scales, ranging from individual stream reaches to watersheds and larger regions. RipRAM relies on visual indicators to reliably assess physical and biological complexity, which is then used to infer ecological functioning and benefits (i.e., condition). RipRAM evaluates eight factors to score overall riparian health and can be visualized as a "linear" assessment of stream reaches. The eight factors are:
    a. Total riparian cover;
    b. Vegetation cover structure;
    c. Vegetation cover quality;
    d. Vegetation age diversity and natural regeneration;
    e. Riparian vegetation width;
    f. Riparian substratum condition and vertical connectivity;
    g. Macroinvertebrate habitat patch richness; and
    h. Human alterations to channel morphology

15. RipRAM enables two or more trained practitioners working together in the field to assess the overall health of a riparian area by choosing the best-fit set of narrative descriptions of observable conditions ranging from the worst commonly observed to the best achievable for a particular area being assessed. RipRAM yields an overall index score for each assessed area based on the component scores of the eight metrics.

16. RipRAM data have been collected in the central coast region at over 100 Central Coast Ambient Monitoring Program (CCAMP) sites, as well as over 200 sites within specific watersheds as part of a watershed assessment intensification. A total of 347 sites have been assessed to date. Most recently, eight sites were sampled in the Santa Maria and Santy Ynez watersheds in agricultural areas with relatively intact riparian corridors.

17. RipRAM scores were compared with other means of estimating habitat condition. Scores were found to compare well with a visual estimate of riparian condition on Google Earth prior to a field visit. RipRAM scores were found to have a significant difference between the high, medium, and low categories defined through the Google Earth spatial review. For the higher classified sites, RipRAM showed no bias for perennially flowing streams compared to intermittently flowing streams. RipRAM showed a significant difference in the condition of riparian sites grouped by adjacent land use. Land use categories which in general put higher stress on

riparian areas (agriculture, urban) showed lower condition than land use categories which in general put lower stress on riparian areas (grazing, open, and rural). RipRAM scores were also compared with other environmental indicators that are intended to represent specific beneficial uses.

18. RipRAM is a robust assessment tool that yields scores relevant to riparian habitat quality. However, as with any assessment tool it is subject to constraints. One constraint is that a full and complete assessment requires access to the full stream corridor being assessed. Pilot assessments conducted from a bridge versus visiting the complete riparian corridor reveals that bridge assessments consistently get slightly lower scores. Another constraint is that the assessment is based on a comparison of current riparian habitat compared to the FEMA 100-year floodplain. This portion of the assessment relies on the FEMA flood maps, which may not always be accurate at a detailed scale or may not be available for a given stream segment.

19. RipRAM is discussed in additional detail in the section on the *Rapid Assessment Method* compliance pathway.

Physical Habitat

20. Nearly all the Cooperative Monitoring Program (CMP) core monitoring sites have been evaluated following the Standard Operating Procedures for SWAMP at least once since 2008, when that protocol was first implemented (Ode, et. al., 2016). CCAMP and SWAMP data from other areas of the region with agricultural influence are included in this assessment. Physical habitat (PHab) scores seven parameters (Mazor, et al., 2013; Harrington, 2011).
    a. Channel Dimensions: The wetted width, bankfull width, and bankfull height of the waterbody channel.
    b. Flow Habitat Types: Identifies the presence of cascades, falls, rapids, riffles, runs, glides, and pools.
    c. Stream Morphology: Measures average wetted depth, average depth, average bankfull width, average bankfull height, reach slope and sinuosity, stream flow habitats, and stream discharge.
    d. Stream Substrate Composition and Algal Cover: Measures the average substrate size, the percentage of fines/sand, gravel, cobble, boulders, and hardpan/bedrock, as well as percent cobble embeddedness, microalgal thickness, macroalgal cover, and macrophyte cover.
    e. Human Influence: Measures the distance from walls, riprap, dams, buildings, pavement, railroads, pipes, landfill/trash, park/lawn, row crops, pasture/range, logging/mining, vegetation management, bridges/abutments, and orchards/vineyards.

f. Riparian Vegetation: Measures the vegetation class, percent tree canopy, woody shrubs and saplings, herbs/grasses, and barren/bare soil and duff.
g. Habitat Complexity, Bank Stability, and Canopy Cover: Measures the percentage of filamentous algae, aquatic macrophytes/emergent vegetation, boulders, woody debris, undercut banks, overhanging vegetation, live tree roots, and artificial structures.

21. At many of the core monitoring sites in agricultural areas, instream habitat is lacking, and sand or fines dominate the substrate. Percent canopy cover is low or absent and the riparian habitat typically does not have a diverse structure that includes woody vegetation with understory (Pacific EcoRisk, 2015).

22. The PHab data indicate that streams in areas of commercial agricultural land use areas are typically in very poor condition in terms of habitat, lack woody vegetation, and have substrates heavily dominated by fine sediment. Invertebrate community composition and the aquatic predators that depend on them are sensitive to habitat degradation. In some cases, the fine sediment dominating stream substrate is likely the largest influence on benthic community composition, but in areas where sediment and water toxicity is common, chemical impacts to native communities are also probable. Heavily sedimented stream bottoms can result from the immediate discharge of sediment from nearby fields, the loss of stable vegetated stream bank habitat, the channelization of streams and consequent loss of floodplain, as well as from upstream sources.

Current Scope and Location of Riparian Areas

23. The current scope and location of wetland and riparian areas was assessed using Geographic Information System desktop analyses. A summary is presented below.

Wetlands

24. The scope and location of wetlands in the central coast region was assessed using the National Wetlands Inventory (NWI) database. The NWI was created by the U.S. Fish and Wildlife Service (USFWS) in 1974 to conduct a nationwide inventory of wetlands to provide its biologists and others with information on the distribution of wetlands to aid in wetland conservation efforts. ***Table A.C.5*-1** presents an assessment of central coast region wetlands based on NWI data. ***Table A.C.5*-2** summarizes the scope of wetlands located within commercial irrigated agricultural areas of the central coast region.

aTable A.C.5-1. Central Coast Region Wetland Acreage by Wetland Type

Wetland Type	Acres	Wetland density at the landscape level[24]
Total Wetlands in Central Coast Region	**198,047**	**2.7%**
Riverine wetlands	91,760	1.2%
Lake wetlands	24,572	0.3%
Freshwater ponds	8,457	0.1%
Freshwater forest/shrub wetlands	45,326	0.6%
Freshwater emergent wetlands	22,139	0.3%
Estuarine and marine wetlands	5,794	0.1%

Table A.C.5-2. Central Coast Region Wetland Acreage in Irrigated Agricultural Areas

Wetland Type	Acres	Wetland density at the landscape level
Total Wetlands in Agricultural Areas	**9,068**	**1.7%**
Riverine wetlands	2,905	0.5%
Lake wetlands	3	0%
Freshwater ponds	688	0.1%
Freshwater forest/shrub wetlands	1,024	0.2%
Freshwater emergent wetlands	4,444	0.8%
Estuarine and marine wetlands	4	0%

25. **Figure A.C.5-1** shows a graph of the spatial extent of wetlands in the central coast region by land use type (agricultural, urban, and undeveloped areas).

[24] The central coast region has 7,355,835 acres of land.

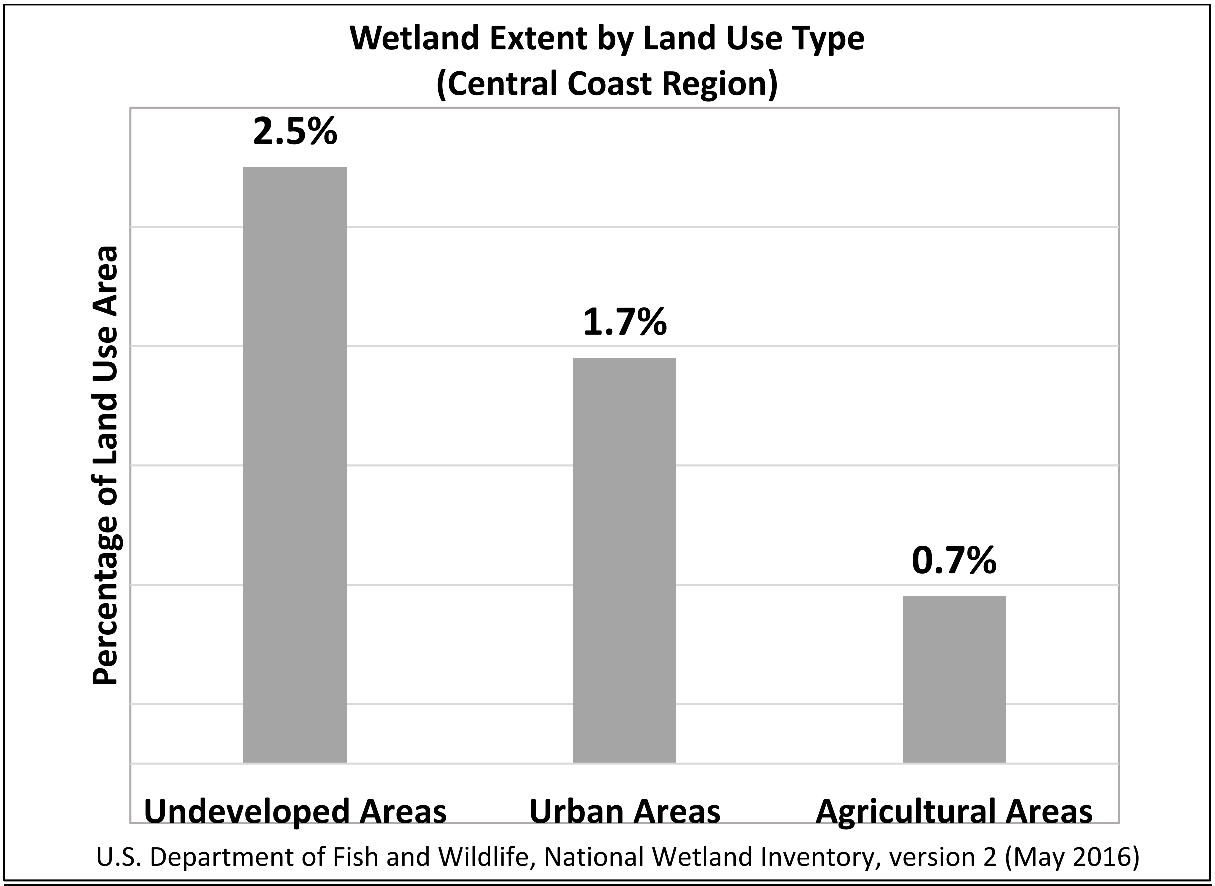

Figure A.C.5-1. Wetland Extent by Land Use Type

Riparian Areas

26. The scope and location of riparian areas in the central coast region was assessed using spatial datasets from the California Department of Forestry and Fire Protection's Fire and Resource Assessment Survey. The FRAP dataset estimates riparian assets through a combination of the National Hydrography Dataset (NHD) and National Land Cover Dataset (NLCD). Staff used the FRAP data to estimate the current condition (ranked highest to lowest) and extent of riparian assets (percent cover) in the central coast region (***Table A.C.5*-3**) and in agricultural areas (***Table A.C.5*-4**) of the region.

Table A.C.5-3. Central Coast Region Riparian Acreage.

Riparian Cover Rank	Estimated Riparian Cover (%)	% of central coast region	Acres in central coast region[25]
3 (highest asset)	70 - 100 percent cover	1.0%	75,453
2 (medium asset)	40 - 70 percent cover	3.3%	242,061
1 (low asset)	1 - 40 percent cover	13.2%	969,593
Total riparian area in central coast region [26]			**1,287,107**
0 (non-riparian areas, no asset)	0 percent canopy cover	82.5%	6,068,728

Table A.C.5-4. Central Coast Region Riparian Acreage in Irrigated Agricultural Areas

Riparian Cover Rank	Estimated Riparian Cover (%)	% of irrigated agricultural areas	Acres in irrigated agricultural areas[27]
3 (highest asset)	70 - 100 percent cover	0.03%	160
2 (medium asset)	40 - 70 percent cover	0.3%	1,452
1 (low asset)	1 - 40 percent cover	9%	48,370
Total riparian area in irrigated agricultural areas[28]			**49,982**
0 (non-riparian areas, no asset)	0 percent canopy cover	90.1%	485,323

27. **Figure A.C.5-2** illustrates the spatial extent of riparian areas in the central coast region by land use type (agricultural, urban, and undeveloped areas).[29]

[25] Central coast region = 7,255,835 acres of land.
[26] Defined as areas within 100-meter buffers of NHD streams within agricultural areas.
[27] Acres of irrigated agriculture in the central coast region (years 2014-16) = 535,304 acres (California Department of Conservation, Farmland Mapping and Monitoring Program).
[28] Defined as areas within 100-meter buffers of all NHD streams within agricultural areas.
[29] Riparian canopy as a percentage of the land use area.

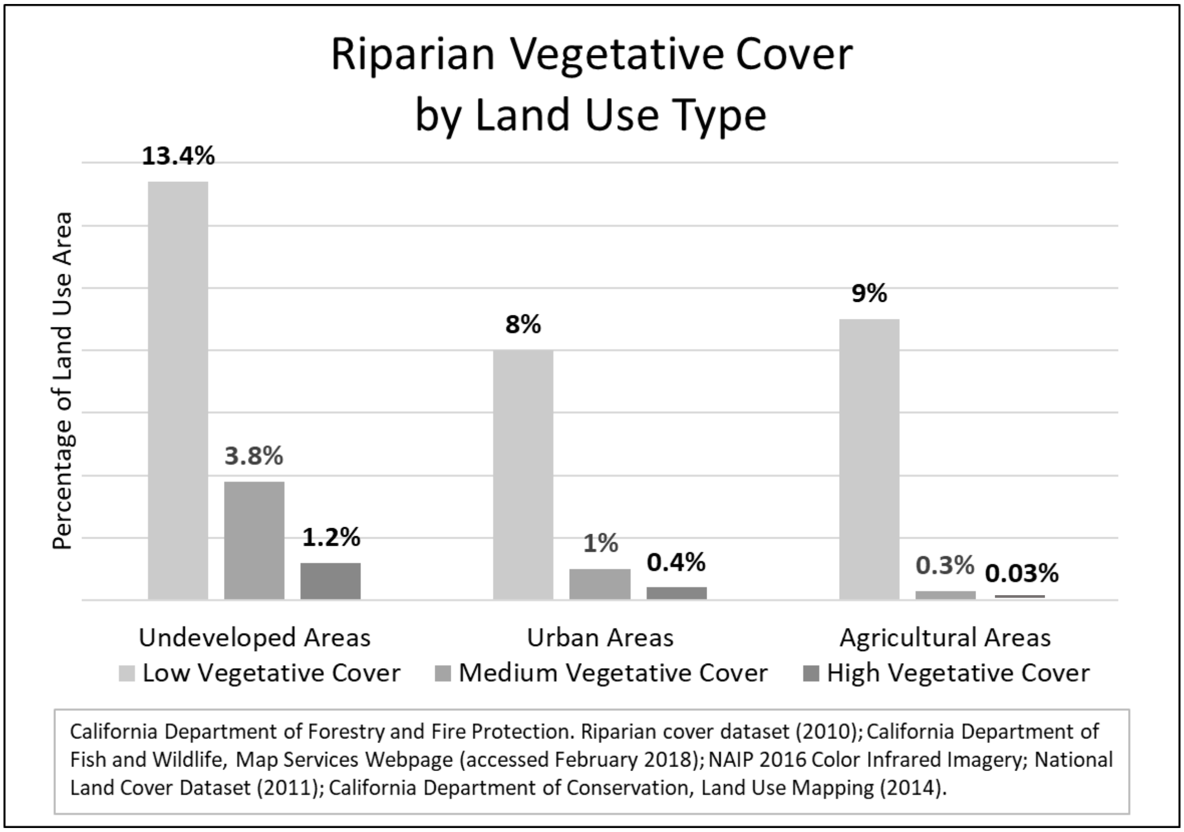

Figure A.C.5-2. Riparian Vegetative Cover by Land Use Type

Aerial Imagery

28. The use of publicly available aerial imagery was explored relative to the ability to assess the extent and condition of riparian areas on or adjacent to commercial irrigated agricultural land use areas in the central coast region. A summary is presented in the findings below.

29. The National Agriculture Imagery Program (NAIP) supported by the United States Department of Agriculture (USDA) is a color infrared (CIR) imagery. CIR imagery is useful for various purposes, including vegetation mapping. Infrared analysis in aerial imagery is possible because most objects exhibit a negligible infrared reflectance, but actively growing plants exhibit a high infrared reflectance and stressed plants (either from disease or drought) exhibit a reduction in their infrared reflectance. Thus, infrared imagery can highlight areas of denser, healthy green vegetation (high chlorophyll density). This vegetation can include riparian vegetation, wetlands, as well as areas of healthy irrigated cropland and lawns. Given the inability to distinguish between cropland and wetland or riparian areas, this tool is not currently useful for such an analysis.

30. There are image-based services available online; however, many of them require subscriptions or "pay for specified products" (e.g., TerraServer,[30] DigitalGlobe,[31] nearmap,[32] etc.). There are a variety of services offered through ESRI online,[33] USGS,[34] and a couple of additional "user friendly" options such as Google Maps and Google Earth.

31. Depending on the data source (and quality), processing the imagery (i.e., clipping it to the central coast region, or specific agricultural areas) would be time intensive. In addition, the publicly available imagery is not yet high enough resolution to conduct this analysis. Given these constraints, this Order requires Dischargers to report baseline information on the extent and condition of riparian areas in commercial irrigated land use areas.

Water Quality Objectives and Beneficial Uses

32. Riparian areas play an important role in achieving numerous water quality objectives established in the Basin Plan to protect specific beneficial uses. These include water quality objectives related to:
    a. Natural receiving water temperature,
    b. Dissolved oxygen levels,
    c. Suspended sediment load,
    d. Settleable material concentrations,
    e. Chemical constituents, and
    f. Turbidity.

33. For example, the removal of wetlands reduces estuarine habitat and impacts the quality of marine habitat, since wetlands act as a filtration system before surface waters are discharged to the ocean. The removal of riparian habitat along surface waters threatens maintenance of temperature water quality objectives, which negatively affects dissolved oxygen-related water quality objectives, which negatively affects the food web.

34. Riparian areas play an important role in protecting several of the beneficial uses designated in the Basin Plan. Commercial irrigated agricultural activities have resulted in water quality impacts that are not protective of the following beneficial uses:

[30] https://www.terraserver.com/
[31] https://www.digitalglobe.com/
[32] https://go.nearmap.com/
[33] http://www.esri.com/data/imagery
[34] https://earthexplorer.usgs.gov/

a. Ground Water Recharge;
b. Fresh Water Replenishment;
c. Warm Fresh Water Habitat;
d. Cold Fresh Water Habitat;
e. Inland Saline Water Habitat;
f. Estuarine Habitat;
g. Marine Habitat;
h. Wildlife Habitat;
i. Preservation of Biological Habitats of Special Significance;
j. Rare, Threatened or Endangered Species;
k. Migration of Aquatic Organisms;
l. Spawning, Reproduction and/or Early Development; and
m. Areas of Special Biological Significance.

35. Riparian areas protect water quality and reduce water quality impacts in many ways. They are effective at reducing sediment and pollutant discharges. They also provide high quality habitat for wildlife, both aquatic and terrestrial.

36. “Wetlands and riparian areas play a significant role in protecting water quality and reducing adverse water quality impacts associated with Nonpoint Source (NPS) pollution, and they help decrease the need for costly stormwater and flood protection facilities. Thus, wetlands and riparian areas are an important component of a combination of management measures that can be used to reduce NPS pollution. In addition, in their natural condition they provide habitat for feeding, nesting, cover, and breeding to many species of birds, fishes, amphibians, reptiles, and mammals.” (USEPA, 2005).

37. Riparian areas play an important role in achieving several water quality objectives established to protect specific beneficial uses. These include, but are not limited to, those water quality objectives related to natural receiving water temperature, dissolved oxygen, suspended sediment load, settleable material concentrations, chemical constituents, and turbidity.

<u>Ecological Functions and Values</u>

38. Riparian areas function to retain and recycle nutrients, thereby reducing nutrient loading to surface water or groundwater. Riparian areas trap and filter sediment and other wastes contained in agricultural runoff and reduce turbidity. Riparian areas temper physical hydrologic functions, protecting aquatic habitat by dissipating stream energy and temporarily allowing the storage of floodwaters, and by maintaining surface water flow during dry periods. Riparian areas regulate water temperature and dissolved oxygen, which must be maintained within healthy ranges to protect aquatic life. In the absence of human alteration, riparian

areas stabilize banks and supply woody debris (NRC, 2002), having a positive influence on channel complexity and in-stream habitat features for fish and other aquatic organisms (CDFG, 2003).

39. Riparian areas are critical to the quality of in-stream habitat. Riparian vegetation provides woody debris, shade, food, nutrients and habitat important for fish, amphibians, and aquatic insects (CDFG, 2003). Riparian areas help to sustain broadly based food webs that help support a diverse assemblage of wildlife (NRC, 2002).

40. Up to 43 percent of the federally threatened and endangered species rely directly or indirectly on wetlands for their survival (USEPA, 2020). Of all the states, California has the greatest number of at-risk animal species (15) and, by far, the greatest number of at-risk plant species (104) occurring within isolated wetlands (Comer et al., 2005).

41. The state set an overarching goal to prevent further decline of wetlands through a “no net loss” approach. The California Wetlands Conservation Policy, Executive Order W-59-93, also known as the “No Net Loss Policy,” adopted in 1993, established the State’s intent to develop and adopt a policy framework and strategy to protect California’s unique wetland ecosystems. One of the goals of this policy is to ensure no overall net loss and achieve a long-term net gain in the quantity, quality, and permanence of wetlands acreage and values in California in a manner that fosters creativity, stewardship and respect for private property.

42. Heathy riparian areas are integral to healthy aquatic systems. Through their ability to filter water and accumulate sediments, riparian and wetland areas prevent organic chemicals adhered to sediment, such as pesticides, herbicides and fungicides, from entering the waters of the state (USEPA, 2005). A large body of data provide evidence that in the central coast region, sediment-bound organic chemicals from agricultural areas are toxic to aquatic organisms (CDPR, 2017; Phillips et. al., 2016). In related studies, researchers have shown that wetland treatment areas are effective ways to reduce chemical concentrations and associated toxicity (Anderson et. al., 2010; Anderson et. al., 2017).

43. Heathy riparian areas are critical to the support of steelhead trout and other sensitive and endangered species. In addition to filtering pollutants, riparian corridors maintain bank stability, shade the creek corridor, and maintain appropriate temperatures, create instream habitat via root structure and woody debris, and serve as an important part of the instream food base by contributing leafy debris that supports aquatic insect use.

44. Many of the streams and rivers in the central coast region, including many in commercial irrigated agricultural areas, are designated critical habitat for steelhead trout and other protected species. These species rely on healthy aquatic habitat for spawning, rearing, and feeding. The three most important commercial irrigated agricultural areas in the region, the lower Pajaro, Salinas, and Santa Maria watersheds, are all adjacent to critical steelhead habitat.

45. Riparian management measures can protect waterbodies from anthropogenic land use activities, such as agricultural and urban development. One such management measure, setbacks, are vegetated areas that exist or are established to protect a stream system, lake, reservoir, or coastal estuarine area. The most efficient place to remove pollutants and nutrients from watershed discharges is in riparian areas prior to entering the stream channel (Correll, 2005). Riparian areas perform a range of functions with economic and social value to people (Wenger, 1999), including:
    a. Trapping/removing sediment from runoff.
    b. Stabilizing streambanks and reducing channel erosion.
    c. Trapping/removing phosphorus, nitrogen, and other nutrients that can lead to eutrophication of aquatic ecosystems.
    d. Trapping/removing other contaminants, such as pesticides.
    e. Storing flood waters, thereby decreasing damage to property.
    f. Maintaining habitat for fish and other aquatic organisms by moderating water. temperatures and providing woody debris.
    g. Providing habitat for terrestrial organisms.
    h. Improving the aesthetics of stream corridors (which can increase property values).
    i. Offering recreational and educational opportunities.

46. Riparian vegetation may also play a role in integrated pest management by reducing the amount of chemicals and pesticides needed on agricultural lands and protecting water quality as a result (Karp, 2016). For example, predatory insects consumed pest insects reducing aphid infestations in lettuce (Karp, 2016).

Sediment Trapping

47. Excess sediment has many harmful effects on water quality (Wenger, 1999). In municipal water, sediment is harmful to people and industrial processes. Where sediment is deposited into stream channels, fish and invertebrate habitat is reduced. Suspended sediment creates turbid conditions that reduce light transmittal which decreases algal production. Fine suspended sediments in high concentrations cause direct mortality for many fish species. Suspended sediment reduces the abundance of filter-feeding organisms. Finally, excess sediment reduces the capacity and useful life of reservoirs upon for drinking water.

48. Agricultural land adjacent to a waterbody has the potential to release significant amounts of sediment over long periods of time (NRC, 2010). This condition leads to bank erosion and destabilizes the natural processes of erosion, transport of sediment, and deposition of sediment material (Riley, 2002). Vegetated riparian corridors reduce sedimentation and protect water quality (Lowrance, et. al. 1995; Wenger, 1999). The width and type of vegetation in the riparian corridor play a significant role in sediment reduction (Wenger, 1999).

Bank Stabilization

49. Bank stabilization is significantly enhanced by riparian setbacks. Riparian vegetation has a significant effect on bank stabilization by binding sediment and moderating erosion processes (Lowrance et al., 1995). The removal of vegetation and other disturbances in riparian corridors leads to significant negative impacts to the physical and biological conditions of a waterbody system (Bolton and Shellberg, 2001, and Riley, 2002).

50. In the absence of human alteration, riparian areas stabilize banks and supply woody debris (NRC, 2002), having a positive influence on channel complexity and in-stream habitat features for fish and other aquatic organisms (CDFG, 2003).

51. CCAMP and CMP bioassessment data show that streams in areas with predominantly agricultural land use are typically in poor condition with respect to benthic community health and that habitat in these areas is often poorly shaded, lacking woody vegetation, and heavily dominated by fine sediment. Heavily sedimented stream bottoms can result from the immediate discharge of sediment from nearby fields, the loss of stable, vegetated stream bank habitat, the channelization of streams and consequent loss of floodplain, and from upstream sources.

Nutrient Trapping

52. Excess amounts of nitrogen discharged to surface water causes eutrophication. Nitrogen occurs in many organic and inorganic forms which convert to nitrate and ammonium under certain circumstances. Nitrate as nitrogen (NO_3^-N) in excess of 10 mg/liter presents a human health risk. Un-ionized ammonia (NH_3-N) in excess of 0.025 mg/liter is toxic to aquatic organisms. Nitrate and un-ionized ammonia removal from drinking water represents a significant water treatment expense (Welsh, 1991). There are two pathways that remove nitrogen in a riparian area: vegetation uptake and denitrification. Through the denitrification process anaerobic microorganisms convert nitrate into nitrogen gas. This process is a

permanent removal of nitrogen. Riparian areas are sites of high nitrogen removal (Wenger, 1999).

53. Phosphorous outputs from agricultural operations have been implicated in eutrophication due to overfertilization. Eutrophication causes algal blooms which deplete the oxygen in water as they die off and decay, to the point in many instances where fish and other aquatic organisms die. Research suggests that since most phosphorous is discharged to a waterbody with sediment, riparian areas that are wide enough to adequately trap sediment will also trap phosphorous (Karr and Schlosser, 1977; Osborne and Kovacic, 1993; Peterjohn and Corell, 1985). Riparian areas will provide short term phosphate retention, but eventually the soluble phosphate leaches into groundwater or the waterbody, especially once the riparian area becomes saturated (Osborne and Kovacic 1993; Mander, 1997). However, riparian areas can still protect a waterbody from extreme nutrient pulses during storm events. Phosphorous could also be permanently removed before discharging to a riparian area using an additional field of unfertilized crops, such as hay planted between the phosphorous source and the riparian area (Wenger, 1999).

54. Riparian areas function to retain and recycle nutrients (NRC, 2002; Fisher and Acreman, 2004), thereby reducing nutrient loading directly to surface water or groundwater. Riparian areas trap and filter sediment and other wastes contained in agricultural runoff and reduce turbidity (NRC, 2002; PDRHW, 2000; Palone and Todd, 1998).

Other Contaminant Trapping

55. Animal waste also contributes to water quality degradation. These wastes contain a suite of pathogenic microorganisms. In addition, organic matter is broken down by aerobic bacteria in surface water. Under these conditions, oxygen is quickly consumed, resulting in anaerobic conditions unsuitable for fish and other aquatic life. Riparian areas trap waste transported by surface runoff (Doskey, et. al., 1997).

56. Pesticides are chemicals intended to be toxic since they are designed to kill insects and other pests. They are toxic in varying degrees, causing mortality in some instances, while in other instances having sublethal effects that inhibit reproduction. Riparian areas have been shown to remove pesticides and heavy metals, but the width needed to perform this function is unclear (Wenger, 1999 and Lowrance, et al., 1997). Pesticide removal requires significantly wider riparian areas than those needed for nutrient and contaminant removal (Wenger, 1999).

Flood Protection

57. Periodic flooding is a natural process whereby the volume of water cannot be contained by the active stream channel. Water overflows the streambanks and discharges to the adjacent land. Riparian areas reduce these adverse effects by dispersing flows, storing floodwaters, and absorbing water (allowing for groundwater infiltration). Riparian areas are an effective tool in improving agricultural land management. Wide riparian areas act as buffers to debris that may wash onto fields during floods, thereby offsetting damage to agricultural fields and improving water quality.

58. Vegetated riparian areas provide greater environmental value than unvegetated floodplains or cropped fields. Riparian areas provide as much as 40 times the water storage of a cropped field and 15 times that of grass turf (CRWP, 2006).

59. Riparian areas temper physical hydrologic functions, protecting aquatic habitat by dissipating stream energy and temporarily allowing the storage of floodwaters, and by maintaining surface water flow during dry periods (Palone and Todd, 1998).

Fish and Other Aquatic Life Habitat

60. Woody debris and litter inputs provide essential habitat for many fish and are probably the single most important factor in supporting salmonids (May et al., 1996). Riparian vegetation, especially trees, is also an important source of shading, which helps to control stream temperatures and control the productivity of algae and aquatic plants, thereby reducing algal blooms (Lowrance, et al., 1995). Another source of food energy is aquatic plant life and algae. Like detritus inputs, these are primary food sources for many organisms. However, excess nutrient inputs can alter the system and result in algal blooms causing oxygen depletion which is detrimental to most fish and many other aquatic life (FISRWG, 1998). The integrity of the vegetation along a stream channel is a critical characteristic of a healthy ecology. Direct litter inputs (detritus) are a fundamental food source for many aquatic organisms (Lowrance, et al., 1995). These organisms in turn are a food source higher up the food chain, creating a complex food web of macroinvertebrates, aquatic insects, and fish.

61. Seasonal and daily water temperatures are strongly influenced by the amount of solar radiation reaching the stream surface, which is influenced by riparian vegetation (PDRHW, 2000). Removal of vegetative canopy along surface waters threatens maintenance of temperature water quality objectives, which in turn negatively affects dissolved oxygen related water quality objectives, which in turn

negatively affects fish and other aquatic life (PDRHW, 2000). Riparian areas regulate water temperature and dissolved oxygen, which must be maintained within healthy ranges to protect aquatic life (PDRHW, 2000).

62. Riparian vegetation provides important temperature regulation for instream resources. In shaded corridors of the central coast region, temperatures typically stay under 20 degrees Celsius or 68 degrees F (within optimum temperature ranges for salmonids) but can rapidly increase above 20 degrees Celsius when vegetation is removed. Orcutt Creek in the lower Santa Maria watershed is an example where upstream shaded areas remain cooler than downstream exposed areas, despite lower upstream flows (CCAMP, 2010a).

63. Riparian areas are critical to the quality of in-stream habitat. Riparian vegetation provides woody debris, shade, food, nutrients and habitat important for fish, amphibians and aquatic insects (CDFG, 2003). Riparian areas help to sustain broadly based food webs that help support a diverse assemblage of wildlife (NRC, 2002).

Terrestrial and Avian Wildlife Habitat

64. Riparian areas provide essential habitat for a diverse community of terrestrial wildlife. Riparian areas of a size that address water quality and fish needs may not be adequate to meet the needs for terrestrial wildlife. Many bird species require extremely large riparian corridors to support breeding and foraging. Relatively few studies have assessed the size of riparian areas for mammals. Cross (1985) suggested that riparian zones support higher diversity and density of small mammals than upland habitat. Riparian areas also support diverse and abundant reptile and amphibian populations. However, many amphibian species rely upon not only riparian habitat, but also old growth vegetation and upland habitat during different life stage. More than 225 species of birds, mammals, reptiles, and amphibians depend on California's riparian areas (RHJV, 2004).

Development of the Setback Requirements

65. This Order establishes two types of setback requirements. The riparian setback requirement applies to ranches located in Riparian Priority areas with a surface waterbody on or bordering the ranch. Dischargers have four compliance pathways to choose from to comply with the riparian setback requirement. The operational setback applies to ranches outside of Riparian Priority areas and to ranches that select the Cooperative Approach compliance pathway.

66. The riparian setback requirement is a discharge prohibition and requires implementation of management measures related to protecting and restoring riparian areas. The operational setback is only a discharge prohibition.

Discharge Prohibition in Setback Areas

67. Water Code section 13243 authorizes the Central Coast Water Board, in WDRs, to specify certain conditions or areas where the discharge of waste, or certain types of waste, will not be permitted.

68. The operational and riparian setbacks established through this Order prohibit the discharge of agricultural waste within setback areas. The discharge of waste, including nutrients and pesticides that results from growing and irrigating crops and applying agricultural chemicals in close proximity to surface waterbodies (i.e., within the setback distance) is prohibited because there is a high likelihood that the discharges will cause water quality impairment.

69. Additionally, the storage of chemicals is prohibited within the setback areas due to the potential for the chemicals to discharge to surface waterbodies. Within the riparian setback areas, the riparian vegetation provides sediment and erosion control, as well as the function of reducing other pollutant loading and providing temperature control. Sediment and erosion control practices are required within the operational setback areas to prevent sedimentation and erosion from impacting surface water quality.

70. The setback requirements do not prohibit the discharge of waste coming from irrigated agricultural fields and flowing over the setback areas via overland flow or flowing through the soil profile in the setback area. The setback requirements are focused on prohibiting the discharge of waste originating within the setback areas and allowing the setback areas to provide the water quality benefits of pollutant load reduction.

Management Measures in Riparian Setback Areas

71. As discussed in Section B of this Attachment A, USEPA has provided guidance related to implementing the federal Coastal Zone Act Reauthorization Amendments (CZARA) and their associated management measures for controlling nonpoint source discharges (CZARA, 1993).

72. Chapter 7 of the guidance is titled *Management Measures for Wetlands, Riparian Areas,* and *Vegetated Treatment Systems* and includes a discussion of management measures to protect and restore wetlands and riparian areas to

protect coastal waters from coastal nonpoint pollution (CZARA, 1993). Management measures are defined under CZARA as "*economically achievable measures to control the addition of pollutants to our coastal waters, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes, siting criteria, operating methods, or other alternatives*."

73. Functioning riparian areas address multiple categories of nonpoint source pollution that affect water quality. The primary pollutants addressed by riparian area management are sediment, nitrogen, phosphorus, and temperature (CZARA, 1993).

74. Degraded riparian areas have less ability to remove nonpoint source pollutants and to attenuate stormwater peak flows. Additionally, degraded riparian areas can deliver increased amounts of sediment, nutrients, and other pollutants to other waterbodies, thereby acting as a source of nonpoint source pollution themselves (CZARA, 1993). Because riparian areas degraded due to agricultural activities can act as a source of nonpoint source pollution themselves, this Order establishes waste discharge requirements that focus on protecting and restoring riparian areas to avoid such discharges and their impacts on water quality.

75. CZARA supports this Order's incorporation of the following management measures: Protection of Wetlands and Riparian Areas and Restoration of Wetlands and Riparian Areas.

76. CZARA recommends using native plants to avoid impacts to nearby riparian areas and therefore supports this Order's requirement that Dischargers use native plants species when establishing new vegetation and prohibition on the establishment of non-native invasive species to avoid unintended negative impacts to nearby riparian areas.

    a. *"When consistent with preexisting wetland or riparian area type, plant a diversity of plant types or manage natural succession of diverse plant types rather than planting monocultures. Deeply rooted plants may work better than certain grasses for transforming nitrogen because the roots will reach the water moving below the surface of the soil. For forested systems, a simple approach to successional restoration would be to plant one native tree species, one shrub species, and one ground-cover species and then allow natural succession to add a diversity of native species over time, where appropriate and warranted by target community composition and anticipated successional development. Information on native plant species is available from Federal agencies (e.g., USDA-SCS or USDOIFWS), or* *various State or local agencies, such as the local Cooperative Extension Service Office or State departments of agriculture or natural resources. Other factors listed below need to be considered in the implementation of this practice."*

b. *"Native/Noninvasive Plants. The best species for [vegetated filter strips] VFS are those which will produce dense growths of grasses and legumes resistant to overland flow. Use native or at least noninvasive plants to avoid negatively impacting adjacent natural areas."*

77. The draft EIR associated with this Order also evaluated the potential for the Order's requirements to have a substantial adverse effect, either directly or through habitation modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by CDFW or USFWS; or have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by CDFW or USFWS. For these potential impacts, the draft EIR determined that impacts would be less than significant with mitigation, and identified mitigation measures to avoid or reduce impacts, including avoiding and minimizing impacts on sensitive biological resources. The draft EIR analysis was based on the Order's requirement to use native species when establishing new vegetation, which is included to reduce unintended adverse impacts to nearby vegetation ecosystems supported by the vegetation.

Scientific Approach to Setbacks

78. Setbacks are an effective riparian management measure to protect water quality and beneficial uses. The size of a setback and approaches to assessing riparian setback widths depend on which water quality objective needs to be met and/or which beneficial use needs protection. For example, the setback width needed to effectively remove sediments is different from the width needed to effectively remove nutrients. Setback widths to protect terrestrial wildlife are wider than those needed for sediment or nutrient removal. Setback widths to effectively remove pesticides vary greatly depending on the pesticide type.

Ecosystem Functions and Values

79. A significant volume of peer-reviewed scientific literature and white papers were reviewed to aid in the development of riparian setback widths protective of water quality and beneficial uses. The scientific literature generally indicates the number of ecological functions (e.g., water quality and beneficial use protection) provided by a riparian area tends to increase with its overall width and length. There are constraints in interpreting these recommended setback widths because

researchers generally offer only a minimum and maximum width. ***Table A.C.5*-5** summarizes the peer-reviewed scientific literature reviewed by staff.

Table A.C.5-5. Ecosystem Function

Ecosystem Function	Minimum Buffer Width (feet)	Maximum Buffer Width (feet)
Aquatic Wildlife Support	60	220
Bank or Shoreline Protection	35	80
Contaminant Filtration or Chemical Transformation	35	375
Flood Hazard Reduction / Attenuation	60	350
Multiple Ecosystem Functions	50	170
Nitrogen Removal	65	180
Pesticide Removal	50	330
Sediment Entrapment / Retention	40	225
Water Quality Protection	60	220
Minimum Buffer Width	**35**	**80**
Maximum Buffer Width	**65**	**375**
Average Buffer Width	**51**	**239**
Median Buffer Width	**50**	**220**

(Adapted from VANR, 2005 and Chase, 1995)

80. Setback widths for even minimal terrestrial wildlife habitat and some avian habitat value are generally wide. **Table A.C.5-6** summarizes the peer-reviewed scientific literature reviewed by staff. All the scientific literature staff reviewed were literature reviews; they reviewed and reported on numerous scientific studies specific to a species.

Table A.C.5-6. Terrestrial and Avian Wildlife Protection

Reference	Recommended Setback Width (feet)		
	Amphibians and Reptiles	Birds	Mammals
Schroeder, 1983		165	
Dickson and Huntley, 1987			180
Tassonne, 1981		200	
Darveau, et al., 1995		200	
Tassonne, 1981		200	
Spencer, 1981			200
Johnson, 1986		250	
Foster, et al., 1984		300	

Reference	**Recommended Setback Width (feet)**		
Roderick and Miller, 1991		315	315
Dibello, 1984			330
Hall, 1970			330
Mequist, 1981; Linn and Birks, 1981			330
Keller, et al., 1993		330	
Golet, et al., 1993	330	330	330
Roderick and Miller, 1991		450	
Scheuler, 1987		660	
Forman, 1983	660	660	660
Roderick and Miller, 1991		600	
Grice and Rogers, 1985		600	
Duebbert and Lokemoen, 1976		840	
Cross, 1985			20
Burton and Likens, 1973	50	50	50
Rudolph and Dickson, 1990	215		
White, 1953		150	
Semlitsch and Bodie, 2003	489		
Desbonnet, et al., 1994		429	
Minimum Setback Width (feet)	**50**	**50**	**20**
Maximum Setback Width (feet)	**660**	**840**	**660**
Average Setback Width (feet)	**349**	**374**	**275**
Median Setback Width (feet)	**330**	**322.5**	**322.5**

(Adapted from Vermont Agency of Natural Resources, 2005 and Chase, 1995)

Stream Order

81. The role of stream order is also a component for consideration in determining setbacks distances that achieve water quality objectives and protect beneficial uses. Stream order refers to a method of classifying streams based on their numbers of tributaries. First and second order streams have a higher portion of flows that pass through riparian areas than higher order waterbodies. If pollutant removal is the goal, research suggests that wider riparian setbacks on lower order waterbodies are more effective. If the goal is to protect other ecological functions (e.g., wildlife habitat, large woody debris input), wider setbacks are needed. (NRC, 2002).

82. Stream order classification systems have been developed over decades: Drawl in 1982, Horton in 1945, Scheidegger in 1966, Shreve in 1966, and Strahler in 1952 and Strahler 1957. The Open Source Geospatial Foundation reviewed the advantages and disadvantages to each. Drawl's hierarchal system is a

compromise between Strahler and Shreve magnitude and takes advantage of both ordering and magnitude. However, it minimizes the bifurcation ratio of the network. Horton's ordering system produces natural stream ordering with main streams and tributaries but requires prior Strahler ordering which may result in unnatural ordering where the highest order may be attributed to the channel that leads to the most branched parts of a catchment. Shreve's system assigns a magnitude of one to every initial channel and sums the magnitudes of its tributaries. Scheidegger's stream magnitude system is like Shreve's but assigns a magnitude of two for every initial channel. (OSGF, n.d.).

Strahler Stream Order

83. This Order uses the Strahler Stream Order system (Strahler system) to determine the required setback width and vegetative cover for streams adjacent to or running through ranches in Riparian Priority areas for the reasons described below. The Strahler system has a good mathematical background (OSGV, n.d.).

84. According to Hughes, et. al. (2011), "Water-body size is one of the most important factors affecting the structure and function of aquatic ecosystems. The categorical variable, Strahler stream order, is commonly used as a surrogate for stream size, perhaps because stream size is a multidimensional attribute that defies simple definition.

85. The Strahler system is relatively easy to extract from stream networks constructed from digital elevation data and national hydrographic datasets. The Strahler system is acting as a proxy for other hydrogeologic and geomorphic variables. The Strahler system is a feasibly achieved surrogate for uniformity in applications (Booth, D., 2019).

86. The Strahler system is readily available and free through the National Hydrography Dataset developed by USGS. Under the Strahler system, hydrography deals with the hierarchy of streams from the source (or headwaters) downstream. The Strahler system is widely used by the State Water Resources Control Board and other regional water quality boards in California, as well as the U.S. Army Corps of Engineers and the U.S. Environmental Protection Agency (SDRWQCB, 1999; SWRCB, 2019; SWRCB, 2007; USEPA, 2000; and USACE, 2005).

Description

87. Under the Strahler system, the headwaters are the first order (Order 1) and downstream segments are defined at confluences (Orders 2 through 6). As two Order 1 waterbodies join, they form an Order 2 waterbody. As two Order 2 waterbodies join, they form an Order 3 waterbody, and so on. The waterbodies are increasingly larger as the classification moves to a higher class. For example, the Salinas River is an Order 6 stream under the Strahler system. Order 6 is the highest Strahler Stream Order in commercial agricultural land use areas of the central coast region. **Figure A.C.5-3** illustrates the Strahler system for Order 1 through Order 6 stream orders.

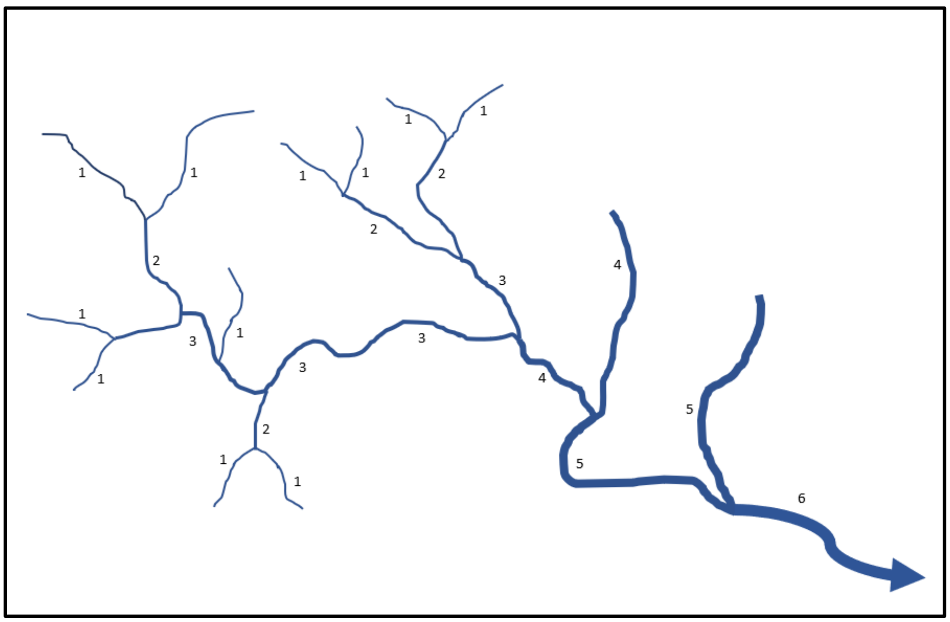

Figure A.C.5-3. Strahler Stream Order System

Limitations

88. Site-specific predictions of stream size from the Strahler system can have errors. Researchers should base their analysis on multiple, continuous measures of stream size (Hughes, et. al, 2011). The Strahler system is dependent on the scale and detail of the map that is used to draw it (Derek, B., 2019). If using National Hydrography Dataset (NHD) based on blue lines on 1:24,000 map, the scale issue is addressed. But if switched to a 1:100,000 scale map, then many 2nd or even 3rd order streams in the 1:24,000 map would be reflected as 1st order streams. Staff used the 1:24,000 scale as a consistent way to delineate reaches.

89. Under the Strahler system, Order 1 streams could generally fall into two categories: manmade agricultural ditches or headwaters. Headwaters are the uppermost streams in the river network furthest from the river's endpoint or confluence with another stream. Headwater streams trap floodwaters, recharge groundwater supplies, remove pollution, provide fish and wildlife habitat, and sustain the health of downstream rivers, lakes and bays. Because small streams and streams that flow for only part of the year are the source of fresh waters, changes that harm these headwaters affect streams, lakes and rivers downstream. This Order provides protection for headwaters due to their high resource value. Based on geographic analyses, most commercial irrigated agricultural land use occurs on floodplains where headwaters do not typically exist. It is possible that the Strahler system will occasionally map a manmade agricultural ditch as an Order 1 stream. This Order includes an option for Dischargers to submit documentation to support an assertion that a waterbody on or adjacent to their ranch is a manmade agricultural ditch and therefore exempt from the riparian setback requirement.

Slope

90. It is important to consider slope when determining an appropriate setback width. Steep slopes do not allow for sufficient retention times to trap sediment and pollutants. Steep slopes also escalate flow velocities, which can result in erosion and channelization of surface water flows through the setback area.

91. To assist local jurisdictions in meeting Clean Water Act and Endangered Species Act requirements, several federal efforts have produced setback guidance and guidelines. As part of the USEPA’s Office of Water stream setback model ordinance, the Office of Water generated design standards for forest setbacks (USEPA, n.d.). The USEPA offers two methods to adjust for slope when determining appropriate setback widths.

92. **Table A.C.5-7** is what USEPA refers to as “Method A.” **Table A.C.5-8** is “Method B.”

Table A.C.5-7. Percent Slope and Setback Widths – Method A

Percent Slope	Width of Setback
15 - 17%	add 10 feet
18 - 20%	add 30 feet
21 - 23%	add 50 feet
24 - 25%	add 60 feet

(USEPA, n.d.)

Table A.C.5-8. Percent Slope and Setback Widths – Method B

Percent Slope	Type of Stream Use	
	Water Contact Recreational Use	Sensitive Stream Habitat
0% to 14%	no change	add 50 feet
15% to 25%	add 25 feet	add 75 feet
> 25%	add 50 feet	add 100 feet

(USEPA, n.d.)

93. Collins, et al. (2006) reviewed studies focused on establishing a formula to consider slope when determining appropriate setback widths (**Table A.C.5-9**). The average adjustment was 1.12 times the slope.

Table A.C.5-9. Setback Width Formulas Adjusted for Slope

Recommended Adjustment	Setback Width Thresholds (meter)
1.25 x slope	30
1.50 x slope	30
1.20 x slope	30
0.60 x slope	30
1.50 x slope	20
0.50 x slope	20
1.33 x slope	30

(Adapted from Collins, et al., 2006)

94. There is consensus that slopes greater than 15% require wider setbacks (Desbonnet, et. al., 1999)

95. This Order uses EPA Method A to determine the required additional setback width for ranches in Riparian Priority areas with slopes greater than 15%. Method A is the preferred approach because it is the simplest to measure while still being protective of water quality and beneficial uses.

Concentrated Flows

96. While setbacks are effective when water flow is uniform across a slope (sheet flow), their effectiveness in trapping sediment greatly decreases when water flow is concentrated into channels or small streams (Wenger, 1999). Commercial irrigated agricultural land practices often concentrate flows into ditches prior to discharging from the farm. The research discussed in this section is almost entirely based on sheet flow.

Vegetation Type and Diversity

97. Land management and conservation agencies describe three vegetated zones within a riparian setback that can provide water quality protection (NRCS, 2007; Welsch, 1991; Tjaden and Weber, 1998). These zones are described below:
    a. Zone 1 – The goal for this zone is to control temperature and turbidity discharges by establishing a mix of trees and shrubs that provide shade and streambank stability. A mix of native woody species that vary from large tree species as they mature to understory trees and shrubs will provide canopy cover and shading next to the water.
    b. Zone 2 – The goal for this zone is to establish a mix of trees and shrubs that will absorb and treat waterborne nutrients and other pollutants and allow water to infiltrate into the soil.
    c. Zone 3 – The goal for this zone is to act as a transitional zone between cropland and zones 1 and 2, serving to slow flows, disperse flows out into more diffuse, sheet flow, and promote sediment deposition. The use of stiff multi-stemmed grasses and forbs are preferred and will help disperse concentrated flows.

98. Non-native invasive plant species often outcompete or predate on native species (ELC, 2015). Invasive species can hybridize and alter ecosystem functions, including nutrient cycling and water filtration, sediment deposition, and erosion (Randall et al., 2000, Rejmanek et al., 2002, ELC, 2015). Invasive species have been shown to reduce agricultural yields (ELC, 2015).

99. Non-native invasive and exotic plant species exclude native riparian vegetation by out-competing native species for habitat. Additionally, non-native invasive and exotic plants do not support the same diversity of wildlife native to riparian areas, often use large amounts of water, and can exist as monocultural stands of grass. Grass habitat is very different from the complex habitat structure provided by a diversity of native riparian trees and shrubs, and results in habitat changes that affect the aquatic based food web (NRCS, 2007; CDFG, 2003).

100. Certain characteristics are attributed to invasive species. They have fast growth rates, asexual or rapid reproduction, the ability to utilize many different food types and sources, and a wide tolerance range of environmental conditions (ELC, 2015). Rare species are the most vulnerable to the introduction of invasive species (Randall et al., 2000). Some invasive species have been shown to alter soil chemistry which impacts survival and reproduction of native species (Randall et al., 2000). Riparian invasive plant species have been shown to alter hydrology; Tamarisks (*Tamarix chinensis, T. ramosissima, T. pentandra,* and *T. parviflora*)

and have been cited as possibly lowering the water table in areas of the central coast region (Randall et al., 2000). The California Department of Fish and Wildlife's Natural Diversity Database reports that 181 of the rarest plant species are threatened by invasive weeds (Randall et al, 2000).

101. Many countries have passed legislation or adopted programs, plans, and policies to limit the introduction of non-native invasive species. The United States has passed three laws, the National Invasive Species Act of 1990 reauthorized in 1996, the Plant Protection Act of 2000, and the Lacey Act of 1900 (ELC, 2015). The California Endangered Species Act (CESA) of 1970, amended in 1984 and 1997, conserves and protects plant and animal species at risk of extinction. There are approximately 250 species currently listed under CESA. The California Department of Fish and Wildlife has the primary responsibility to enforce CESA but works with agencies (including the Central Coast Water Board) and organizations to study, protect, and preserve CESA-listed species and their habitats (CDFW, 2019).

102. Based on the above, this Order includes provisions to prohibit the planting of non-native, invasive (exotic) plant species in riparian areas.

Regulatory Approaches to Setbacks

103. Riparian setback width requirements, management efforts, and approaches vary widely. At the municipality level, stormwater management programs, general plans, and ordinances are sometimes used to establish fixed-width setback requirements. Many state and federal agencies develop policies, plans, and management recommendations, but do not have setback requirements in their statutes, regulations, or other directives.

Central Coast Municipalities

104. Riparian setback requirements adopted by more than 40 municipalities in the central coast region were compiled and are summarized in ***Table A.C.5*-10**.

Table A.C.5-10. Central Coast Municipalities

Municipality	Category A Buffer Width (feet)	Category B Buffer Width (feet)	Category C Buffer Width (feet)
San Luis Obispo County	10	50	100
City of Atascadero	20	35	50
City of San Luis Obispo	20	35	50

Municipality	Category A Buffer Width (feet)	Category B Buffer Width (feet)	Category C Buffer Width (feet)
City of Arroyo Grande	25	35	50
Santa Cruz County	30	50	100
City of Morro Bay	50	100	200
Santa Barbara County	50	100	200
City of Santa Cruz	20	70	
City of Carpinteria	20	100	
City of Pismo Beach	25	100	
City of Salinas	30	100	
City of Capitola	35	50	
Monterey County	50	200	
City of Buellton	50	200	
City of Santa Barbara	25		
City of Watsonville	25		
City of Solvang	30		
City of Santa Maria	30		
City of Lompoc	30		
South Santa Clara County	30		
City of Grover Beach	50		
City of Goleta	50		
San Benito County	50		
City of Seaside	50		
City of Carmel	100		
City of Marina	100		
City of Hollister	100		
Minimum Buffer Width	**10**	**35**	**50**
Maximum Buffer Width	**100**	**200**	**200**
Average Buffer Width	**41**	**88**	**107**
Median Buffer Width	**30**	**85**	**100**

(Staff research, 2018)

105. Of the municipalities that adopted setback requirements (66 percent), more than half developed a waterbody classification system. Other classification systems designate streams or rivers and their tributaries, ranking them based on waterbody size, proximity to environmentally sensitive habitat areas, critical steelhead habitat, water quality issues, and land use designations. Most of the municipalities that do not have specific setback requirements have some language in their Municipal Code, General Plan, or Stormwater Management Plan

that requires new development and redevelopment projects to implement riparian setbacks, but have opted to determine the necessary protective setback width on a project-by-project basis.

106. Central Coast Water Board staff conduct environmental reviews for proposed projects on a routine basis in both the 401 Water Quality Certification and Stormwater Units at the Central Coast Water Board. These reviews reveal that municipalities in the central coast region often grant exceptions or exemptions for open space recreation (i.e., pedestrian trails), ongoing agricultural activities, and forestry land uses.

California Municipalities

107. Literature reviews were conducted to summarize riparian setback widths adopted by other cities and counties in California, summarized in **Table A.C.5-11**.

Table A.C.5-11. California Municipalities

Municipality	Category A Setback Width (feet)	Category B Setback Width (feet)	Category C Setback Width (feet)	Category D Setback Width (feet)
City of San Mateo	20	30	50	100
County of Sonoma	25	50	100	200
City of Sonoma	25	50	100	200
County of Humboldt	25	50	100	
County of Contra Costa	30	50	100	
County of Napa	25		150	
City of San Rafael	30		125	
City of San Jose	50		150	
County of Marin	50		150	
City of Cupertino	50		150	
City of Calistoga	35			185
City of Fairfield	50			200
City of Half Moon Bay	20	70		
City of Ross	25	75		
City of San Anselmo	15			
City of Portola Valley	20			
County of Alameda	20			
City of Albany	20			
City of Fairfax	20			

Municipality	**Category A Setback Width (feet)**	**Category B Setback Width (feet)**	**Category C Setback Width (feet)**	**Category D Setback Width (feet)**
City of Woodside	25			
City of San Carlos[35]	25			
City of Benecia	25			
City of Berkeley	30			
City of Los Altos Hills	30			
City of Yountville[36]	35			
City of Novato	45			
City of San Ramon[37]	100			
City of Fremont[38]	200			
City of San Bernardino	200			
Minimum Setback Width	**15**	**30**	**50**	**100**
Maximum Setback Width	**200**	**75**	**150**	**200**
Average Setback Width	**44**	**54**	**118**	**177**
Median Setback Width	**25**	**50**	**113**	**200**

(Staff research, 2014)

Government Agencies

108. Relatively few government agencies that oversee commercial irrigated agricultural land use activities have the legal authority to require setbacks. The exceptions are the California Department of Forestry and California Department of Pesticide Regulation. The California State Water Resources Control Board, along with the nine regional water quality control boards in the state, may prohibit the discharge of waste in certain areas pursuant to Water Code section 13243 and encourage setbacks as a management measure to meet performance standards. The remaining agencies partner with nonprofits and agricultural landowners and growers to encourage conservation efforts on a voluntary basis.

Department of Forestry

109. The California Department of Forestry established Watercourse and Lake Protection Zones (i.e. riparian areas/setbacks) requirements in the 2010 Forest

[35] Only applies to three creeks in the city.
[36] Only applies to Hopper Creek.
[37] Only applies to upland areas in the city.
[38] Only applies to hill areas in the city.

Practice Rules for watersheds with anadromous salmonids are determined by water class, slope, and key indicator beneficial use. California Code of Regulations 14 CCR sections 916.5, 936.5, and 956.5 set forth procedures for determining watercourse and lake protection zone widths and protective measures, summarized in **Table A.C.5-12**.

Table A.C.5-12. California Forest Practice Rules

Water Class	**Class I**	**Class II**	**Class III**	**Class IV**
Water Class Characteristics or Key Indicator Beneficial Use	* Domestic supplies, including springs, onsite or within 100 feet downstream of the operations area. * Fish always or seasonally present onsite, includes habitat to sustain fish migration and spawning.	* Fish always or seasonally present offsite within 1,000 feet downstream and/or * Aquatic habitat for non-fish aquatic species. * Excludes Class III waters that are tributary to Class I waters.	No aquatic life present, watercourse showing evidence of being capable of sediment transport to Class I and II waters under normal high flow conditions after completion of timber operation.	Man-made watercourses, usually downstream, established domestic, agricultural, hydroelectric supply, or other beneficial use.
Slope Class (%)	Width (feet)	Width (feet)	Width (feet)[39]	Width (feet)
<30	75	50	25	On-Site Determination
30-50	100	75	50	On-Site Determination
>50	150	100	50	On-Site Determination

(Adapted from California Forest Practice Rules, Title 15)

Department of Pesticide Regulation

110. On January 22, 2004, the U.S. District Court for the Western District of Washington at Seattle imposed no-use setback zones around salmon-supporting waters (as defined by the court) in Washington, Oregon, and California for certain pesticides whose toxic impacts had not been adequately evaluated (CDPR, 2011). The court's order will remain in effect for each pesticide listed below until any of the following occur:

[39] These are minimum setbacks. Final setback requirements are determined through onsite inspection.

a. USEPA determines that these pesticides have no effect on listed Pacific salmon and steelhead, or
b. USEPA determines these pesticides are not likely to adversely affect these species, or
c. USEPA completes consultation with the National Marine Fisheries Service about the potential effects of the pesticides on Pacific salmon and steelhead.

111. Under the court order, no-use setback zones of 60 feet for ground applications and 300 feet for aerial applications apply from the edge of salmon-supporting waters for use of the following active ingredients (and sample trade names) reflected in **Table A.C.5-13**:

Table A.C.5-13. Pesticide Active Ingredients and Sample Trade Names

1,3-Dichloropropene (Telone)	Diflubenzuron (Dimilin)	Methyl Parathion (Penncap-M)
2,4-D (Weedar 64)	Dimethoate (Cygon)	Metalochlor (Dual)
Acephate (Orthene)	Disulfoton (Di-Syston)	Metribuzin (Sencor)
Azinphos-methyl (guthion)	Diuron (Karmex)	Naled (Dibrom)
Bensulide (Prefar)	Ethoprop (Mocap)	Oxyfluorfen (Goal)
Bromoxynil (Buctril)	Fenbutatin-oxide (Vendex)	Pendimethalin (Prowl)
Carbaryl (Sevin)	Lindane (Lindane)	Phorate (Thimet)
Carbofuran (Furadan)	Linuron (Lorox)	Prometryn (Caparol)
Chlorothalonil (Bravo)	Malathion (Malaspray)	Propargite (Omite)
Chlorpyrifos (Lorsban, Dursban)	Methamidophos (Monitor)	Tebuthiuron (Spike)
Coumaphos (Agridip)	Methidathion (Supracide)	Tryclopyrester (Garlon 4)
Diazinon (Spectracide)	Methomyl (Lannate)	Trifluralin (Treflan)

(CDPR, 2011)

California State Water Resources Control Board

112. The California State Water Resources Control Board adopted a statewide Cannabis Cultivation General Order (Order No. WQ 2019-0001-DWQ) on February 5, 2019, implementing 50 to 150-foot setbacks required by the Cannabis Cultivation Policy the State Water Board adopted and the Office of Administrative Law approved. The setbacks are based on a watercourse classification system derived from the California Code of Regulations, title 14, Chapter 4. Forest Practice Rules, Subchapters 4, 5, and 6, Forest District Rules, Article 6. Water Course and Lake Protection.

North Coast Regional Water Quality Control Board

113. The North Coast Regional Water Quality Board adopted a Cannabis Waiver of Waste Discharge Requirements (Order No. R1-2015-0023) on July 20, 2015 which requires 50 to 200-foot setbacks based on a stream classification system.[40] The order also provided a process to obtain site-specific exemptions for sites with certain characteristics.

San Francisco Regional Water Quality Control Board

114. The San Francisco Regional Water Quality Control Board adopted the Napa River and Sonoma Creek Watersheds General Waste Discharge Requirements (Order No. R2-2017-0033) on July 17, 2017 specifying stream setbacks greater than or equal to 1.5 times the bankfull width as an option for certain dischargers to achieve water quality objectives for stream and riparian habitats. Dischargers who establish and maintain the specified setback have reduced monitoring and reporting requirements.

Nationwide

115. Literature reviews were conducted to summarize nationwide approaches related to riparian setback policies (e.g., recommended, but not required), summarized in **Table A.C.5-14.**

Table A.C.5-14. Nationwide Policies

State or Federal Policy	Category A Buffer Width (feet)	Category B Buffer Width (feet)	Category C Buffer Width (feet)	Category D Buffer Width (feet)
New Jersey	25	55		645
Ohio, Chagrin River Watershed Partners	25	75	120	300
Florida, St. John's County	25	75	200	300
Ohio, Summit County	30	75	100	300
California Forest Practice Rules	50	75	100	150
Kansas, Lexana County	150	200	300	
Rhode Island	50	100		
Vermont	50	100		

[40] All cannabis cultivators enrolled under the North Coast were required to transition coverage to the Cannabis Cultivation General Order by July 1, 2019.

State or Federal Policy	Category A Buffer Width (feet)	Category B Buffer Width (feet)	Category C Buffer Width (feet)	Category D Buffer Width (feet)
North Carolina, Durham County	50	100		
Vermont	50	100		
Oregon, Lane County	50	150		
Georgia, Cobb County	50	200		
Maine	75	250		
North Carolina, Department of Environment & Natural Resources	100	200		
Washington, Kings County	115	150		
Idaho	5			
Orange County, NC	15			
Maryland, Montgomery County	25			
U.S. Dept. of Agriculture, Forest Service	50			
California Department of Pesticide Regulation (ground application only)	60			
Maryland, Baltimore County	75			
New Hampshire	100			
New York	100			
Maryland	100			
US Environmental Protection Agency	100			
Delaware	300			
New Jersey	300			
Pennsylvania	300			
Wisconsin	300			
Minimum Buffer Width	5	55	100	150
Maximum Buffer Width	300	250	300	645
Median Buffer Width	50	100	120	300
Average Buffer Width	94	127	164	339

(Castelle, 1992; USACE, 1991; Chagrin, 2006; and VANR, 2005)

Compiled Setback Width Research

116. Setback requirements are applied differently based on waterbody type (perennial, intermittent, ephemeral), stream order (based on modeling of flow, connectivity to other waterbodies), and/or key beneficial use indicators (water supply, aquatic habitat, manmade). Staff developed four waterbody classes to combine these different approaches in order to be able to analyze the information collected (A, B, C, and D).

117. Category A represents small-sized waterbodies,[41] or waterbody type (ephemeral), or deemed lower priority for protection (based on key beneficial use indicators). Category B represents medium-sized waterbodies,[42] or waterbody type (intermittent), or deemed medium priority for protection. Category C represents large-sized waterbodies,[43] or waterbody type (perennial), or deemed high priority for protection. Category D represents largest-sized waterbodies,[44] or waterbody type (perennial), or deemed very high priority for protection.

118. The setback width research discussed above is summarized in **Table A.C.5-15** for Category A waterbodies, **Table A.C.5-16** for Category B waterbodies, **Table A.C.5-17** for Category C waterbodies, and **Table A.C.5-18** for Category D waterbodies. The terrestrial and avian wildlife setback data was removed because there is still quite a bit of disagreement among researchers on this topic, the setback widths are significantly wider and skewed the data.

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[41] Small-sized waterbodies would be equivalent to Strahler Stream Orders 1-2.
[42] Medium-sized waterbodies would be equivalent to Strahler Stream Orders 3-4.
[43] Large-sized waterbodies would be equivalent to Strahler Stream Orders 5-6.
[44] Large-sized waterbodies would be equivalent to Strahler Stream Orders 6.

Table A.C.5-15. Compiled Setback Width Research – Category A

Source	Minimum Setback Width (feet)	Maximum Setback Width (feet)	Average Setback Width (feet)	Median Setback Width (feet)
Ecosystem Functions and Values	33	131	60	53
Regulatory Approaches - Central Coast Municipalities	10	100	41	30
Regulatory Approaches - California Municipalities	15	200	44	25
Regulatory Approaches - California	5	300	50	94
Regulatory Approaches - State and Regional Water Boards	50	50	50	50
Regulatory Approaches - Nationwide	5	300	99	63
Minimum Recommended Setback Width (feet)	**5**	**50**	**41**	**25**
Maximum Recommended Setback Width (feet)	**50**	**300**	**99**	**94**
Average Recommended Setback Width (feet)	**20**	**180**	**57**	**53**
Median Recommended Setback Width (feet)	**13**	**166**	**50**	**52**

Table A.C.5-16. Compiled Setback Width Research – Category B

Source	Minimum Setback Width (feet)	Maximum Setback Width (feet)	Average Setback Width (feet)	Median Setback Width (feet)
Ecosystem Functions and Values	--	--	--	--
Regulatory Approaches - Central Coast Municipalities	35	200	88	85
Regulatory Approaches - California Municipalities	30	75	54	50
Regulatory Approaches - California	55	250	100	127
Regulatory Approaches - State and Regional Water Boards	100	100	100	100
Regulatory Approaches - Nationwide	30	250	131	50

Source	Minimum Setback Width (feet)	Maximum Setback Width (feet)	Average Setback Width (feet)	Median Setback Width (feet)
Minimum Recommended Setback Width (feet)	**30**	**75**	**54**	**50**
Maximum Recommended Setback Width (feet)	**100**	**250**	**131**	**127**
Average Recommended Setback Width (feet)	**50**	**175**	**95**	**82**
Median Recommended Setback Width (feet)	**35**	**200**	**100**	**85**

Table A.C.5-17. Compiled Setback Width Research – Category C

Source	Minimum Setback Width (feet)	Maximum Setback Width (feet)	Average Setback Width (feet)	Median Setback Width (feet)
Ecosystem Functions and Values	82	598	256	241
Regulatory Approaches - Central Coast Municipalities	50	200	107	100
Regulatory Approaches - California Municipalities	50	150	118	113
Regulatory Approaches - California	100	645	160	244
Regulatory Approaches - State and Regional Water Boards	100	300	120	164
Regulatory Approaches - Nationwide	50	645	273	100
Minimum Recommended Setback Width (feet)	**50**	**150**	**107**	**100**
Maximum Recommended Setback Width (feet)	**100**	**645**	**273**	**244**
Average Recommended Setback Width (feet)	**72**	**423**	**172**	**160**
Median Recommended Setback Width (feet)	**66**	**449**	**140**	**139**

Table A.C.5-18. Compiled Setback Width Research – Category D

Source	Minimum Setback Width (feet)	Maximum Setback Width (feet)	Average Setback Width (feet)	Median Setback Width (feet)
Ecosystem Functions and Values	--	--	--	--
Regulatory Approaches - Central Coast Municipalities	300	300	300	300
Regulatory Approaches - California Municipalities	100	200	177	200
Regulatory Approaches - California	150	300	300	263
Regulatory Approaches - State and Regional Water Boards	150	645	300	339
Regulatory Approaches - Nationwide	300	300	300	300
Minimum Recommended Setback Width (feet)	**100**	**200**	**177**	**200**
Maximum Recommended Setback Width (feet)	**300**	**645**	**300**	**339**
Average Recommended Setback Width (feet)	**200**	**349**	**275**	**280**
Median Recommended Setback Width (feet)	**150**	**300**	**300**	**300**

119. The riparian setback width requirements established in this Order are based on peer-reviewed scientific/technical literature and regulatory approaches or policies at the local, regional, state, and nationwide level. The scientific literature generally indicates the total number of ecosystem functions and values provided by riparian areas tend to increase with overall width, length, and vegetation diversity.

120. The riparian setback width requirements were validated through an analysis of RipRAM and pHAB scores that represent high quality riparian and wetland areas in agricultural areas of the central coast and comparing those scores to riparian and wetland area condition and spatial extent at the sites. Wetland setbacks are based on acreage rather than feet because they are not linear landscape features.

Government Agency and Non-Governmental Organization Outreach

121. Central Coast Water Board staff conducted research and outreach efforts to government agencies and non-governmental organizations (NGOs) to determine whether there is regulatory or mission/vision alignment with the recommended requirements for riparian management. Staff identified relevant state and federal agencies and NGOs and sought their input on the following five topics. General input from the organization on Central Coast Water Board staff's proposed requirements.
    a. Work the organization conducts that might present a potential conflict with the proposed requirements.
    b. Cooperative watershed restoration approach opportunities.
    c. Education and outreach opportunities offered by the organization.
    d. Whether the organization supports staff's proposed requirements.

    The findings below summarize the results of this outreach (CCRWQCB, 2020).

Government Agencies

122. Department of Conservation – Division of Land Resource Protection (DLRP). DLRP staff provided an overview of their various programs. DLRP staff did not identify potential conflicts with staff's proposed requirements. DLRP staff believes their Watershed Coordinator Program provides an opportunity for collaboration on the staff's proposed requirements for the third-party cooperative watershed restoration approach. Central Coast Water Board and DLRP staff will continue to work together on this effort moving forward. DLRP does not engage in formal outreach and education. DLRP's policy is not to formally support or oppose other agency's regulations, programs, policies, or plans.

123. Department of Fish and Wildlife (CDFW). CDFW staff confirmed they do not have specific setback requirements in their Code. They issue Lake and Streambed Alteration Agreements and negotiate setback requirements on a project-by-project basis. CDFW staff did not identify any potential conflicts with staff's proposed requirements. CDFW offers watershed restoration grants through a variety of programs and will continue to work with Central Coast Water Board staff to identify opportunities to collaborate on third-party cooperative watershed restoration programs. CDFW staff could also see a role in demonstrating to dischargers how to comply with both Central Coast Water Board and CDFW permitting requirements. CDFW and the Central Coast Water Board will continue to coordinate on rare, threatened, endangered species protection efforts. CDFW does not engage in formal outreach and education. CDFW will consider participating in the public comment process for the draft of this Order.

124. Department of Pesticide Regulations (DPR). DPR staff discussed their regulatory authority. DPR does not have specific setback requirements. DPR regulates pesticide use and labeling. DPR staff did not identify potential conflicts with staff's proposed requirements. DPR staff was supportive of the third-party cooperative approach as an alternate compliance pathway. DPR staff indicated the agency funds grants that may tie into third-party cooperative watershed restoration approaches. DPR does not conduct formal outreach and education. DPR staff were uncertain whether upper management would support participating in the public comment process for the draft of this Order.

125. National Marine Fisheries Service (NMFS). NMFS staff provided an overview of their programs. NMFS staff indicated they conduct watershed restoration efforts throughout the central coast region, but on a small scale. NMFS staff expressed concern there could be gaps in terms of species movement (and not just steelhead trout movement). Central Coast Water Board staff explained that all third-party cooperative watershed approaches would require Executive Officer review and approval to ensure we address this important issue. NMFS staff felt there may be opportunities to leverage their watershed restoration efforts with the third-party approach proposed by Central Coast Water Board staff. NMFS does not conduct formal outreach and education. NMFS staff is in overall support of Central Coast Water Board staff's proposed requirements and will seek upper management approval to participate in the public comment process for the draft of this Order.

126. National Resources Conservation Service (NRCS). NRCS staff provided an overview of their programs. NRCS did not identify potential conflicts with staff's proposed requirements. The NRCS could have a role identifying a problem and developing a solution but would not likely be interested in being a third party. A lot of these types of restoration efforts are implemented by RCDs. RCDs are more agile in terms of being able to identify a current and felt need of the community and then apply for funding to address it. The challenge is RCDs have no base funding. NRCS can be (and often is) a funding link for RCDs. NRCS outreach and education is limited to spreading information about agency services. NRCS staff routinely present at workshops but in general they do not conduct education and outreach. NRCS's policy is not to formally support or oppose other agency's regulations, permits, programs, policies, or plans.

127. Resource Conservation Districts (RCDs). RCDs from Cachuma (Santa Barbara county), Monterey, San Luis Coastal, Santa Cruz, and Upper Salinas-Las Tablas, participated in this outreach. They provided an overview of their programs. RCD staff generally support riparian restoration projects, but on a case by case basis to

resolve a specific issue. The setback widths of restoration projects are generally much less than staff's proposed setbacks (e.g., 20-ft widths tailored to the conditions of the site). RCD staff would prefer to see a stream reach approach but understand this may be infeasible within the regulatory framework. Stream flows may not support riparian habitat establishment; this is very site-specific. RCD staff felt that Central Coast Water Board staff should consider impacts on small versus large growers and/or impacts to landowners. RCD staff believes establishing riparian areas can lead to weed maintenance needs and attract pests to adjacent cropland. The RCD approach is site-specific planning. It is difficult for the RCD to support setback requirements without site specific planning. RCDs are positioned to conduct on-the-ground riparian habitat restoration and could potentially be a useful resource for both on-farm and cooperative approaches to watershed-based restoration efforts. RCD staff routinely present at workshops but in general they do not conduct outreach and education. As a result of this discussion, Central Coast Water Board staff incorporated a compliance pathway using RipRAM (discussed in the Current Conditions section) to allow for a rapid assessment of the existing riparian area on a farm to provide a site-specific analysis.

128. U.S. Fish and Wildlife Services (USFWS). General input was that the on-farm riparian setbacks were reasonable. USFWS staff would prefer to see continuous riparian setbacks throughout watersheds dominated by commercial irrigated land use but understand why this is not possible due to regulatory constraints. USFWS staff believes food safety concerns related to riparian setbacks are a false perception not supported by scientific literature. USFWS conducts habitat restoration throughout the central coast region. USFWS staff does not see a conflict to improving riparian corridors and water quality. There could be a conflict for landowners that lease small parcels of land to growers (e.g., crop land taken out of production). USFWS advised using caution in language related to onsite or cooperative restoration efforts. The USFWS habitat program can provide technical assistance to private landowners for the benefit of threatened and endangered species and sometimes provide cost share funds to implement such projects. However, the restoration efforts must be voluntary and not part of a compensatory mitigation requirement. Central Coast Water Board staff addressed this concern in the requirements by removing the concept of mitigation or compensatory mitigation related to restoration efforts to comply with riparian setback requirements.

Non-Governmental Organizations

129. Central Coast Salmon Enhancement (CCSE). CCSE staff provided an overview of their program. CCSE staff believes the proposed setback requirements and potential for third-party cooperative approaches aligns well with what they do.

CCSE staff believes they are well positioned to assist Dischargers with on-farm and third-party approaches. CCSE staff expressed interested in exploring education and outreach opportunities. CCSE staff will consider participating in the public comment process for the draft of this Order.

130. Land Conservancy of San Luis Obispo (LC-SLO). LC-SLO staff provided an overview of their program. LC-SLO staff works with farmers, ranchers, and other landowners to protect property through conservation easements to restore habitat in streams (e.g., Guadalupe and Nipomo Dunes). LC-SLO owns and manages properties that conduct farming activities and have stream and riparian habitat. The organization has education programs connecting people with the land. LC-SLO staff like the various compliance pathways (i.e., flexibility), especially the cooperative approach. LC-SLO staff thinks the use of the word "ranch" is misleading. These are "farms" and the use of the word "ranch" may raise concerns by ranchers that are unnecessary. LC-SLO staff expressed concern with some of their own operators who manage quite holistically: certified organic, cover crop, etc. Central Coast Water Board staff discussed with LC-SLO staff that with the compliance pathways, these operators would be able to find a suitable approach that suits their site-specific needs. LC-SLO staff suggested including language that excludes natural riparian process (e.g., flooding). LC-SLO has concerns about how to deal with orchards and planting heritage trees instead of native trees in a setback area. Central Coast Water Board staff explained there is enough flexibility through using RipRAM or the Alternative Proposal to allow for these types of activities. LC-SLO staff would be open to conducting education and outreach since this is a component of the organization's program already.

State Water Resources Control Board Policies

131. State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State. The State Water Resources Control Board's State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State (Procedures) will become effective on May 28, 2020. This Order uses the definition of wetlands provided in the Procedures: "An area is wetland if, under normal circumstances, (1) the area has continuous or recurrent saturation of the upper substrate caused by groundwater, or shallow surface water, or both; (2) the duration of such saturation is sufficient to cause anaerobic conditions in the upper substrate; and (3) the area's vegetation is dominated by hydrophytes or the area lacks vegetation."

132. California Wetlands Conservation Policy – "No Net Loss Policy". Executive Order W-59-93 (signed by Governor Pete Wilson on August 23, 1993) established state policy guidelines for wetlands conservation. The primary goal of this policy is to

ensure no overall net loss of wetlands and to achieve a long-term net gain in the quantity, quality, and permanence of wetland acreage in California. The California Wetlands Conservation Policy established the following statewide policy initiatives. State level efforts have been ongoing for over 25 years,

a. Development of a Statewide wetlands inventory.
b. Support for wetland planning.
c. Improved administration of existing regulatory programs.
d. Strengthened landowner incentives to protect wetlands.
e. Support for mitigation banking.
f. Development and expansion of other wetlands programs.
g. Integration of wetlands policy and planning with other environmental and land use processes.

Compliance Pathways

133. This Order establishes four compliance pathways for compliance with the riparian setback requirements. This allows Dischargers flexibility and the ability to consider site-specific needs while still maintaining compliance with this Order.

Cooperative Watershed Restoration Participation

134. One of the compliance pathways is to participate in a third-party cooperative watershed restoration program instead of implementing an on-farm setback. Dischargers could also opt to form their own third-party cooperative watershed restoration program. The existing programs would be used to guide restoration program staff in making recommendations on proposals to develop third-party cooperatives that are sufficient to warrant Executive Officer approval.

135. Five third-party cooperative watershed restoration programs and a conceptual proposal were reviewed, most of which serve the central coast region, which are summarized in the findings below.

136. Based on this research, opportunities to participate in third-party cooperative watershed restoration programs in the central coast region exist. Furthermore, there is also the potential for Dischargers to form their own third-party organizations and link their efforts to multi-benefit projects already developed in the central coast region, including those discussed in the Government Agency and Nongovernmental Organization sections discussed above. These efforts have the potential to create greater funding, benefit from the expertise of existing programs, and develop higher quality, watershed-level restoration projects in the central coast region.

137. The programs reviewed by Central Coast Water Board staff have many similarities. All were governed by a board of directors in some way. The programs involve stakeholders in the planning process and take into the account the needs and interests of their communities. Despite the differences in their goals and final work products, the programs all necessitated a cooperative and inclusive approach to achieve their land and resource management goals. Landowner participation varies depending on the type of program.

138. **Table A.C.5-19** summarizes and compares the programs that were reviewed. Specifically, the table identifies leadership structure, planning processes, methods of landowner participation, and costs of participation to the landowner.

Table A.C.5-19. Comparison of Cooperative Management Programs and Organizations

Program	Leadership Structure	Planning Process	Landowner Participation	Participation Costs
Salinas River Stream Maintenance Program	Managed primarily by Monterey County Water Resources Agency (MCWRA) and Resource Conservation District of Monterey County; MCWRA Board of Directors serves as the approving body.	EIR developed and revised by public comment and committee advisement. Demonstration Project conducted to test approach.	Landowners apply annually to conduct maintenance work.	Cost of maintenance work
Integrated Regional Water Management San Luis Obispo County	Lead Agency: San Luis Obispo County Flood Control and Water Conservation District. Approving Body: The District's Board of Directors. Regional Water Management Groups (RWMG) of local agencies and non-profits governed by a Memo of Understanding develops and carries out the Plan.	RWMG developed IRWM plan with input from stakeholders in defined sub-regions. Plan is updated every 5 years.	Projects identified to carry out IRWM Goals. Landowner participation dependent on the project.	Costs are dependent on project needs.
Morro Bay National Estuary Program	Board of Directors, Executive Committee, Implementation Committee.	Guided by Comprehensive Conservation & Management Plan	Landowners work with MBNEP individually.	Varies
Resource Conservation Districts	Board of Directors and Executive Director	Varies	Landowners work with RCD individually.	Varies
Habitat Conservation Plans and Natural Community Conservation Plans	Managed by non-profit governed by Board of Directors.	Plan prepared by county environmental agency with involvement from local stakeholders.	Participating landowners provided lands/ funds. Non-participating landowners contribute mitigation fees.	Donated lands/funds or mitigation fees.
Central Coast Wetland Group (Conceptual Plan)	Third-party organization governed by the Central Coast Water Board and informed by an Advisory Committee.	Identify restoration opportunities in central coast watersheds, collect fees from qualifying landowners, and organize, implement, and manage restoration projects.	Participating landowners provide lands/ funds.	Costs are dependent on project needs.

139. Salinas River Maintenance Program (SMP). The SMP is a multi-benefit program that takes a coordinated approach to sediment and vegetation management in the Salinas River. The program is managed primarily by the Monterey County Water Resources Agency and the Resource Conservation District of Monterey County. The program implements projects along 92 miles of the Salinas River with cooperation from landowners, growers, and municipalities. Projects include Arundo removal, vegetation maintenance, and sediment removal and grading. The SMP was developed with the assistance of a Technical and Design Committee and Permitting Committee formed by stakeholders who represented public and agency interests. Phase 1 of the program tested the program's stream maintenance approach in a Demonstration Project along 11.5 miles of the Salinas River. The project was a success and Phase 2 commenced to expand the stream maintenance approach to the entire program area. Maintenance work occurs during defined work seasons (MCWRA et al., 2016). Applications for work in each season are submitted by landowners who are members of the River Management Unit Association, a nonprofit created to support the SMP (County of Monterey, 2018).

140. Integrated Regional Water Management (IRWM). IRWM is a statewide effort to manage water issues on a regional scale. There are 48 IRWM regions in the state of California. The IRWM Planning Act requires the formation of Regional Water Management Groups (RWMG) to develop IRWM Plans. Groups consist of three or more local agencies, with stakeholder participation from community groups, nonprofits, private companies, and others. IRWM Plans identify regional water management issues, establish goals, objectives, and performance measures, define governance for the IRWM region, describe the stakeholder participation processes, and identify projects that work towards regional management solutions. (CDWR et al., 2017)

141. A review of IRWM planning and implementation was conducted in February of 2015. The review process identified opportunities to improve the IRWM process: improved stakeholder participation, better coordination of local land use plans and IRWM plans, and further incorporation of flood management (CDWR et al., 2018). A later review of stakeholder perspectives in 2017 identified key needs of IRWM regions, including greater recognition and support from government agencies and tribes, better alignment of government policies and regulations, technical assistance, greater participation at the regional level, stable and diversified investments, and increased public recognition and appreciation (CDWR et al., 2017).

142. The San Luis Obispo County IRWM planning process is overseen by the San Luis Obispo County Flood Control and Water Conservation District. The IRWM, which is governed by a Memorandum of Understanding consisting of local water agencies and nonprofit organizations developed the IRWM Plan with input from stakeholders in three sub-regions within the county. The mission of the plan is to "facilitate regional plans, programs, and projects to further sustainable water resource management." Goals of the plan encompass five categories of water resource management to address water issues including water supply, groundwater management, and water reclamation from wastewater treatment. The IRWM Plan identifies 115 concepts and projects/programs to achieve the plan's goals. (SLORWMG et al., 2014).

143. Morro Bay National Estuary Program. The Morro Bay National Estuary Program (MBNEP) is a non-profit organization that protects and restores the Morro Bay estuary. It works with the community to conduct monitoring, restoration, and education. It collaborates with partners and landowners on a voluntary basis to address its seven priority issues affecting the health of Morro Bay estuary and watershed: accelerated sedimentation, bacterial contamination, elevated nutrient levels, toxic pollutants, scarce freshwater resources, preserving biodiversity, and environmentally balanced uses. (MBNEP, 2018).

144. Resource Conservation Districts. Resource Conservation Districts (RCDs) are special districts in the state of California that work on resource conservation. They are locally governed by boards of directors. RCDs implement projects on public and private lands and educate landowners and the public about resource conservation. Their mission is to develop a land stewardship ethic that promotes long-term sustainability in California. (CARCD, n.d.).

145. Habitat Conservation Plans. Habitat Conservation Plans are tools to allow activities that may result in incidental take of a federally listed species, if steps are taken to minimize and mitigate impact. Two types of HCPs have developed over time: smaller, project-specific plans and area-wide plans that manage multiple species and often require collaboration between multiple agencies. Area-wide HCPs developed efforts to broaden and deepen the scope of the HCP process by taking a more comprehensive multi-species focus. Area-wide HCPs come with challenges of increased complexity, higher cost, coordination between agencies, and a long-term commitment. Conditions for success of these plans include a clear organizational structure, integrated permitting requirements, and open participation between stakeholders. Lessons learned from the successes and failures of area-wide HCPs include robust monitoring is essential, incentives for adaptive management should be provided, and mitigation performed before development is most effective. (Camacho et al., 2015).

146. Natural Community Conservation Plans (NCCPs). NCCPs were developed by the California Department of Fish and Wildlife (CDFW). CDFW cooperates with private and public partners to take a broad-based, ecosystem approach to planning for the protection of biological diversity. This program is a cooperative effort to protect habitats and species on a broad scale, rather than focusing on individual listed species (CDFW, 2018). The NCCP program expanded on the HCP program in response to criticism of the latter's limited scope (Camacho et al., 2015). As NCCPs are designed to cover multiple species over large areas, many of the same challenges that large-scale HCPs encounter can apply to them.

147. Central Coast Wetland Group (CCWG). CCWG developed a conceptual plan for structuring a program for riparian and wetland restoration administered by a third-party organization. The program would identify restoration opportunities in central coast watersheds, collect fees from qualifying landowners, and organize, implement, and manage watershed-level restoration projects. Projects would focus on riparian enhancement that benefits basin plan water quality objectives for sediment, toxicity, nutrients, and temperature. This approach to watershed restoration would be cost effective and produce the highest quality of information and data management. The program would be managed by a third-party and governed by the Central Coast Water Board. A Riparian Advisory Committee would prioritize restoration projects, among other duties. Restoration would be coordinated using a landscape approach based on the Wetland and Riparian Area Monitoring Plan for Wildlife of the California Wetland Monitoring Workgroup of the Water Quality Monitoring Council (CCWG, 2018)

On-Farm Setback

148. The second compliance pathway is to either confirm that a riparian setback of the applicable size already exists on the ranch or implement the required riparian setback on the ranch.

Rapid Assessment Method

149. The third compliance pathway is to have RipRAM (a riparian rapid assessment method) conducted on an existing on-farm setback and compare those scores to the established reference site score for the applicable watershed. If the RipRAM score meets the minimum reference site score, the Discharger is in compliance with the riparian setback requirement. If the RipRAM score does not meet the minimum reference site score, Dischargers who select this compliance pathway must implement restoration efforts on the ranch, have the RipRAM assessment

repeated, and ultimately achieve the minimum RipRAM reference site score in the MRP.

150. A previous section on the *Riparian Rapid Assessment Method* provides general information about RipRAM. The findings below discuss how RipRAM analyses were used to establish the minimum RipRAM reference site score.

151. The Central Coast Wetlands Group (CCWG) conducted the analysis discussed below to ascertain reasonable and scientifically defensible minimum reference site RipRAM index scores in agricultural land use areas of the central coast region (CCWG, 2019) for dischargers that select the Rapid Assessment Method compliance pathway for Riparian and Wetland Habitat Management.

152. RipRAM assessments in the Central Coast Region have been conducted at over 100 Central Coast Ambient Monitoring Program (CCAMP) sites, as well as over 200 sites within specific watersheds as part of a watershed assessment intensification project. A total of 347 sites have been assessed to date. Most recently eight sites were assessed in the Santa Maria and Santa Ynez watersheds in agricultural areas identified through desktop research as having relatively intact riparian corridors.

153. Index scores represent the average of all eight parameters measured during a RipRAM assessment. Index scores range from 3.12 to 98.44, with a median score of 71.9. This range of scores demonstrates the capacity to score a full range of riparian conditions.

154. An analysis of RipRAM index scores enables comparison between scores in agricultural areas and the rest of the central coast. This analysis was limited to CCAMP sites as well as some supplemental sites in agricultural areas with intact riparian corridors. Restricting the analysis to CCAMP sites eliminates any bias in site selection and regional focus. The goal of this analysis was to determine minimum RipRAM index scores in agricultural areas with relatively intact riparian corridors. These sites were designated Ag Reference Sites. Several reference sites were extracted from previously collected data. Several additional reference sites were recently assessed in the Point Conception region (Santa Maria and Santa Ynez watersheds).

155. The score analysis is outlined below in **Table A.C.5-20**. Index scores (minimum, first quartile, median, third quartile, and maximum scores) are presented separately for non-agricultural and agricultural areas of the central coast region. The first column lists RipRAM index scores collected at CCAMP sites that are not in agricultural areas, including urban, rangeland, and open space land uses. The

second column presents RipRAM index scores for all CCAMP sites located within agricultural land use areas. The third column provides scores for a subset of CCAMP sites with high quality riparian areas (areas with intact riparian corridors) adjacent to agriculture land use (Ag Reference Sites).

Table A.C.5-20. RipRAM Index Score Analysis

	Non-Agricultural Land Use	Agricultural Land Use	Agricultural Land Use Reference Sites
Minimum	11	3	53
First Quartile	43	16	64
Median	70	36	69
Third Quartile	81	58	78
Maximum	97	80	86

156. This analysis of RipRAM scores for each of the land use categories has several clear results. More than half of riparian assessments at CCAMP monitoring sites within irrigated agricultural land use were below the first quartile score of all other land use categories. Similarly, three quarters of CCAMP agricultural land use sites had scores below the median score for the other land use categories. The highest scores within agricultural land use sites were similar to each other (80-86). These data verify that riparian condition within agricultural areas of the central coast region is significantly lower than other land use types combined.

157. Based on the range of scores outlined in **Table A.C.5-20**, the median score for all the Ag Reference Sites is 69, so an index score of 69 or higher can be considered an intact riparian corridor of good quality in an agricultural land use area. A single index score that applies to all agricultural areas in the central coast region can be identified because only sites with intact riparian corridors of good quality in agricultural land use settings were used in the analysis. The eight RipRAM assessment parameters already account for site-specific conditions in the overall index scores.

158. A comparison of Ag Reference Site scores across Strahler stream orders revealed no statistically significant difference between stream orders. The median index score can therefore be applied across all Strahler stream orders because the RipRAM scores are internally scaled to the size and complexity of the stream. Currently, only the Pajaro HUC-8 watershed has enough RipRAM data to assign an Ag Reference Site index score based on watershed-level data. However, the median Ag Reference Site index score for the Pajaro HUC-8 watershed is also 69. Based on this analysis, all HUC-8 watersheds have been assigned the Ag Reference Site index score of 69 for all Riparian Priority Areas in the central coast region.

159. A rigorous training protocol will be developed for RipRAM as part of the second phase of RipRAM development. This will be a field-based training taught by the Principal Investigators (PIs) who developed the method or by qualified trainers who have been intensively trained by the PIs. There will be at least two trainings offered in 2021 as part of the current development effort, one in the central coast and one in southern California. Future trainings will be planned according to demand.

160. As part of a new EPA grant, at least an additional 40 sites will be sampled statewide using RipRAM during the 2020 field season (spring and summer) to validate the tool's use throughout California. After these assessments are completed, more region-specific values for individual HUC-8 watersheds may be developed. In addition, additional RipRAM assessment data will become available from all Dischargers that select the Rapid Assessment Method compliance pathway.

Alternative Proposal

161. The fourth compliance pathway is to have a qualified professional (see the definition in Attachment C) prepare and submit an alternative proposal that demonstrates that existing on-farm management measures result in the functions and values applicable to the site even though the management measures differ from the setback width and vegetation requirements set forth in this Order.

Constraints

162. Potential constraints associated with the riparian setback management measure requirements in commercial irrigated land use areas are discussed below.

Food Safety

163. Although the exact acreage of riparian habitat that has been degraded or removed in irrigated land use areas is unknown, it is widely known that such degradation and removal has occurred over many decades in the central coast region. Some of this degradation/removal was the result of concerns over food safety following outbreaks of foodborne illness.

164. Following an *Escherichia coli* 0157:H7 bagged spinach outbreak in 2006 traced to a central coast region ranch, growers were pressured to remove non-crop vegetation surrounding fields to minimize wildlife intrusion (Gennet, 2013 and Karp, 2015). Between 2005 and 2012, many growers converted non-crop

vegetation to bare ground buffers. Declines in riparian area (9 percent), woodland (2 percent), scrub (13 percent), grassland (11 percent), and meadow/marsh (30 percent) were observed between 2005 and 2012, along with a 30 percent increase in bare ground (Karp, 2015). Research conducted in 2013 revealed that between 2005 and 2009, 13.3 percent of riparian and wetland vegetation along the Salinas River was either converted to bare ground or crops, or was observably altered and degraded and 8.2 percent of existing riparian and wetland vegetation was lost in 20 Salinas River Valley wildlife corridors (Gennet, 2013).

165. An estimated 979 acres of land was converted from riparian, woodland, upland scrub, grassland, and meadow/marsh from 2005 to 2012 in the Salinas Valley alone. There was an increase of 692 acres in bare ground area during this time period. It is probable that a significant portion of non-crop vegetation area was converted from 2005-2012 to bare ground and non-crop land due to food-safety concerns. It is likely that similar changes in land cover occurred during the 2005 to 2012 time period in other commercial irrigated agricultural watersheds (e.g. the Santa Maria River and Pajaro River Watersheds).

166. Approximately 1,441 acres in the entire Salinas River Watershed could potentially be affected by the riparian setback management measure requirements along riparian areas, assuming no non-crop vegetation is currently present (i.e., the 1,441 acres estimate is a worse-case-scenario). The 1,441 acres estimate includes all required setbacks under the On-Farm Setback compliance pathway, including the operational setback.

167. The riparian area management requirement will not necessarily result in a conversion of cropland to non-crop vegetation, but rather conversion from bare ground to non-crop vegetation in riparian areas. Dischargers may decide to increase the bare ground area flanking the newly established non-crop vegetation in riparian areas to address food safety concerns, which could result in a conversion from cropland. Although the riparian setback requirement could result in conversion from cropland to non-crop vegetation areas, it is likely that many of the lands will be converted from bare ground. Evidence suggests that much conversion from non-crop vegetation to bare ground or croplands occurred relatively recently, following food safety events.

168. Several food-borne pathogen outbreaks have sickened consumers, and in some cases resulted in consumer fatalities, over the past approximately 15 years. The federal government, industry, and the food supply chain have responded with food safety measures to minimize the risk of future outbreaks. The U.S. Food and Drug Administration (FDA) has identified and continues to develop and

update rules regarding the known routes of contamination, including agricultural water, soil amendments, animals, worker health and hygiene, and equipment and buildings (FDA, 2015a, FDA, 2015b, and Sharapov, 2016).

169. Real and/or perceived incompatible demands between food safety and environmental protection are a major issue in the central coast region. Dischargers have removed vegetated management measures (in some cases, after receiving substantial public funds to install the vegetated management measures) and have removed riparian vegetation, both of which increase waste loading to waters of the State and impair beneficial uses.

170. Agriculture near surface waterbodies can lead to removal or reduction of riparian vegetation and impairment of its ecological functions (ANR, 2007). Once riparian vegetation is removed, it no longer serves to shade water, provide food for aquatic organisms, maintain stream banks, provide a source of large woody debris, or slow or filter runoff to streams. The result is degraded water quality and fish habitat (ANR, 2007). For these reasons, maintenance of riparian vegetation is a critical element of any type of land use (ANR, 2007).

171. Setbacks are areas of vegetation left beside a stream or lake to protect against land use impacts (ANR, 2007). Whether or not harvesting is permitted within the setback, well-designed and managed setbacks can contribute significantly to the maintenance of aquatic and riparian habitat and the control of pollution. Riparian setbacks protect aquatic and riparian plants and animals from upland sources of pollution by trapping or filtering sediments, nutrients, and chemicals from forestry, agricultural and residential activities (ANR, 2007).

172. <u>Leafy Greens Products Handling Marketing Agreement</u>. The California Leafy Greens Products Handling Marketing Agreement (LGMA) was established in 2007 following the 2006 outbreak of *Escherichia coli* 0157:H7 (LGMA About, 2019). The goal of the LGMA is to ensure that leafy greens are safe for consumption. The LGMA sets forth food safety practices that may be implemented on leafy greens farms throughout the state. LGMA members are companies that ship and sell California-grown lettuce, spinach and other leafy greens products (LGMA, 2019).

173. LGMA's food safety practices/guidelines are referred to as "Metrics," which are updated periodically to align with new science or regulations. Most recently, the Metrics were updated to fully align with the Food and Drug Administration's (FDA) Produce Safety Rule. The LGMA Metrics include recommended buffer distances between leafy green crops and various types of adjacent land uses (e.g., composting operations, grazing lands/domestic animals, homes or other

buildings with a septic leach field, etc.); however, there are no specific requirements restricting the presence of riparian habitat or vegetated areas in proximity to leafy greens fields (LGMA, 2019).

> "*Fencing, vegetation removal, and destruction of habitat may result in adverse impacts to the environment. Potential adverse impacts include loss of habitat to beneficial insects and pollinators; wildlife loss; increased discharges of sediment and other pollutants resulting from the loss of vegetative filtering; and increased air quality impacts if bare soil is exposed to wind. It is recommended that producers check for local, state, and federal laws and regulations that protect riparian habitat and wetland areas, restrict removal of vegetation or habitat, or regulate wildlife deterrence measures, including hazing, harassment, lethal and non-lethal removal, etc*." (LGMA, 2019)

174. Food Safety Modernization Act. The Food Safety Modernization Act (FSMA) is a comprehensive federal food safety law that focuses on prevention of the causes of foodborne illnesses in the United States. Established in 2011, FSMA directs the FDA to create a national food safety system in partnership with state and local authorities, and allows FDA the ability to require comprehensive, science-based preventive controls across the food supply (FSMA, 2018). With respect to domesticated and wild animals, as well as habitat, the FDA states:

> "*Farms are not required to exclude animals from outdoor growing areas, destroy animal habitat, or clear borders around growing or drainage areas. Nothing in the rule should be interpreted as requiring or encouraging such actions*." (FDA, 2015a).

175. While food safety regulations do not require growers to take measures to destroy habitat, implementation and associated risk-management decisions have resulted in attempts at "zero-risk" strategies. Efforts focused on the removal of all vegetation within a non-scientifically defined buffer area surrounding farm fields to preclude the potential presence of wildlife related vectors. These non-vegetated food safety buffers are often created adjacent to riparian corridors. This approach conflicts with established science documenting the environmental and water quality benefits of riparian vegetation. Moreover, both strategies – non-vegetated food safety buffers and vegetated environmental buffers (riparian vegetation) – often require taking arable land out of production, thus reducing potential agricultural benefit and associated revenue. This puts growers in a difficult situation, pitting them between market-based, food safety rules and environmental protection requirements.

Literature Review.

176. The State and Regional Water Boards require commercial irrigated farming operations to implement management measures to protect and improve water quality. This Order intentionally allows flexibility in the choice of appropriate management measures, recognizing the complexity and variety of farming in the state.

177. Well-documented scientific evidence indicates that vegetated conservation measures (e.g., riparian setbacks, vegetated ditches, grassed roadways, and filter strips at the edges of fields) both reduce erosion and filter pollutants (e.g., nutrients, pesticides, sediment, and pathogens) from agricultural fields (Beretti, 2008). Vegetated conservation measures are among the most effective tools available to growers for protecting and improving water quality. The State and Regional Water Quality Control Boards, United States Department of Agriculture (USDA) Natural Resources Conservation Service, Resource Conservation Districts, Monterey Bay National Marine Sanctuary, and many other organizations have been working with growers for decades to encourage the use of vegetated conservation measures (Beretti, 2008). There is questionable benefit to food safety from eliminating vegetated buffer zones.

178. Riparian vegetation and vegetated setback zones are critically important to prevent the transport of sediment and bacteria, which may include the downstream transport of *Escherichia coli* O157:H7 bacteria. Tate et al., (2006) tested vegetated buffers on cattle grazing lands and found them a very effective way to reduce inputs of waterborne *Escherichia coli* into surface waters. Data indicates that the major source of *Escherichia coli* O157:H7 bacteria are cattle, not wildlife (Stuart, 2006). In many agricultural areas of the central coast region, cattle operations are located upstream of irrigated agricultural fields. Therefore, the removal of riparian vegetation and their buffer zones increases the transport of pathogens such as *Escherichia coli* O157:H7 and the risk of food contamination. The removal of riparian vegetation for food safety purposes is not warranted, not supported by the scientific literature, and may increase the risk of food contamination.

179. Riparian vegetation helps reduce nonpoint source runoff pollutant loading and plays a vital role in protecting water quality and aquatic life beneficial uses of surface water. However, a thriving aquatic ecosystem, with its necessary riparian vegetation, has the potential to attract terrestrial wildlife that can harbor and transport pathogens into areas where food is grown for human consumption.

180. Over the past two decades, the concept of co-management of food safety and conservation has emerged. There is strong evidence that the removal of non-crop vegetation (e.g., riparian areas) may actually increase the risk of food contamination by pathogens, increase the need for pest control, and reduce crop yields (Baumgartner, 2011; Karp, 2015; Karp, 2016; Richardson, 2009; Stuart, 2006; and Wild Farm Alliance, 2016).

181. According to a spring 2007 survey by the Resource Conservation District of Monterey County (RCDMC), 19 percent of 181 respondents said that their buyers or auditors had suggested they remove non-crop vegetation from their ranches to prevent contamination from pathogens such as the *Escherichia coli* 0157:H7 bacteria. In response to pressures by auditors and/or buyers, approximately 15 percent of all growers surveyed indicated they removed or discontinued use of previously adopted management practices used for water quality protection. Grassed waterways, filter or buffer strips, and trees or shrubs were among the management measures removed (RCDMC, 2007).

182. A central coast grower follow-up survey[45] was conducted in spring 2009 by the Monterey County Resources Conservation District (Beretti, 2009). The purpose was to gain a better understanding of the drivers and challenges to co-managing food safety and environmental protection. The survey revealed the following.

  a. International buyers, processors, and auditors present obstacles to adopting the concept of co-management leafy green growers, large operations, and conventional operations were most likely to experience co-management challenges.
  b. Some organic operations that produce strawberries, Brussel sprouts, and artichokes face similar challenges.
  c. The use of the LGMA Metrics presents obstacles for growers.
  d. Food safety auditors have a strong and negative influence on co-management efforts.
  e. There has been a reduction in the use of environmentally sensitive practices since 2008.
  f. Efforts to promote co-management will require open dialogue and collaboration among the agricultural industry (including handlers and buyers), food safety scientists, private companies, human health and environmental regulatory agencies, and environmental scientists and organizations.

[45] The survey was sent to 647 known irrigated row crop operations with 178 complete responses.

Food Safety Workshop.

183. In September 2019, the Central Coast Water Board hosted a public workshop dedicated to the discussion of food safety issues at the farm field level. The focus was a discussion on how food safety protocols are affected by non-crop vegetation, such as riparian vegetation, or vegetation buffering streams and rivers. The workshop was intended to provide context on this issue's complexity to inform the Central Coast Water Board's consideration of riparian area management requirements as it relates to the co-management of food safety and environmental protection. The staff report and minutes for the regular meeting of September 19-20, 2019 details the participants, their backgrounds, and the discussion (CCRWQCB, 2019). The main takeaways are reflective of the discussion above. Of note is that despite concerted effort by staff and a grower-shipper representative, the Central Coast Water Board was unable to obtain buyer or auditor participation.

Existing Structures, Easements, and Conservation/Restoration Projects

184. Some Dischargers may have existing permanent structures (access roads, buildings, storage sheds, fences, etc.) within a required minimum setback area. This Order provides exemptions for certain permanent structures.

185. Some dischargers may have easements (e.g., utilities, conservation, etc.) within a required minimum setback area. This Order provides exemptions for certain easements.

186. Some dischargers may have already implemented restoration projects or conservation plans within a required minimum setback area. The riparian setback requirements provide a compliance pathway to allow for a RipRAM assessment of the restoration or conservation area to demonstrate the project meets water quality objectives and protects beneficial uses and has the same functions and value as the applicable setback width and vegetation type.

Stream Miles Protected and Irrigated Acres Potentially Affected

187. Central Coast Water Board staff performed an analysis to assess the impact of the setback management measure requirements on irrigated agricultural operations in terms of land potentially taken out of production, as well as the length of stream miles that would be protected by the setback management measure requirement. It is important to note that the analysis of land potentially taken out of production is a worst-case scenario due to data limitations.

188. It was assumed that all land that fell within the setback distances was being actively farmed; however, some of that area may already be non-crop area or may actually be functioning riparian area. Furthermore, the numbers shown below assume that all Dischargers choose the On-Farm Setback compliance pathway, rather than one of the other available pathways that may reduce the amount of land potentially taken out of production on their individual ranch. Similarly, the number of stream miles newly protected assumes that those stream miles had no or very limited riparian areas prior to the requirement.

189. **Table A.C.5-21** shows the total estimated stream miles protected by the riparian setback requirements and the total irrigated acreage potentially affected (potentially taken out of production), based on the worst-case scenario analysis. Based on this analysis, in total, less than one percent of irrigated acreage regionwide would be potentially taken out of production.

Table A.C.5-21. Stream Miles Protected and Acreage Potentially Affected

	General Information				Riparian Setbacks		Operational Setbacks		Total for All Setbacks		
Priority	**HUC-8 Name**	**Ranches in Area**	**Irrigated Acres in Area**	**Strahler Order 2 through 6 Miles in Area**	**Stream Miles Protected**	**Acres Potentially Affected**	**Stream Miles Protected**	**Acres Potentially Affected**	**Stream Miles Protected**	**Acres Potentially Affected**	**Percent Irrigated Acres**
1	Santa Maria	435	48,146	390	25	329	3	10	28	340	0.7%
2	Salinas	1,306	199,651	1,724	118	1,163	53	278	171	1,441	0.7%
3	Pajaro	1,030	53,875	776	31	395	80	327	110	722	1.3%
3	Monterey Bay	369	29,053	237	52	725	0	0	52	725	2.5%
3	Santa Ynez	286	17,117	622	6	38	34	90	40	129	0.8%
4	Cuyama	94	22,116	678	0	1	29	118	29	119	0.5%
4	Estrella	138	20,861	500	0	0	28	90	28	90	0.4%
4	Central Coastal	430	19,705	636	45	197	0	0	45	197	1.0%
4	San Antonio	61	10,478	92	26	205	0	0	26	205	2.0%
4	Santa Barbara Coastal	259	7,897	200	21	86	0	0	21	87	1.1%
4	San Francisco Coastal South	19	1,394	59	0	3	0	0	0	3	0.2%
4	Ventura	35	1,003	9	0	0	3	8	3	8	0.8%
4	Coyote	4	72	0	0	0	0	0	0	0	0.0%
	TOTAL	**4,462**	**431,298**	**5,924**	**323**	**3,143**	**231**	**922**	**554**	**4,064**	**0.9%**

Success Criteria

190. Clean Water Act section 401 Water Quality Certifications (WQCs) issued in the central coast region were reviewed from 2010 through 2019.[46] These WQCs required the success criteria summarized in **Table A.C.5-22**. Not every WQC had the same methodology for determining success criteria. Information was not always available for each of the four standard categories for success criteria that are commonly used (e.g., percent vegetative cover, percent invasive species cover, percent bare ground, and years without supplemental irrigation). Averages were used to establish success criteria for on-farm riparian setbacks. The success criteria for riparian setbacks established in this Order were developed based on this assessment.

Table A.C.5-22. Central Coast Water Board Water Quality Certification Success Criteria (Riparian Restoration Projects)

401 WQC Number	% Vegetative Cover	Invasive Species (< % Cover)	% Bare Ground	Years Without Supplemental Irrigation
34210WQ06	75	15		
34210WQ11	90	10		3
34211WQ12	90			2
34211WQ15	90	5		3
34211WQ16	90	5		2
32717WQ18				
32717WQ29				2
33517WQ01				2
34017WQ15	80	5		
34017WQ24		5		2
34017WQ30	60	5		
34217WQ15	80	5		
34217WQ19	60	10		
34018WQ01	85			2
34018WQ02	70	10	20	2
34018WQ03	75			2
34018WQ06	85			
34018WQ12	80			3
34018WQ13	70	10	20	2
34018WQ15		15		

[46] Staff only began tracking 401 WQC compensatory mitigation compliance in 2017. As such this data is limited.

401 WQC Number	% Vegetative Cover	Invasive Species (< % Cover)	% Bare Ground	Years Without Supplemental Irrigation
32718WQ16	50			
32718WQ19	70			2
34218WQ11				
34218WQ23	60			
34218WQ28	70	30		1
34218WQ34	50	10		
34219WQ04	90	5		3
Average	**75**	**10**	**20**	**2**

191. The Natural Research Council examined a range of nationwide performance standards required for 20 wetland creation and restoration in U.S. Army Corps of Engineers (USACE) Clean Water Act section 404 permits (NRC, 2001). Fourteen projects were less than 30 acres (on average 13.8 acres). The average time schedule requirement for these projects to meet performance standards was just over four years. Six projects were greater than 30 acres (on average 445 acres). The average time schedule requirement for these projects to meet performance standards was just under five years. The success criteria for these projects are summarized in **Table A.C.5-23**. The success criteria for wetland setbacks established in this Order were developed based on this assessment.

Table A.C.5-23. US Army Corps of Engineers Permit Success Criteria (Wetland Restoration Projects)

Project Number	% Hydrophytic Vegetative Cover	% Emergent Area Vegetative Cover	% Invasive Species Cover
1		50	
2	75		
3	80		5
4	85		
5	80		
6	85		10
7	85		
8	50	50	
9	80	50	10
10	60	100	10
11	75		
12	80		5

Project Number	% Hydrophytic Vegetative Cover	% Emergent Area Vegetative Cover	% Invasive Species Cover
13	85		
14			
15			10
16	75		
17	33		
18	90		
19			
20	75		5
AVERAGE	**75**	**63**	**8**

Time Schedules

192. Scientific literature, regulatory approaches, and 401 Water Quality Certification projects were reviewed to determine the appropriate time schedules to implement restoration projects and achieve success criteria. Substantial time (years to decades) may be required to improve and fully restore riparian functions (NRC, 2002).

193. Clean Water Act section 401 Water Quality Certifications (WQCs) issued in the central coast region were reviewed from 2010 through 2019. These WQCs required success criteria to be met on average within five years and for vegetation to survive for two years without supplemental irrigation. Out of 26 projects, four had passed the required five-year time schedule to meet success criteria, including the two-year vegetation survival without supplemental irrigation schedule (the other projects still had time left to meet the success criteria). All four of those projects met the five-year time schedule to achieve success criteria. These WQC restoration projects were nearly all on the smaller scale (less than half an acre).

194. The statewide Cannabis General Order requires cultivators to comply with riparian setback requirements, including revegetating disturbed areas to pre-legacy or pre-cannabis conditions or better. Cultivators are required to monitor the revegetated areas for a minimum of five years to assess and achieve 85 percent survival and growth of revegetated areas. If the success rate of the revegetation efforts is less than 85 percent, cultivators are required to replant the unsuccessful vegetation.

195. The Natural Research Council examined a range of nationwide performance standards required for 20 wetland creation and restoration in U.S. Army Corps of Engineers (USACE) Clean Water Act section 404 permits (NRC, 2001). Fourteen projects were less than 30 acres (on average 13.8 acres). The average time schedule requirement for these projects to meet performance standards was just over four years. Six projects were greater than 30 acres (on average 445 acres). The average time schedule requirement for these projects to meet performance standards was just under five years.

196. The Johnson Creek Watershed Council developed a strategy for riparian area restoration commencing in spring of 2013. Three projects are highlighted: one on private property in the upper watershed, another in an urban setting near the mouth of Johnson Creek, and another also in an urban setting along Johnson Creek. Time schedules to achieve successful revegetation without supplemental irrigation ranged from two to five years (JCWC, n.d.). Substantial time (years to decades) may be required to improve and restore riparian functions (NRC, 2002). In general, large-scale restoration projects (>30 acres) fall into the decade category, while small-scale restoration projects (<30 acres) fall into the year's category.

Monitoring and Reporting

197. The MRP requires all Dischargers with waterbodies running through or adjacent to their ranches to monitor and report the current riparian setback width and vegetation. The costs of this monitoring has a reasonable relationship to the benefits obtained from understanding the current state of riparian areas in the central coast region, the role of riparian areas in protecting aquatic life beneficial uses, and given the water quality degradation observed in the region due, at least in part, to reduced or degraded riparian areas. The Central Coast Water Board needs these reports to document and ensure compliance with this Order. Findings in sections C.5 and D.3 of this Attachment A document the impacts of agricultural discharges and reduced or degraded riparian areas on water quality that demonstrate the need for riparian area reporting and provide the evidence that supports requiring Dischargers to submit the reports.

Section D. Additional Information

198. Section D includes tables and figures related to groundwater requirements (Section C.1) and surface water requirements (Sections C.2, C.3, and C.4). Key findings from the tables and narrative report are incorporated into the findings in this Order.

Section D.1. Groundwater Tables

The Central Coast Water Board published a staff report on groundwater quality conditions in May 2018 titled *Groundwater Quality Conditions and Agricultural Discharges in the Central Coast Region* (CCRWQCB, 2018c). The tables below are updated tables from the May 2018 report to incorporate additional groundwater monitoring data received in 2018 and 2019. Information from these tables is incorporated into findings in Section C.1.

The overall conclusions from the updated data are the same as the overall conclusions from the May 2018 report. A review of the most recent nitrate concentration data indicates that a significant number of groundwater basins in the central coast region are experiencing significant nitrate contamination, particularly in agricultural areas. The data also indicate increasing concentrations in some sub-basins where water quality is already degraded by nitrate, as well as in some sub-basins that historically have had higher quality groundwater.

Tables related to Nitrate in Groundwater

Table A.D.1-1. Regional Data Summary of Mean Nitrate Concentration, by Well Type

Well Type	ILRP Irrigation Well	ILRP Domestic Well	Other Domestic Wells	Monitoring Wells	Municipal Supply Wells	Unspecified Well Types	All Well Types
Min (mg/l-N)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Max (mg/l-N)	870	627	68.7	602	500	870	870
Mean (mg/l-N)	9.8	11.0	6.4	4.2	2.9	10.2	8.8
Median (mg/l-N)	3.3	3.2	1.9	0.4	1.0	3.0	2.4
Standard Deviation (mg/l-N)	20.6	19.7	12.1	21.9	5.8	20.3	19.5
First Quartile (mg/l-N)	0.5	0.5	0.2	0.1	0.5	0.5	0.3
Third Quartile (mg/l-N)	11.4	11.7	6.8	3.6	3.3	11.3	8.9
Number of Samples with non-detects	1827	1027	98	4637	5156	3520	16265
Number of Samples	10097	6276	491	11423	33436	19085	80813
Number of Wells	4204	2681	476	1694	1736	6768	17561
Percent of Wells Above MCL (%)	27.1	27.0	17.2	8.0	5.5	26.8	22.7
Percent of Samples Above MCL (%)	26.0	25.4	17.1	7.7	12.3	26.2	17.7

Table A.D.1-2. Regional Data Summary of Mean Nitrate Concentration in On-Farm Domestic Wells, by Groundwater Basin (mg/l NO3-N). GHV - Gilroy-Hollister Valley; SV – Salinas Valley; SMRV – Santa Maria River Valley.

Basin Name	Min.	Max.	Mean	Med.	SD	25%	75%	ND	Samples	Wells	Well % Exceed.	Sample % Exceed.
OUTSIDE OF GW BASINS	0.0	48.5	1.5	0.2	4.0	0.1	1.2	424	1003	390	2.6	4.1
AÑO NUEVO AREA	0.0	0.1	0.0	0.0	NA	0.0	0.0	1	2	1	0.0	0.0
CARMEL VALLEY	0.1	0.1	0.1	0.1	NA	0.1	0.1	4	4	1	0.0	0.0
CARPINTERIA	0.1	7.7	1.8	1.8	1.3	1.3	2.3	4	23	9	0.0	26.4
CHOLAME VALLEY	0.1	1.1	0.6	0.7	0.3	0.4	0.7	1	19	6	0.0	0.0
CHORRO VALLEY	0.4	4.0	2.4	2.4	2.3	1.6	3.2	0	5	2	0.0	3.0
CORRALITOS - PAJARO VALLEY	0.0	188.0	13.1	2.4	19.3	0.2	19.9	112	495	259	37.5	19.0
CUYAMA VALLEY	0.1	16.0	3.5	2.2	3.4	1.5	4.2	1	56	23	8.7	7.8
GHV - LLAGAS AREA	0.1	54.4	10.1	6.2	10.3	3.6	12.9	3	360	191	33.5	22.4
GHV - NORTH SAN BENITO	0.0	96.3	8.2	3.3	11.7	0.7	10.0	59	385	196	25.0	14.7
GOLETA	8.5	20.5	12.2	12.2	NA	12.2	12.2	0	4	1	100.0	4.1
HUASNA VALLEY	0.5	0.8	0.6	0.6	0.3	0.5	0.7	0	2	2	0.0	0.0
LOCKWOOD VALLEY	0.9	10.9	3.6	3.4	2.7	1.6	4.3	0	25	11	9.1	1.8
LOS OSOS VALLEY - LOS OSOS AREA	0.1	27.8	5.2	1.8	9.0	0.1	3.0	2	18	5	20.0	3.0
LOS OSOS VALLEY - WARDEN CREEK	0.1	16.0	4.6	1.2	6.2	0.1	8.5	4	14	6	33.3	14.1
MORRO VALLEY	0.1	33.9	5.9	2.4	9.8	0.1	6.3	8	37	13	15.4	56.2
POZO VALLEY	0.8	2.8	1.9	1.9	0.5	1.7	2.0	0	6	2	0.0	0.0
SV - 180/400 FOOT AQUIFER	0.0	130.0	11.4	2.2	20.1	0.4	10.5	39	419	200	25.0	15.7
SV - ATASCADERO AREA	0.1	21.7	3.2	2.3	3.5	0.7	4.6	14	128	49	6.1	5.3

Basin Name	Min.	Max.	Mean	Med.	SD	25%	75%	ND	Samples	Wells	Well % Exceed.	Sample % Exceed.
SV - EAST SIDE AQUIFER	0.1	204.0	32.1	14.4	40.7	4.0	47.0	5	301	123	58.5	49.4
SV - FOREBAY AQUIFER	0.0	158.0	25.7	18.9	25.7	6.3	36.2	17	569	285	63.5	34.0
SV - LANGLEY AREA	0.0	2.2	0.7	0.2	1.0	0.1	1.0	3	6	3	0.0	9.9
SV- MONTEREY	0.1	4.3	1.4	0.9	1.4	0.6	1.6	1	12	7	0.0	0.8
SV - PASO ROBLES AREA	0.1	21.7	3.5	2.7	3.5	0.9	4.6	101	945	344	4.7	4.5
SV - SEASIDE	3.0	6.1	4.1	4.1	NA	4.1	4.1	0	3	1	0.0	0.5
SV - UPPER VALLEY AQUIFER	0.1	142.0	16.3	6.4	23.4	0.9	23.7	18	167	82	41.5	27.7
SAN ANTONIO CREEK VALLEY	0.1	14.7	2.9	1.8	3.2	0.2	3.8	18	102	33	3.0	3.3
SAN BENITO RIVER VALLEY	1.0	3.4	2.5	2.5	0.5	2.4	2.7	0	5	2	0.0	1.9
SAN LUIS OBISPO VALLEY	0.1	80.0	11.3	7.4	11.9	3.6	14.9	10	121	42	35.7	18.1
SAN SIMEON VALLEY	0.1	1.1	0.4	0.4	0.5	0.3	0.6	2	4	2	0.0	0.0
SANTA ANA VALLEY	1.4	24.4	9.0	3.4	10.7	2.9	12.4	0	9	3	33.3	12.1
SANTA CLARA VALLEY - SANTA CLARA	0.2	16.0	7.2	5.6	5.6	4.5	10.0	0	6	6	33.3	14.3
SANTA CRUZ MID-COUNTY	0.1	1.0	0.4	0.3	0.3	0.2	0.7	2	13	6	0.0	2.4
SANTA MARGARITA	0.1	1.1	0.5	0.5	0.6	0.3	0.7	2	5	2	0.0	0.4
SMRV - ARROYO GRANDE	0.1	66.6	5.2	0.9	11.2	0.1	5.6	30	92	35	17.1	9.1
SMRV - SANTA MARIA	0.1	627.0	21.1	12.4	25.9	4.4	27.1	10	468	183	55.2	29.9
SANTA ROSA VALLEY	0.1	0.7	0.4	0.4	0.4	0.2	0.5	1	2	2	0.0	3.3
SANTA YNEZ RIVER VALLEY	0.1	150.0	4.4	1.3	10.9	0.1	3.3	130	433	151	8.6	7.1
TORO VALLEY	0.1	0.5	0.3	0.3	NA	0.3	0.3	1	4	1	0.0	0.0
VILLA VALLEY	0.2	0.4	0.3	0.3	NA	0.3	0.3	0	4	1	0.0	0.0

Table A.D.1-3. Regional Data Summary of Mean Nitrate Concentrations in Irrigation Supply Wells, by Groundwater Basin (mg/l NO3-N). GHV - Gilroy-Hollister Valley; SV – Salinas Valley; SMRV – Santa Maria River Valley.

Basin Name	Min.	Max.	Mean	Med.	SD	25%	75%	ND	Samples	Wells	Well % exceed.	Sample % exceed
OUTSIDE OF GW BASINS	0.0	230.0	2.4	0.1	6.9	0.1	1.2	521	999	392	5.9	4.1
BITTER WATER VALLEY	7.3	7.9	7.6	7.6	NA	7.6	7.6	0	2	1	0.0	0.0
CARPINTERIA	0.1	81.5	10.1	4.5	13.3	1.7	14.7	16	236	75	30.7	26.4
CHOLAME VALLEY	0.5	5.9	3.3	2.8	1.9	1.9	5.0	0	13	5	0.0	0.0
CHORRO VALLEY	0.7	6.4	1.7	1.7	1.5	1.2	2.2	0	6	2	0.0	3.0
CORRALITOS - PAJARO VALLEY	0.0	93.8	7.9	0.9	14.1	0.1	9.1	335	1046	500	23.8	19.0
CUYAMA VALLEY	0.1	38.4	4.0	1.7	5.9	0.8	4.2	15	205	78	10.3	7.8
GHV - LLAGAS AREA	0.0	117.0	12.8	9.1	13.1	5.4	15.3	7	401	234	43.6	22.4
GHV - NORTH SAN BENITO	0.0	72.0	5.4	1.7	9.1	0.5	6.3	95	460	231	15.2	14.7
GOLETA	0.1	9.7	1.5	0.1	3.3	0.1	0.3	16	21	6	0.0	4.1
HUASNA VALLEY	1.1	1.5	1.3	1.3	NA	1.3	1.3	0	2	1	0.0	0.0
LOCKWOOD VALLEY	1.3	5.7	3.4	3.1	1.2	2.7	4.4	0	36	14	0.0	1.8
LOS OSOS VALLEY - LOS OSOS AREA	0.1	45.5	4.5	1.3	9.0	0.8	2.1	5	21	8	12.5	3.0
LOS OSOS VALLEY - WARDEN CREEK	0.1	28.0	7.5	4.9	9.6	1.9	7.8	2	16	7	14.3	14.1
MAJORS CREEK	0.1	0.4	0.1	0.1	0.0	0.1	0.1	3	4	2	0.0	0.0
MONTECITO	0.1	9.2	2.8	0.2	4.5	0.2	4.1	2	7	3	0.0	4.0
MORRO VALLEY	0.1	45.0	9.7	6.2	11.0	1.9	12.0	3	43	10	30.0	56.2
NEEDLE ROCK POINT	0.0	0.1	0.1	0.1	0.0	0.1	0.1	11	13	5	0.0	0.0
OLD VALLEY	0.3	0.9	0.6	0.6	NA	0.6	0.6	0	2	1	0.0	0.0
POZO VALLEY	1.7	3.3	2.4	2.4	NA	2.4	2.4	0	4	1	0.0	0.0

Basin Name	Min.	Max.	Mean	Med.	SD	25%	75%	ND	Samples	Wells	Well % exceed.	Sample % exceed
SV - 180/400 FOOT AQUIFER	0.0	84.0	6.5	2.3	10.6	0.6	7.4	56	879	375	19.5	15.7
SV - ATASCADERO AREA	0.1	13.0	1.8	0.9	2.0	0.2	2.9	39	155	55	0.0	5.3
SV - EAST SIDE AQUIFER	0.0	156.0	21.3	14.2	21.1	5.0	32.7	3	639	253	59.7	49.4
SV - FOREBAY AQUIFER	0.0	95.5	14.0	7.9	15.6	2.7	20.4	39	832	343	43.4	34.0
SV - LANGLEY AREA	0.0	9.1	2.1	1.7	2.3	0.1	3.8	6	31	11	0.0	9.9
SV - MONTEREY	0.1	14.0	4.2	2.6	4.9	2.2	3.5	1	9	6	16.7	0.8
SV - PASO ROBLES AREA	0.1	44.6	3.0	2.6	3.4	0.9	3.9	129	1005	383	1.8	4.5
SV - UPPER VALLEY AQUIFER	0.1	116.0	14.8	6.5	21.2	2.2	17.7	20	319	148	39.2	27.7
SAN ANTONIO CREEK VALLEY	0.0	59.0	2.2	0.6	3.8	0.1	2.8	62	190	81	6.2	3.3
SAN BENITO RIVER VALLEY	0.1	12.5	4.3	4.8	2.8	2.4	6.5	3	19	7	0.0	1.9
SAN LUIS OBISPO VALLEY	0.1	37.9	5.0	3.6	5.6	1.8	5.7	8	118	44	13.6	18.1
SANTA ANA VALLEY	0.5	10.0	4.3	3.5	2.4	3.1	4.7	0	16	5	0.0	12.1
SANTA BARBARA	0.1	0.1	0.1	0.1	NA	0.1	0.1	3	4	1	0.0	2.8
SANTA CLARA VALLEY - SANTA CLARA	1.0	7.0	2.8	1.6	2.8	1.1	3.3	0	4	4	0.0	14.3
SANTA CRUZ MID-COUNTY	0.0	1.1	0.2	0.1	0.4	0.0	0.1	21	24	6	0.0	2.4
SANTA MARGARITA	0.1	0.3	0.2	0.2	NA	0.2	0.2	0	2	1	0.0	0.4
SMRV - ARROYO GRANDE	0.1	45.0	2.1	0.1	5.8	0.1	1.6	63	98	33	9.1	9.1
SMRV - SANTA MARIA	0.1	256.0	18.8	12.1	20.1	4.1	26.9	53	1535	627	55.0	29.9
SANTA ROSA VALLEY	0.1	0.5	0.2	0.1	0.2	0.1	0.2	9	11	4	0.0	3.3
SANTA YNEZ RIVER VALLEY	0.1	870.0	9.9	0.4	60.3	0.1	3.0	271	658	237	11.0	7.1
WEST SANTA CRUZ TERRACE	0.0	0.9	0.4	0.4	0.5	0.0	0.8	10	12	4	0.0	0.3

Table A.D.1-4. Regional Data Summary of Mean Nitrate Concentration in All Wells, by Groundwater Basin (mg/l NO3-N). GHV - Gilroy-Hollister Valley; SV – Salinas Valley; SMRV – Santa Maria River Valley.

Basin Name	Min.	Max.	Mean	Med.	SD	25%	75%	ND	Samples	Wells	Well % Exceed.	Sample % Exceed.
OUTSIDE OF GW BASINS	0.0	500.0	1.9	0.2	5.5	0.1	1.2	5267	10271	2434	4.0	4.1
AÑO NUEVO AREA	0.0	0.6	0.3	0.2	0.3	0.0	0.5	14	18	4	0.0	0.0
BITTER WATER VALLEY	0.2	7.9	5.2	7.6	4.2	4.0	7.6	1	20	3	0.0	0.0
CARMEL VALLEY	0.0	4.7	0.3	0.2	0.6	0.1	0.4	222	326	35	0.0	0.0
CARPINTERIA	0.1	81.5	9.0	4.1	12.3	1.7	11.8	42	628	184	27.7	26.4
CARRIZO PLAIN	6.8	33.9	16.8	13.8	9.2	9.9	25.8	0	16	8	75.0	87.5
CHOLAME VALLEY	0.1	5.9	1.8	1.1	1.8	0.7	2.4	4	67	23	0.0	0.0
CHORRO VALLEY	0.4	24.8	2.3	2.7	1.2	0.8	3.2	0	508	13	0.0	3.0
CORRALITOS - PAJARO VALLEY	0.0	189.0	9.2	1.1	16.1	0.1	10.8	1592	5365	1816	26.3	19.0
CORRALITOS - PURISIMA HIGH.	0.1	0.7	0.2	0.2	0.1	0.1	0.3	10	29	8	0.0	0.0
CUYAMA VALLEY	0.0	174.0	3.8	1.6	6.0	0.7	4.2	59	676	243	9.5	7.8
FOOTHILL	0.1	53.3	3.9	1.4	7.2	0.1	5.6	104	390	76	6.6	4.1
GHV - LLAGAS AREA	0.0	129.0	10.8	7.2	11.7	4.0	12.6	106	3855	980	34.3	22.4
GHV - NORTH SAN BENITO	0.0	96.3	6.1	2.0	9.9	0.5	7.3	846	4983	1061	18.3	14.7
GOLETA	0.0	60.0	1.9	0.2	5.1	0.1	0.7	394	563	105	6.7	4.1
HUASNA VALLEY	0.5	1.5	0.8	0.8	0.4	0.6	1.1	0	8	6	0.0	0.0
LOCKWOOD VALLEY	0.1	10.9	3.3	3.1	2.2	1.9	4.1	16	282	70	4.3	1.8
LOS OSOS VALLEY - LOS OSOS AREA	0.1	45.5	5.0	1.7	7.5	0.4	5.5	52	691	39	15.4	3.0
LOS OSOS VALLEY - WARDEN CREEK	0.1	28.0	6.2	2.8	7.9	0.2	8.9	14	64	26	23.1	14.1
MAJORS CREEK	0.1	0.4	0.2	0.1	0.2	0.1	0.2	7	10	4	0.0	0.0

Basin Name	Min.	Max.	Mean	Med.	SD	25%	75%	ND	Samples	Wells	Well % Exceed.	Sample % Exceed.
MONTECITO	0.0	23.4	3.1	2.0	3.7	0.5	5.4	54	352	58	3.4	4.0
MORRO VALLEY	0.1	45.0	7.6	3.3	9.6	0.1	10.8	33	1071	55	27.3	56.2
NEEDLE ROCK POINT	0.0	0.1	0.1	0.1	0.0	0.1	0.1	23	27	10	0.0	0.0
OLD VALLEY	0.1	4.7	1.3	1.5	0.5	0.8	1.8	7	49	8	0.0	0.0
POZO VALLEY	0.5	3.3	1.7	1.9	0.7	1.4	2.3	6	54	8	0.0	0.0
SV - 180/400 FOOT AQUIFER	0.0	587.0	8.9	2.1	26.4	0.5	7.7	526	6057	1357	20.9	15.7
SV - ATASCADERO AREA	0.1	21.7	2.5	1.5	3.0	0.5	3.8	206	1428	243	3.7	5.3
SV - EAST SIDE AQUIFER	0.0	204.0	22.8	12.5	28.4	3.7	33.3	68	4217	832	54.3	49.4
SV - FOREBAY AQUIFER	0.0	158.0	18.9	10.4	21.5	3.5	26.4	183	5060	1291	51.3	34.0
SV - LANGLEY AREA	0.0	56.0	3.3	1.6	4.3	0.2	4.5	426	2313	208	8.2	9.9
SV - MONTEREY	0.0	21.4	2.1	1.1	3.3	0.5	2.6	97	358	78	3.8	0.8
SV - PASO ROBLES AREA	0.0	52.0	3.1	2.4	3.4	0.7	4.1	825	5650	1634	3.1	4.5
SV - SEASIDE	0.0	63.3	2.1	1.3	2.1	0.5	3.4	68	590	38	0.0	0.5
SV - UPPER VALLEY AQUIFER	0.0	142.0	14.0	5.6	21.2	1.4	17.5	150	1636	513	36.3	27.7
SAN ANTONIO CREEK VALLEY	0.0	59.0	2.5	1.1	4.2	0.1	3.1	224	757	257	5.1	3.3
SAN BENITO RIVER VALLEY	0.0	12.5	2.4	1.0	2.7	0.1	3.8	47	108	29	0.0	1.9
SAN LUIS OBISPO VALLEY	0.0	80.0	6.2	3.6	8.7	0.5	7.4	198	1368	265	17.0	18.1
SAN SIMEON VALLEY	0.1	1.1	0.5	0.5	0.3	0.3	0.7	5	41	7	0.0	0.0
SANTA ANA VALLEY	0.5	24.4	7.0	3.5	7.4	3.0	8.2	0	58	17	17.6	12.1
SANTA BARBARA	0.0	22.0	2.3	0.5	3.6	0.1	3.5	271	604	155	4.5	2.8
SANTA CLARA VALLEY - SANTA CLARA	0.2	16.0	5.4	5.2	4.6	1.8	6.2	0	14	12	16.7	14.3
SANTA CRUZ MID-COUNTY	0.0	29.0	1.3	0.4	2.6	0.1	1.0	371	744	106	2.8	2.4
SANTA MARGARITA	0.0	50.0	0.7	0.4	1.1	0.1	0.9	389	691	67	0.0	0.4

Basin Name	Min.	Max.	Mean	Med.	SD	25%	75%	ND	Samples	Wells	Well % Exceed.	Sample % Exceed.
SMRV - ARROYO GRANDE	0.1	66.6	3.4	0.6	8.5	0.1	1.9	224	580	157	11.5	9.1
SMRV - SANTA MARIA	0.0	627.0	17.6	10.0	21.2	3.3	23.9	800	12781	1827	49.8	29.9
SANTA ROSA VALLEY	0.0	69.6	1.5	0.3	3.9	0.1	1.0	40	92	35	2.9	3.3
SANTA YNEZ RIVER VALLEY	0.0	870.0	6.2	0.4	40.3	0.1	2.8	2079	5006	1095	8.4	7.1
TORO VALLEY	0.1	0.5	0.3	0.3	0.0	0.3	0.3	2	8	2	0.0	0.0
VILLA VALLEY	0.2	0.4	0.3	0.3	0.0	0.3	0.3	0	8	2	0.0	0.0
WEST SANTA CRUZ TERRACE	0.0	11.0	0.8	0.2	1.5	0.1	0.7	193	321	57	0.0	0.3

Table A.D.1-5. Summary of Trend Analysis Results for Individual Wells, by Well Type

Well Type	Number of wells that meet statistical test criteria	Number of wells with significant trends	Number of wells with significant decreasing trends	Number of wells with significant increasing trends	Percentage of testable wells with decreasing trends (%)	Percentage of testable wells with increasing trends (%)
ILRP Irrigation Well	155	11	3	8	2	5
ILRP Domestic Well	84	6	2	4	2	5
Monitoring Wells	545	106	63	43	12	8
Municipal Supply Wells	971	317	106	211	11	22
Unspecified Well Types	850	110	38	72	4	8

Table A.D.1-6. Summary of Trend Analysis Results for Individual Wells, by Groundwater Basin. GHV - Gilroy-Hollister Valley; SV – Salinas Valley; SMRV – Santa Maria River Valley

GW Basin Name	Number of wells that meet statistical test criteria	Number of wells with significant trends	Number of wells with significant increasing trends	Number of wells with significant decreasing trends	Percentage of testable wells with increasing trends (%)	Percentage of testable wells with decreasing trends (%)
OUTSIDE OF GW BASIN	335	39	22	17	7	5
CARMEL VALLEY	12	2	1	1	8	8
CARPINTERIA	28	3	2	1	7	4
CHORRO VALLEY	6	4	0	4	0	67
CORRALITOS - PAJARO VALLEY	144	28	19	8	13	6
CUYAMA VALLEY	30	7	5	2	17	7
FOOTHILL	23	7	5	2	22	9
GHV - LLAGAS AREA	111	25	8	17	7	15
GHV - NORTH SAN BENITO	175	52	27	24	15	14
GOLETA	20	5	3	2	15	10

GW Basin Name	Number of wells that meet statistical test criteria	Number of wells with significant trends	Number of wells with significant increasing trends	Number of wells with significant decreasing trends	Percentage of testable wells with increasing trends (%)	Percentage of testable wells with decreasing trends (%)
LOCKWOOD VALLEY	19	1	1	0	5	0
LOS OSOS VALLEY - LOS OSOS AREA	17	8	8	0	47	0
MONTECITO	17	3	2	1	12	6
MORRO VALLEY	20	4	1	3	5	15
SV - 180/400 FOOT AQUIFER	179	48	41	7	23	4
SV - ATASCADERO AREA	50	9	4	5	8	10
SV - EAST SIDE AQUIFER	116	32	25	7	22	6
SV - FOREBAY AQUIFER	124	22	18	4	15	3
SV - LANGLEY AREA	112	42	29	13	26	12
SV - MONTEREY	20	3	3	0	15	0
SV - PASO ROBLES AREA	147	29	11	18	7	12
SV - SEASIDE	20	6	4	2	20	10
SV - UPPER VALLEY AQUIFER	54	13	10	3	19	6
SAN ANTONIO CREEK VALLEY	30	3	2	1	7	3
SAN BENITO RIVER VALLEY	4	2	2	0	50	0
SAN LUIS OBISPO VALLEY	49	11	4	7	8	14
SANTA BARBARA	27	6	4	2	15	7
SANTA CRUZ MID-COUNTY	18	2	2	0	11	0
SANTA MARGARITA	14	3	3	0	21	0
SMRV - ARROYO GRANDE	24	4	3	1	13	4
SMRV - SANTA MARIA	384	102	66	34	17	9
SANTA YNEZ RIVER VALLEY	239	32	8	21	3	9

Tables related to Pesticides in Groundwater

Table A.D.1-7. Groundwater Protection List. Pesticides that contain any of the following chemicals are designated as having the potential to pollute groundwater (California Code of Regulations, Title 3, Section 6800)

(A) The following chemicals that have been detected in groundwater or soil in California pursuant to section 13149 of the Food and Agricultural Code.

Atrazine	Bromacil	Bentazon (Basagran®)
Diuron	Norflurazon	Prometon
Simazine		

(B) The following chemicals that have the potential to pollute groundwater in California identified pursuant to section 13145(d) of the Food and Agricultural Code.

Acephate	Dimethomorph	Metribuzin
Alachlor	Dinotefuran	Myclobutanil
Aldicarb	Dithiopyr	Napropamide
Aminocyclopyrachlor	EPTC	Nitrapyrin
Aminocyclopyrachlor, potassium salt	Ethofumesate	Orthosulfamuron
Aminopyralid, triisopropanolamine salt	Ethoprop	Oryzalin
Azoxystrobin	Fenamidone	Penoxsulam
Bensulfuron methyl	Flazasulfuron	Phorate
Bensulide	Fludioxonil	Prometryn
Bispyribac-sodium	Fluopicolide	Propamocarb hydrochloride
Boscalid	Flutolanil	Propanil
Carbaryl	Fosetyl-Al (aluminum tris)	Propiconazole
Chlorantraniliprole	Fosthiazate	Propyzamide
Chloropicrin	Halosulfuron-methyl	Prothioconazole
Chlorothalonil	Hexazinone	Pyraclostrobin
Chlorsulfuron	Imazamox, ammonium salt	Pyrazon
Clomazone	Imazapyr, isopropylamine salt	Rimsulfuron
Clothianidin	Imazethapyr, ammonium salt	Siduron
Cycloate	Imidacloprid	Sulfentrazone
Cyprodinil	Indaziflam	Sulfometuron-methyl
2,4-D, 2-ethylhexyl ester	Iprodione	Tebuconazole
2,4-D, diethanolamine salt	Isoxaben	Tebuthiuron
2,4-D, dimethylamine salt	Linuron	Thiamethoxam

2,4-D, isooctyl ester	Malathion	Thiencarbazone-methyl
Dazomet	Mefenoxam	Thiobencarb
Diazinon	Mesotrione	Thiophanate methyl
Dicamba, diglycolamine salt	Metalaxyl	Triadimefon
Dicamba, dimethylamine salt	Metaldehyde	Triallate
Dicamba, sodium salt	Metconazole	Triclopyr, butoxyethyl ester
Dichlobenil	Methiocarb	Triclopyr, triethylamine salt
Dichloran	Methomyl	Triflumizole
Dimethenamid-P	Metolachlor	Triticonazole
Dimethoate	(S)-Metolachlor	

Table A.D.1-8. List of DPR Groundwater Protection List Pesticides Detected in the Central Coast Region.

PESTICIDE	Monterey	Santa Clara	Santa Cruz	San Luis Obispo	Santa Barbara	San Benito
Atrazine	NVD	2007(1)	NVD	NVD	NVD	NVD
Bromacil	2001(1)	NVD	NVD	NVD	NVD	NVD
Diuron	2001(2)	NVD	NVD	1992(3)	NVD	NVD
Norflurazon	NVD	NVD	NVD	NVD	NVD	NVD
Simazine		NVD	NVD	NVD	NVD	NVD
Prometon	NVD	NVD	NVD	NVD	NVD	NVD
Bentazon	NVD	NVD	NVD	NVD	NVD	NVD
DEA (degradate)	NVD	2007(1)	NVD	2008()	NVD	NVD
ACET degradate	2001(1) 2007(1)	NVD	NVD	NVD	NVD	NVD
NVD – No verified detection. Year detected and number of detections in parentheses.						

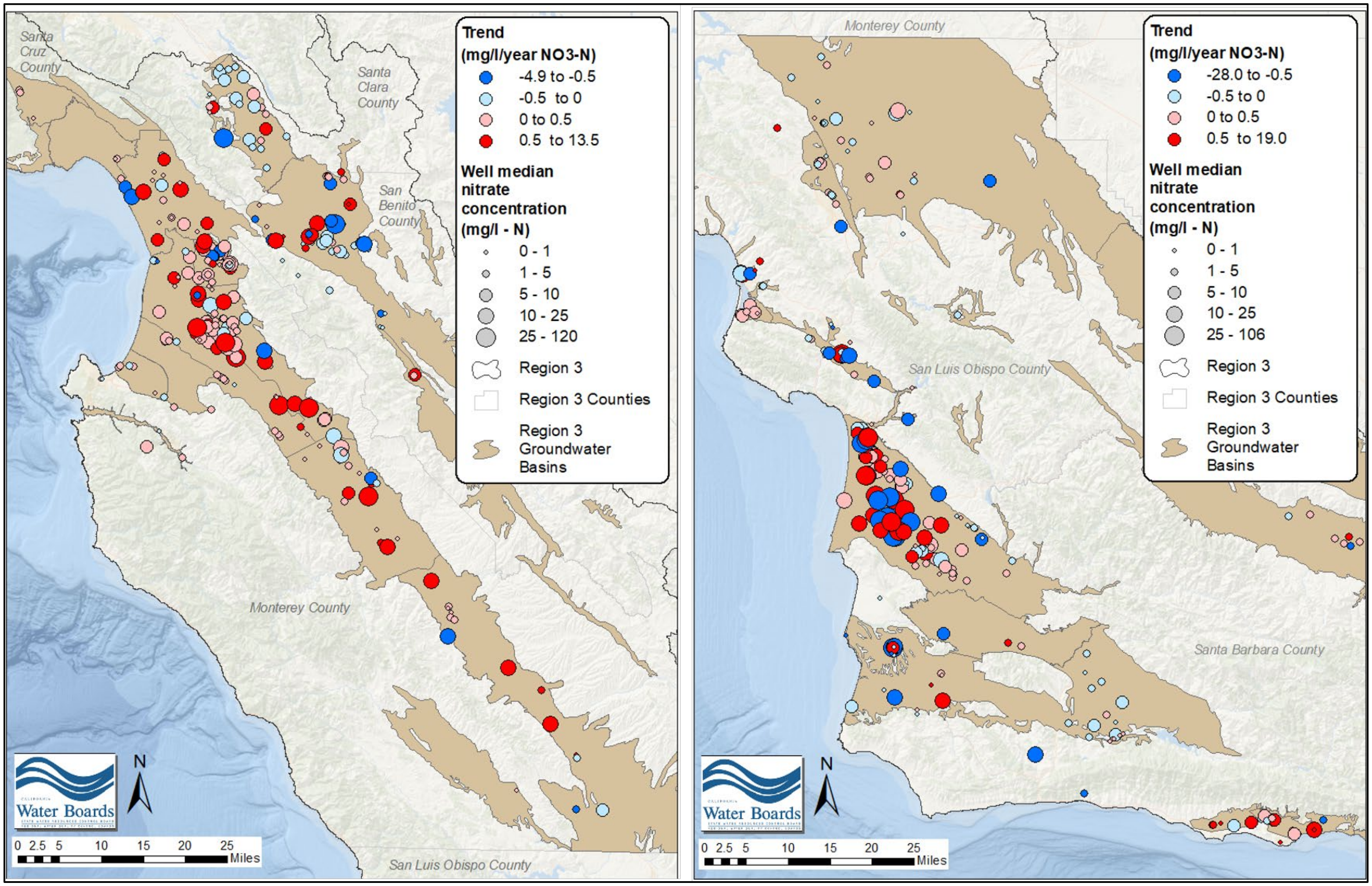

Figure A.D.1-1. Map of wells with statistically significant nitrate concentrations based on calculation of Kendall's Tau and the Akritas-Theil-Sen slope. Bubble size indicates the median concentration of samples used in the well trend analysis. Bubble colors represent whether the trend is increasing nitrate concentration (red) or decreasing nitrate concentration (blue).

Section D.2. Surface Water Tables

The Central Coast Water Board published a staff report on groundwater quality conditions in March 2018 titled *Surface Water Quality Conditions and Agricultural Discharges in the Central Coast Region* (CCRWQCB, 2018b).

The information in the findings in Section C.2, Section C.3, and Section C.4 reflect additional data received and reviewed by the Central Coast Water Board since the March 2018 staff report was published. The tables below also reflect additional surface water monitoring data. The tables reflect data collected and received from 2005 to 2019.

The overall conclusions from the updated data are the same as the overall conclusions from the March 2018 staff report: agricultural discharges are causing and contributing to significant surface water pollution related to nutrients, pesticides, toxicity, turbidity, and sediments.

Tables related to Nitrate in Surface Water

Table A.D.2-1. Nitrate MEQ Values and Scores Over Time (Dry Season) (CMP data 2005-2019)

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**MEQ Score**	**MEQ Value**	**MEQ Score**
305BRS	N/A	N/A	53.43	Poor	13.20	Very Poor
305CAN	46.89	Poor	43.95	Very Poor	50.96	Poor
305CHI	36.77	Very Poor	16.46	Very Poor	51.90	Poor
305COR	72.97	Fair	83.14	Good	74.51	Fair
305FRA	96.79	Excellent	99.30	Excellent	98.12	Excellent
305FUF	N/A	N/A	12.70	Very Poor	11.64	Very Poor
305LCS	29.58	Very Poor	51.00	Poor	15.72	Very Poor
305PJP	61.76	Poor	72.90	Fair	66.88	Fair
305SJA	9.86	Very Poor	9.36	Very Poor	8.60	Very Poor
305TSR	77.20	Fair	85.89	Good	10.26	Very Poor
305WCS	N/A	N/A	12.65	Very Poor	15.13	Very Poor
305WSA	64.68	Poor	29.36	Very Poor	97.01	Excellent
309ALG	23.78	Very Poor	21.84	Very Poor	10.76	Very Poor
309ASB	11.65	Very Poor	8.19	Very Poor	8.20	Very Poor
309BLA	6.85	Very Poor	5.81	Very Poor	6.51	Very Poor
309CCD	N/A	N/A	20.51	Very Poor	12.05	Very Poor
309CRR	13.41	Very Poor	13.80	Very Poor	9.95	Very Poor
309ESP	22.83	Very Poor	13.74	Very Poor	32.53	Very Poor
309GAB	11.24	Very Poor	17.27	Very Poor	39.70	Very Poor
309GRN	96.22	Excellent	97.69	Excellent	95.69	Excellent
309JON	35.02	Very Poor	34.96	Very Poor	12.70	Very Poor
309MER	23.21	Very Poor	18.65	Very Poor	9.70	Very Poor
309MOR	99.16	Excellent	97.04	Excellent	96.61	Excellent

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**MEQ Score**	**MEQ Value**	**MEQ Score**
309NAD	11.02	Very Poor	12.41	Very Poor	19.62	Very Poor
309OLD	N/A	N/A	37.33	Very Poor	42.67	Very Poor
309QUI	8.90	Very Poor	11.21	Very Poor	11.75	Very Poor
309RTA	N/A	N/A	76.44	Fair	41.14	Very Poor
309SAC	91.82	Excellent	97.83	Excellent	98.18	Excellent
309SAG	92.14	Excellent	97.39	Excellent	96.94	Excellent
309SSP	89.16	Good	96.40	Excellent	95.80	Excellent
309TEH	10.81	Very Poor	9.49	Very Poor	9.57	Very Poor
310CCC	74.87	Fair	88.99	Good	90.74	Excellent
310LBC	11.72	Very Poor	N/A	N/A	79.70	Fair
310PRE	54.54	Poor	66.71	Fair	58.58	Poor
310USG	76.24	Fair	87.51	Good	76.15	Fair
310WRP	11.99	Very Poor	9.27	Very Poor	32.25	Very Poor
312BCC	30.84	Very Poor	15.88	Very Poor	15.48	Very Poor
312BCJ	10.54	Very Poor	15.22	Very Poor	22.40	Very Poor
312GVS	6.61	Very Poor	5.82	Very Poor	8.16	Very Poor
312MSD	26.25	Very Poor	41.80	Very Poor	18.81	Very Poor
312OFC	10.60	Very Poor	9.79	Very Poor	10.04	Very Poor
312OFN	14.04	Very Poor	12.70	Very Poor	12.58	Very Poor
312ORC	9.17	Very Poor	13.31	Very Poor	11.40	Very Poor
312ORI	6.18	Very Poor	8.57	Very Poor	5.78	Very Poor
312SMA	11.57	Very Poor	16.45	Very Poor	12.59	Very Poor
312SMI	12.60	Very Poor	N/A	N/A	N/A	N/A
313SAE	N/A	N/A	N/A	N/A	N/A	N/A
314SYF	49.66	Poor	80.71	Good	78.41	Fair
314SYL	99.75	Excellent	99.71	Excellent	99.78	Excellent

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**MEQ Score**	**MEQ Value**	**MEQ Score**
314SYN	76.18	Fair	99.46	Excellent	75.36	Fair
315APF	98.92	Excellent	N/A	N/A	98.49	Excellent
315BEF	16.64	Very Poor	39.52	Very Poor	74.24	Fair
315FMV	9.98	Very Poor	13.74	Very Poor	12.50	Very Poor
315GAN	16.82	Very Poor	27.88	Very Poor	22.87	Very Poor
315LCC	N/A	N/A	N/A	N/A	89.40	Good

Table A.D.2-2. Nitrate MEQ Values and Scores Over Time (Wet Season) (CMP data 2005-2019)

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**MEQ Score**	**MEQ Value**	**MEQ Score**
305BRS	N/A	N/A	13.15	Very Poor	21.72	Very Poor
305CAN	76.65	Fair	57.11	Poor	70.34	Fair
305CHI	71.19	Fair	65.80	Fair	69.29	Fair
305COR	84.16	Good	91.70	Excellent	88.42	Good
305FRA	96.71	Excellent	98.18	Excellent	98.72	Excellent
305FUF	N/A	N/A	11.83	Very Poor	11.74	Very Poor
305LCS	34.59	Very Poor	56.02	Poor	39.77	Very Poor
305PJP	74.31	Fair	79.41	Fair	75.72	Fair
305SJA	17.06	Very Poor	18.29	Very Poor	15.62	Very Poor
305TSR	78.96	Fair	89.02	Good	38.49	Very Poor
305WCS	N/A	N/A	32.81	Very Poor	18.65	Very Poor
305WSA	61.81	Poor	73.25	Fair	87.37	Good
309ALG	34.36	Very Poor	47.30	Poor	28.86	Very Poor
309ASB	11.24	Very Poor	9.36	Very Poor	8.05	Very Poor
309BLA	11.57	Very Poor	7.74	Very Poor	6.67	Very Poor
309CCD	N/A	N/A	27.41	Very Poor	18.84	Very Poor

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**MEQ Score**	**MEQ Value**	**MEQ Score**
309CRR	35.77	Very Poor	63.74	Poor	36.18	Very Poor
309ESP	29.79	Very Poor	32.83	Very Poor	41.06	Very Poor
309GAB	56.79	Poor	56.56	Poor	83.92	Good
309GRN	76.16	Fair	76.83	Fair	90.44	Excellent
309JON	51.42	Poor	53.71	Poor	49.79	Poor
309MER	18.22	Very Poor	23.88	Very Poor	21.10	Very Poor
309MOR	96.94	Excellent	94.61	Excellent	95.02	Excellent
309NAD	30.81	Very Poor	26.11	Very Poor	37.70	Very Poor
309OLD	49.99	Poor	31.46	Very Poor	35.02	Very Poor
309QUI	32.12	Very Poor	34.89	Very Poor	46.24	Poor
309RTA	N/A	N/A	68.17	Fair	66.09	Fair
309SAC	87.81	Good	86.76	Good	94.26	Excellent
309SAG	84.36	Good	85.11	Good	94.65	Excellent
309SSP	91.03	Excellent	97.26	Excellent	91.01	Excellent
309TEH	23.22	Very Poor	22.30	Very Poor	23.61	Very Poor
310CCC	83.72	Good	90.07	Excellent	93.08	Excellent
310LBC	48.20	Poor	72.83	Fair	71.65	Fair
310PRE	59.94	Poor	70.51	Fair	72.48	Fair
310USG	79.56	Fair	87.42	Good	76.11	Fair
310WRP	36.14	Very Poor	20.29	Very Poor	40.63	Very Poor
312BCC	39.04	Very Poor	67.88	Fair	31.39	Very Poor
312BCJ	30.41	Very Poor	20.84	Very Poor	24.18	Very Poor
312GVS	8.15	Very Poor	10.24	Very Poor	34.79	Very Poor
312MSD	37.83	Very Poor	48.22	Poor	29.38	Very Poor
312OFC	12.80	Very Poor	12.73	Very Poor	17.45	Very Poor
312OFN	12.12	Very Poor	12.56	Very Poor	12.73	Very Poor

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**MEQ Score**	**MEQ Value**	**MEQ Score**
312ORC	14.46	Very Poor	11.80	Very Poor	10.88	Very Poor
312ORI	12.78	Very Poor	8.35	Very Poor	7.96	Very Poor
312SMA	18.05	Very Poor	14.16	Very Poor	12.36	Very Poor
312SMI	26.02	Very Poor	85.45	Good	75.17	Fair
313SAE	N/A	N/A	N/A	N/A	82.51	Good
314SYF	51.04	Poor	79.34	Fair	81.21	Good
314SYL	98.79	Excellent	97.51	Excellent	98.83	Excellent
314SYN	71.20	Fair	89.53	Good	71.06	Fair
315APF	96.78	Excellent	20.47	Very Poor	89.26	Good
315BEF	34.18	Very Poor	57.11	Poor	74.13	Fair
315FMV	17.83	Very Poor	20.81	Very Poor	16.71	Very Poor
315GAN	38.86	Very Poor	32.52	Very Poor	37.53	Very Poor
315LCC	N/A	N/A	N/A	N/A	89.67	Good

Table A.D.2-3. Nitrate MEQ Values and Scores (CMP data 2005-2019)

Site	Nitrate Dry Season MEQ Value	Nitrate Dry Season Score	Nitrate Wet Season MEQ Value	Nitrate Wet Season Score
305BRS	26.30	Very Poor	18.90	Very Poor
305CAN	47.42	Poor	68.47	Fair
305CHI	31.62	Very Poor	68.85	Fair
305COR	75.50	Fair	87.38	Good
305FRA	97.63	Excellent	97.51	Excellent
305FUF	11.92	Very Poor	11.76	Very Poor
305LCS	33.42	Very Poor	42.78	Very Poor
305PJP	67.10	Fair	76.27	Fair
305SJA	9.43	Very Poor	17.26	Very Poor
305TSR	60.16	Poor	73.84	Fair
305WCS	14.21	Very Poor	23.09	Very Poor
305WSA	62.67	Poor	68.52	Fair
309ALG	20.72	Very Poor	37.96	Very Poor
309ASB	9.90	Very Poor	10.08	Very Poor
309BLA	6.40	Very Poor	9.39	Very Poor
309CCD	17.31	Very Poor	24.62	Very Poor
309CRR	13.02	Very Poor	40.24	Very Poor
309ESP	21.44	Very Poor	32.30	Very Poor
309GAB	17.22	Very Poor	61.04	Poor
309GRN	96.39	Excellent	78.03	Fair
309JON	31.09	Very Poor	51.93	Poor
309MER	19.27	Very Poor	20.70	Very Poor
309MOR	97.96	Excellent	95.80	Excellent
309NAD	12.58	Very Poor	30.50	Very Poor
309OLD	39.18	Very Poor	33.20	Very Poor
309QUI	10.04	Very Poor	34.19	Very Poor
309RTA	48.20	Poor	66.71	Fair
309SAC	93.50	Excellent	88.20	Good
309SAG	93.65	Excellent	85.32	Good
309SSP	92.17	Excellent	91.49	Excellent
309TEH	10.14	Very Poor	22.91	Very Poor
310CCC	81.72	Good	87.48	Good
310LBC	26.31	Very Poor	55.24	Poor
310PRE	59.97	Poor	66.98	Fair
310USG	80.02	Good	81.83	Good
310WRP	15.22	Very Poor	31.56	Very Poor
312BCC	27.16	Very Poor	41.22	Very Poor
312BCJ	13.87	Very Poor	25.75	Very Poor

Site	Nitrate Dry Season MEQ Value	Nitrate Dry Season Score	Nitrate Wet Season MEQ Value	Nitrate Wet Season Score
312GVS	6.40	Very Poor	10.27	Very Poor
312MSD	30.09	Very Poor	39.79	Very Poor
312OFC	10.21	Very Poor	13.51	Very Poor
312OFN	13.28	Very Poor	12.22	Very Poor
312ORC	10.67	Very Poor	12.95	Very Poor
312ORI	6.94	Very Poor	10.37	Very Poor
312SMA	13.19	Very Poor	15.73	Very Poor
312SMI	12.60	Very Poor	33.98	Very Poor
313SAE	N/A	N/A	82.51	Good
314SYF	60.69	Poor	62.68	Poor
314SYL	99.75	Excellent	98.59	Excellent
314SYN	80.42	Good	76.49	Fair
315APF	98.80	Excellent	93.08	Excellent
315BEF	31.77	Very Poor	47.53	Poor
315FMV	11.59	Very Poor	18.71	Very Poor
315GAN	21.83	Very Poor	36.29	Very Poor
315LCC	89.40	Good	89.67	Good

Table A.D.2-4. Percentage of Nitrate Exceedances for all samples (wet and dry season) (CMP data 2005-2019)

Site	Total Number of Samples Exceeding 10 mg/L between 2005-2019 (wet and dry season)	Total Number of Samples Taken between 2005-2019 (wet and dry season)	Percentage of all samples exceeding 10 mg/L between 2005-2019 (wet and dry season)
305BRS	31	36	86%
305CAN	30	104	29%
305CHI	62	159	39%
305COR	2	133	2%
305FRA	0	137	0%
305FUF	32	32	100%
305LCS	93	148	63%
305PJP	13	157	8%
305SJA	154	162	95%
305TSR	29	154	19%
305WCS	32	35	91%
305WSA	28	115	24%
309ALG	121	167	72%
309ASB	160	165	97%

Site	Total Number of Samples Exceeding 10 mg/L between 2005-2019 (wet and dry season)	Total Number of Samples Taken between 2005-2019 (wet and dry season)	Percentage of all samples exceeding 10 mg/L between 2005-2019 (wet and dry season)
309BLA	165	170	97%
309CCD	56	65	86%
309CRR	40	51	78%
309ESP	120	169	71%
309GAB	21	46	46%
309GRN	7	109	6%
309JON	93	171	54%
309MER	148	171	87%
309MOR	0	171	0%
309NAD	105	128	82%
309OLD	59	90	66%
309QUI	101	126	80%
309RTA	5	20	25%
309SAC	0	92	0%
309SAG	1	79	1%
309SSP	0	92	0%
309TEH	151	171	88%
310CCC	2	140	1%
310LBC	25	52	48%
310PRE	30	159	19%
310USG	6	159	4%
310WRP	80	104	77%
312BCC	37	58	64%
312BCJ	136	163	83%
312GVS	112	116	97%
312MSD	102	157	65%
312OFC	162	170	95%
312OFN	162	166	98%
312ORC	167	170	98%
312ORI	165	171	96%
312SMA	156	164	95%
312SMI	21	30	70%
313SAE	0	3	0%
314SYF	33	115	29%
314SYL	0	61	0%
314SYN	11	93	12%
315APF	1	80	1%

Site	Total Number of Samples Exceeding 10 mg/L between 2005-2019 (wet and dry season)	Total Number of Samples Taken between 2005-2019 (wet and dry season)	Percentage of all samples exceeding 10 mg/L between 2005-2019 (wet and dry season)
315BEF	77	130	59%
315FMV	150	159	94%
315GAN	125	159	79%
315LCC	0	18	0%

Table A.D.2-5. Median, Maximum, and Average Nitrate Concentrations (CMP Data 2005-2019)

Site	Median Nitrate Concentration between 2005-2019 (wet and dry season) (mg/L)	Maximum Nitrate Concentration between 2005-2019 (wet and dry season) (mg/L)	Average Nitrate Concentration between 2005-2019 (wet and dry season) (mg/L)
305BRS	23.30	38.20	22.30
305CAN	1.96	61.55	8.36
305CHI	8.98	32.50	10.96
305COR	1.57	63.42	3.41
305FRA	0.12	9.58	0.36
305FUF	31.20	37.20	29.14
305LCS	14.33	36.10	14.41
305PJP	5.87	14.60	6.01
305SJA	33.04	61.90	32.26
305TSR	2.17	53.60	7.06
305WCS	20.50	42.60	21.45
305WSA	2.71	49.50	6.79
309ALG	18.20	66.00	19.59
309ASB	44.90	109.00	46.81
309BLA	67.25	130.00	63.28
309CCD	21.40	109.00	24.70
309CRR	21.30	75.90	26.04
309ESP	21.60	103.00	27.45
309GAB	7.75	89.20	14.26
309GRN	0.64	42.50	2.51
309JON	11.40	69.10	14.42
309MER	23.60	85.00	26.70
309MOR	0.15	6.27	0.49
309NAD	21.00	208.00	28.46
309OLD	13.70	54.90	17.05

Site	Median Nitrate Concentration between 2005-2019 (wet and dry season) (mg/L)	Maximum Nitrate Concentration between 2005-2019 (wet and dry season) (mg/L)	Average Nitrate Concentration between 2005-2019 (wet and dry season) (mg/L)
309QUI	24.90	96.90	28.14
309RTA	6.06	85.40	11.77
309SAC	0.68	8.39	1.56
309SAG	0.70	10.50	1.82
309SSP	0.82	8.08	1.31
309TEH	32.00	107.00	32.54
310CCC	1.75	68.20	2.65
310LBC	9.84	38.60	13.50
310PRE	7.95	40.30	8.96
310USG	2.92	12.20	3.61
310WRP	25.85	79.80	28.00
312BCC	14.10	112.00	18.29
312BCJ	25.60	158.00	30.85
312GVS	63.65	260.00	60.73
312MSD	13.45	105.00	17.19
312OFC	39.05	102.00	39.37
312OFN	28.85	78.00	31.14
312ORC	31.10	78.10	32.41
312ORI	62.50	159.00	58.77
312SMA	27.40	96.10	28.86
312SMI	22.45	96.40	27.68
313SAE	2.83	5.99	3.29
314SYF	5.08	30.70	8.41
314SYL	0.01	2.17	0.16
314SYN	1.36	72.00	4.13
315APF	0.10	10.60	0.69
315BEF	12.20	81.50	13.76
315FMV	24.70	322.00	26.98
315GAN	14.80	40.00	14.82
315LCC	2.07	3.07	1.73

Tables related to Pesticides and Toxicity in Surface Water

Table A.D.2-6. CMP Sites with Poor or Very Poor MEQ Scores for Organophosphate Pesticides Over Time (CMP data 2005-2019)

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
CMP Site	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
305BRS	N/A	N/A				
305CAN	N/A	N/A	N/A		N/A	
305CHI	N/A	N/A				
305COR	N/A	N/A	N/A			
305FRA	N/A	N/A	N/A			
305FUF	N/A	N/A				
305LCS	N/A	N/A				
305PJP	N/A	N/A				
305SJA	N/A	N/A				
305TSR	N/A	N/A				
305WCS	N/A	N/A				
305WSA	N/A	N/A	N/A		N/A	
309ALG	Diazinon	Chlorpyrifos, Diazinon, Malathion		Malathion		
309ASB	Diazinon				Malathion	
309BLA				Malathion		
309CCD	N/A	N/A	Chlorpyrifos			
309CRR	N/A	N/A	N/A	N/A	N/A	N/A
309ESP	Diazinon, Malathion	Chlorpyrifos, Diazinon		Diazinon		
309GAB	N/A	N/A	N/A	Malathion	N/A	

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
CMP Site	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**	**Dry Season**	**Wet Season**
309GRN		N/A	N/A			N/A
309JON	Diazinon	Chlorpyrifos, Diazinon		Chlorpyrifos		
309MER	Diazinon			Diazinon, Malathion	Malathion	Malathion
309MOR						
309NAD	Chlorpyrifos, Diazinon, Malathion		N/A	Diazinon	Diazinon, Malathion	Diazinon
309OLD						
309QUI	Chlorpyrifos, Diazinon	Chlorpyrifos, Diazinon				
309RTA	N/A	N/A	N/A		Malathion	
309SAC			N/A	N/A		N/A
309SAG		N/A	N/A	N/A		N/A
309SSP		Diazinon,	N/A	N/A		N/A
309TEH	Diazinon	Chlorpyrifos, Diazinon, Malathion			Malathion	Malathion
310CCC	N/A	N/A				
310LBC	N/A	N/A	N/A	N/A	N/A	N/A
310PRE		N/A				
310USG		N/A				Malathion
310WRP	N/A	N/A			N/A	
312BCC	N/A	Chlorpyrifos,	N/A	N/A	N/A	Malathion
312BCJ	Chlorpyrifos, Malathion	Chlorpyrifos,				Malathion

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
CMP Site	Dry Season	Wet Season	Dry Season	Wet Season	Dry Season	Wet Season
312GVS	Chlorpyrifos, Malathion	Malathion			N/A	Chlorpyrifos, Malathion
312MSD	Chlorpyrifos, Malathion	Malathion			Malathion,	Chlorpyrifos, Malathion
312OFC	Chlorpyrifos, Malathion	Chlorpyrifos, Malathion	Malathion	Malathion	Malathion	
312OFN	Malathion				Malathion	Malathion
312ORC	Chlorpyrifos, Diazinon, Malathion	Chlorpyrifos	Malathion	Chlorpyrifos, Malathion	Malathion	Malathion
312ORI	Chlorpyrifos, Malathion	Malathion	Malathion		Malathion	Malathion
312SMA	Chlorpyrifos, Diazinon, Malathion	Chlorpyrifos			Malathion	Malathion
312SMI		N/A	N/A	N/A	N/A	
313SAE	N/A	N/A	N/A	N/A	N/A	N/A
314SYF		N/A				N/A
314SYL	N/A	N/A				N/A
314SYN	N/A	N/A			N/A	
315APF		N/A	N/A	N/A		
315BEF		N/A				
315FMV		N/A				
315GAN		N/A				
315LCC	N/A	N/A	N/A	N/A		

N/A indicates that the site was not analyzed for organophosphate pesticides during the time period shown. Blank cells indicate that the site was analyzed for organophosphate pesticides during the time period shown and received an MEQ score of fair, good, or excellent.

Table A.D.2-7. CMP Sites with Poor or Very Poor MEQ Scores for Pyrethroid Pesticides and Chlorpyrifos in Sediment Over Time (CMP data 2005-2019)

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
CMP Site	**Dry Season**	**Wet Season**	**Dry Season***	**Wet Season**	**Dry Season**	**Wet Season**
305BRS	N/A	N/A	N/A			
305CAN		N/A	N/A			
305CHI		N/A	N/A			
305COR		N/A	N/A	Bifenthrin, Chlorpyrifos, Cyfluthrin, Cyhalothrin-lambda, Cypermethrin, Esfenvalerate, Fenpropathrin, Fenvalerate, Permethrin		
305FRA		N/A	N/A			
305FUF	N/A	N/A	N/A			
305LCS		N/A	N/A			
305PJP		N/A	N/A	Bifenthrin, Chlorpyrifos, Cyfluthrin, Cyhalothrin-lambda, Cypermethrin, Esfenvalerate, Fenpropathrin, Fenvalerate, Permethrin		

	Agricultural Order 1.0		**Agricultural Order 2.0**		**Agricultural Order 3.0**	
CMP Site	**Dry Season**	**Wet Season**	**Dry Season***	**Wet Season**	**Dry Season**	**Wet Season**
305SJA	Cyhalothrin-lambda	N/A	N/A			
305TSR		N/A	N/A			
305WCS	N/A	N/A	N/A			
305WSA		N/A	N/A	N/A	N/A	Bifenthrin
309ALG	Bifenthrin, Chlorpyrifos, Cyhalothrin-lambda, Cypermethrin	N/A	N/A	Bifenthrin	Bifenthrin	Bifenthrin, Cyhalothrin-lambda
309ASB		N/A	N/A		Bifenthrin	
309BLA		N/A	N/A			
309CCD	N/A	N/A	N/A			
309CRR		N/A	N/A	N/A	N/A	N/A
309ESP	Bifenthrin, Cyhalothrin-lambda	N/A	N/A			
309GAB	N/A	N/A	N/A	N/A	N/A	
309GRN		N/A	N/A	N/A		
309JON	Bifenthrin, Chlorpyrifos, Cyhalothrin-lambda, Cypermethrin, Fenpropathrin	N/A	N/A		Bifenthrin	Bifenthrin, Cyhalothrin-lambda
309MER	Bifenthrin	N/A	N/A		Bifenthrin	Bifenthrin
309MOR		N/A	N/A			
309NAD	Bifenthrin	N/A	N/A	N/A		Bifenthrin, Cypermethrin

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
CMP Site	**Dry Season**	**Wet Season**	**Dry Season***	**Wet Season**	**Dry Season**	**Wet Season**
309OLD	Bifenthrin, Cyhalothrin-lambda	N/A	N/A	Bifenthrin	Bifenthrin	Bifenthrin, Cyhalothrin-lambda
309QUI	Chlorpyrifos, Cyhalothrin-lambda, Cypermethrin, Esfenvalerate	N/A	N/A			N/A
309RTA	N/A	N/A	N/A	N/A	Bifenthrin, Chlorpyrifos, Cyfluthrin, Cyhalothrin-lambda, Cypermethrin, Fenpropathrin, Permethrin	Bifenthrin, Cyhalothrin-lambda, Permethrin
309SAC		N/A	N/A	N/A	N/A	
309SAG		N/A	N/A	N/A		N/A
309SSP		N/A	N/A	N/A	Chlorpyrifos,	Chlorpyrifos
309TEH	Bifenthrin	N/A	N/A			Bifenthrin
310CCC		N/A		N/A		Chlorpyrifos
310LBC	N/A	N/A	N/A	N/A	N/A	
310PRE		N/A	Cyhalothrin-lambda	N/A		
310USG		N/A		N/A		Chlorpyrifos
310WRP		N/A		N/A	N/A	
312BCC	Bifenthrin, Fenpropathrin	N/A	N/A	N/A	N/A	
312BCJ	Bifenthrin, Chlorpyrifos, Cyhalothrin-	N/A	Bifenthrin, Cypermethrin	N/A		Bifenthrin, Chlorpyrifos

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
CMP Site	**Dry Season**	**Wet Season**	**Dry Season***	**Wet Season**	**Dry Season**	**Wet Season**
	lambda, Cypermethrin, Fenpropathrin, Permethrin					
312GVS	Cyhalothrin-lambda	N/A		N/A	N/A	N/A
312MSD	Bifenthrin, Permethrin	N/A	Bifenthrin	N/A	Bifenthrin, Cyhalothrin-lambda, Permethrin	Bifenthrin, Chlorpyrifos, Cyhalothrin-lambda
312OFC	Bifenthrin, Chlorpyrifos, Cyhalothrin-lambda	N/A	Bifenthrin, Cyhalothrin-lambda, Fenpropathrin	N/A	Bifenthrin, Cyhalothrin-lambda, Fenpropathrin	Bifenthrin
312OFN	Bifenthrin, Chlorpyrifos, Fenpropathrin	N/A		N/A	Bifenthrin	Bifenthrin
312ORC	Chlorpyrifos	N/A	Bifenthrin, Chlorpyrifos, Cyfluthrin, Cyhalothrin-lambda, Cypermethrin, Fenpropathrin Fenvalerate, Permethrin	N/A		Chlorpyrifos
312ORI		N/A		N/A		
312SMA		N/A		N/A		Chlorpyrifos
312SMI	N/A	N/A	N/A	N/A	N/A	N/A
313SAE	N/A	N/A	N/A	N/A	N/A	N/A
314SYF		N/A		N/A		

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
CMP Site	**Dry Season**	**Wet Season**	**Dry Season***	**Wet Season**	**Dry Season**	**Wet Season**
314SYL		N/A	N/A	N/A		N/A
314SYN		N/A		N/A	N/A	Chlorpyrifos
315APF		N/A	N/A	N/A		
315BEF	Chlorpyrifos,	N/A		N/A		
315FMV		N/A	Bifenthrin, Cyhalothrin-lambda,	N/A		Chlorpyrifos
315GAN		N/A		N/A		
315LCC	N/A	N/A	N/A	N/A	Bifenthrin, Chlorpyrifos, Cyfluthrin, Cyhalothrin-lambda, Cypermethrin, Esfenvalerate, Fenpropathrin	Chlorpyrifos

N/A indicates that the site was not analyzed for pyrethroid pesticides or chlorpyrifos in sediment during the time period shown. Blank cells indicate that the site was analyzed for pyrethroid pesticides or chlorpyrifos in sediment during the time period shown and received an MEQ score of fair, good, or excellent.

*Results for esphenvalerate taken during the dry season during Agricultural Order 2.0 were j-flagged due to holding time violations. Due to the unknown quality of the samples the results are inconclusive regarding whether sites had elevated levels of esphenvalerate during this time period.

Table A.D.2-8. CMP Sites with Poor or Very Poor MEQ Scores for Neonicotinoid Pesticides Over Time (CMP data 2017-2019)

	Agricultural Order 3.0	
CMP Site	**Dry Season**	**Wet Season**
305BRS	Imidacloprid	Imidacloprid
305CAN	N/A	Imidacloprid
305CHI	Imidacloprid	
305COR		
305FRA		
305FUF	Imidacloprid	Imidacloprid
305LCS		
305PJP		Imidacloprid
305SJA		Imidacloprid
305TSR		Imidacloprid
305WCS		Imidacloprid
305WSA	N/A	Clothianidin, Imidacloprid
309ALG	Clothianidin, Imidacloprid, Thiamethoxam	Clothianidin, Imidacloprid, Thiamethoxam
309ASB		Imidacloprid, Thiamethoxam
309BLA		Imidacloprid
309CCD	Imidacloprid, Thiamethoxam	Clothianidin, Imidacloprid, Thiamethoxam
309CRR	N/A	N/A
309ESP		Imidacloprid
309GAB	N/A	Imidacloprid
309GRN		N/A
309JON	Clothianidin, Imidacloprid, Thiamethoxam	Clothianidin, Imidacloprid
309MER	Clothianidin	Clothianidin, Imidacloprid, Thiamethoxam
309MOR		Imidacloprid
309NAD		Clothianidin, Imidacloprid, Thiamethoxam
309OLD	Imidacloprid	Imidacloprid
309QUI	Thiamethoxam	Clothianidin, Imidacloprid, Thiamethoxam
309RTA	Clothianidin, Imidacloprid	Clothianidin, Imidacloprid

	Agricultural Order 3.0	
CMP Site	**Dry Season**	**Wet Season**
309SAC		N/A
309SAG		N/A
309SSP		N/A
309TEH	Clothianidin	Imidacloprid
310CCC	Imidacloprid	
310LBC	N/A	N/A
310PRE		
310USG		Imidacloprid
310WRP	N/A	Imidacloprid
312BCC	N/A	Imidacloprid
312BCJ		Imidacloprid
312GVS	N/A	Imidacloprid
312MSD	Thiamethoxam	Imidacloprid
312OFC		Imidacloprid
312OFN		Imidacloprid, Thiamethoxam
312ORC	Clothianidin, Imidacloprid	Imidacloprid
312ORI	Imidacloprid	Imidacloprid
312SMA	Clothianidin, Imidacloprid	Imidacloprid
312SMI	N/A	
313SAE	N/A	N/A
314SYF		N/A
314SYL		N/A
314SYN	N/A	Imidacloprid
315APF		
315BEF		
315FMV		Imidacloprid
315GAN		Imidacloprid
315LCC		

N/A indicates that the site was not analyzed for neonicotinoid pesticides during the time period shown. Blank cells indicate that the site was analyzed for neonicotinoid pesticides during the time period shown and received an MEQ score of fair, good, or excellent. Sites were not analyzed for neonicotinoid pesticides until Agricultural Order 3.0.

Table A.D.2-9. Imidacloprid Exceedance and Detection Frequency (CMP Data 2017-2019)

Site	Number of Samples Exceeding USEPA Benchmark 0.01 µg/L	Number of Samples with Imidacloprid Detections	Number of Samples	Percentage of samples exceeding 0.01 µg/L	Percentage of samples detecting Imidacloprid
305BRS	3	3	4	75%	75%
305CAN	2	2	2	100%	100%
305CHI	1	1	4	25%	25%
305COR	0	0	3	0%	0%
305FRA	0	0	4	0%	0%
305FUF	3	3	4	75%	75%
305LCS	0	0	4	0%	0%
305PJP	2	2	4	50%	50%
305SJA	1	1	4	25%	25%
305TSR	2	2	4	50%	50%
305WCS	2	2	4	50%	50%
305WSA	1	1	2	50%	50%
309ALG	3	3	4	75%	75%
309ASB	2	2	4	50%	50%
309BLA	2	2	4	50%	50%
309CCD	2	2	3	67%	67%
309ESP	2	2	4	50%	50%
309GAB	1	1	1	100%	100%
309GRN	0	0	2	0%	0%
309JON	4	4	4	100%	100%
309MER	1	1	4	25%	25%
309MOR	1	1	4	25%	25%
309NAD	1	1	2	50%	50%
309OLD	2	2	4	50%	50%
309QUI	1	1	2	50%	50%
309RTA	2	2	2	100%	100%
309SAC	0	0	1	0%	0%
309SAG	0	0	2	0%	0%
309SSP	0	0	2	0%	0%
309TEH	2	2	4	50%	50%
310CCC	1	1	4	25%	25%
310PRE	0	0	4	0%	0%
310USG	1	1	4	25%	25%
310WRP	1	1	1	100%	100%

Site	Number of Samples Exceeding USEPA Benchmark 0.01 µg/L	Number of Samples with Imidacloprid Detections	Number of Samples	Percentage of samples exceeding 0.01 µg/L	Percentage of samples detecting Imidacloprid
312BCC	1	1	1	100%	100%
312BCJ	2	2	3	67%	67%
312GVS	1	1	1	100%	100%
312MSD	2	2	4	50%	50%
312OFC	1	1	4	25%	25%
312OFN	2	2	4	50%	50%
312ORC	4	4	4	100%	100%
312ORI	4	4	4	100%	100%
312SMA	4	4	4	100%	100%
312SMI	0	0	1	0%	0%
314SYF	0	0	2	0%	0%
314SYL	0	0	1	0%	0%
314SYN	1	1	1	100%	100%
315APF	0	0	2	0%	0%
315BEF	0	0	3	0%	0%
315FMV	2	2	4	50%	50%
315GAN	1	1	4	25%	25%
315LCC	0	0	3	0%	0%

Table A.D.2-10. Bifenthrin in Sediment Detection and Exceedance Frequency (CMP Data 2010-2019)

Site	Total Number of Samples Exceeding 0.52 µg/g o.c.	Total Number of Samples with Bifenthrin Detections	Total Number of Samples	Percentage of all samples exceeding 0.52 µg/g o.c.	Percentage of all Samples with Bifenthrin Detections
305BRS	0	5	5	0%	100%
305CAN	0	0	4	0%	0%
305CHI	0	0	6	0%	0%
305COR	0	1	6	0%	17%
305FRA	0	0	6	0%	0%
305FUF	1	5	5	20%	100%
305LCS	0	4	6	0%	67%
305PJP	0	3	6	0%	50%
305SJA	0	0	6	0%	0%
305TSR	0	0	6	0%	0%
305WCS	0	3	5	0%	60%
305WSA	1	3	3	33%	100%
309ALG	4	6	6	67%	100%
309ASB	1	5	5	20%	100%
309BLA	0	5	6	0%	83%
309CCD	0	3	5	0%	60%
309CRR	0	0	1	0%	0%
309ESP	1	6	6	17%	100%
309GAB	0	1	1	0%	100%
309GRN	0	0	5	0%	0%
309JON	3	4	4	75%	100%
309MER	3	5	6	50%	83%
309MOR	0	3	6	0%	50%
309NAD	2	4	4	50%	100%
309OLD	5	6	6	83%	100%
309QUI	0	1	3	0%	33%
309RTA	2	2	3	67%	67%
309SAC	0	0	2	0%	0%
309SAG	0	0	3	0%	0%
309SSP	0	1	5	0%	20%
309TEH	3	6	6	50%	100%
310CCC	0	0	6	0%	0%
310LBC	0	1	2	0%	50%

Site	Total Number of Samples Exceeding 0.52 µg/g o.c.	Total Number of Samples with Bifenthrin Detections	Total Number of Samples	Percentage of all samples exceeding 0.52 µg/g o.c.	Percentage of all Samples with Bifenthrin Detections
310PRE	0	2	6	0%	33%
310USG	0	2	6	0%	33%
310WRP	0	0	3	0%	0%
312BCC	1	2	2	50%	100%
312BCJ	3	5	5	60%	100%
312GVS	0	2	2	0%	100%
312MSD	4	6	6	67%	100%
312OFC	6	6	6	100%	100%
312OFN	3	6	6	50%	100%
312ORC	0	2	6	0%	33%
312ORI	0	4	6	0%	67%
312SMA	0	0	6	0%	0%
314SYF	0	2	4	0%	50%
314SYL	0	0	2	0%	0%
314SYN	0	0	3	0%	0%
315APF	0	0	4	0%	0%
315BEF	0	0	5	0%	0%
315FMV	1	2	6	17%	33%
315GAN	0	0	6	0%	0%
315LCC	0	0	3	0%	0%

Tables Related to Turbidity in Surface Water

Table A.D.2-11. Turbidity MEQ Scores over Time (Dry Season) (CMP Data 2005-2019)

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**Site**	**MEQ Value**	**MEQ Score**
305BRS	N/A	N/A	44.77	Very Poor	61.86	Poor
305CAN	72.26	Fair	93.21	Excellent	83.84	Good
305CHI	32.26	Very Poor	71.40	Fair	57.89	Poor
305COR	39.60	Very Poor	75.42	Fair	63.50	Poor
305FRA	4.87	Very Poor	41.27	Very Poor	8.79	Very Poor
305FUF	N/A	N/A	9.29	Very Poor	11.34	Very Poor
305LCS	82.35	Good	92.04	Excellent	85.55	Good
305PJP	68.74	Fair	79.95	Fair	80.59	Good
305SJA	70.63	Fair	73.49	Fair	75.68	Fair
305TSR	18.95	Very Poor	38.61	Very Poor	67.98	Fair
305WCS	N/A	N/A	69.60	Fair	88.87	Good
305WSA	36.30	Very Poor	87.23	Good	51.61	Poor
309ALG	20.41	Very Poor	21.54	Very Poor	14.30	Very Poor
309ASB	39.70	Very Poor	33.38	Very Poor	71.70	Fair
309BLA	30.46	Very Poor	31.37	Very Poor	71.48	Fair
309CCD	N/A	N/A	8.04	Very Poor	33.06	Very Poor
309CRR	0.98	Very Poor	2.25	Very Poor	33.66	Very Poor
309ESP	11.58	Very Poor	35.32	Very Poor	9.37	Very Poor
309GAB	3.52	Very Poor	4.65	Very Poor	20.66	Very Poor
309GRN	24.22	Very Poor	59.16	Poor	73.73	Fair
309JON	38.53	Very Poor	33.45	Very Poor	46.95	Poor
309MER	17.36	Very Poor	11.69	Very Poor	10.91	Very Poor
309MOR	63.40	Poor	37.77	Very Poor	67.30	Fair
309NAD	6.13	Very Poor	16.13	Very Poor	17.87	Very Poor

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**Site**	**MEQ Value**	**MEQ Score**
309OLD	14.07	Very Poor	24.38	Very Poor	8.87	Very Poor
309QUI	6.17	Very Poor	33.26	Very Poor	21.44	Very Poor
309RTA	N/A	N/A	0.42	Very Poor	13.89	Very Poor
309SAC	19.36	Very Poor	14.49	Very Poor	32.31	Very Poor
309SAG	14.11	Very Poor	18.09	Very Poor	50.04	Poor
309SSP	39.18	Very Poor	24.87	Very Poor	20.39	Very Poor
309TEH	6.51	Very Poor	19.57	Very Poor	9.57	Very Poor
310CCC	96.20	Excellent	88.13	Good	91.81	Excellent
310LBC	98.90	Excellent	N/A	N/A	45.58	Poor
310PRE	74.32	Fair	75.49	Fair	79.97	Fair
310USG	93.42	Excellent	87.60	Good	86.75	Good
310WRP	96.60	Excellent	93.76	Excellent	85.85	Good
312BCC	28.78	Very Poor	46.18	Poor	47.72	Poor
312BCJ	14.59	Very Poor	42.31	Very Poor	56.05	Poor
312GVS	55.98	Poor	40.63	Very Poor	88.75	Good
312MSD	30.92	Very Poor	43.25	Very Poor	44.47	Very Poor
312OFC	11.63	Very Poor	59.88	Poor	31.17	Very Poor
312OFN	45.94	Poor	76.67	Fair	77.58	Fair
312ORC	4.80	Very Poor	13.94	Very Poor	22.13	Very Poor
312ORI	59.64	Poor	54.51	Poor	58.22	Poor
312SMA	11.58	Very Poor	24.44	Very Poor	41.72	Very Poor
312SMI	95.51	Excellent	N/A	N/A	N/A	N/A
313SAE	N/A	N/A	N/A	N/A	N/A	N/A
314SYF	83.87	Good	N/A	N/A	82.29	Good
314SYL	97.17	Excellent	84.04	Good	92.88	Excellent
314SYN	95.48	Excellent	98.24	Excellent	74.70	Fair
315APF	96.82	Excellent	81.36	Good	89.66	Good

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**Site**	**MEQ Value**	**MEQ Score**
315BEF	95.80	Excellent	90.48	Excellent	90.98	Excellent
315FMV	71.64	Fair	85.66	Good	88.04	Good
315GAN	57.61	Poor	88.05	Good	75.75	Fair
315LCC	N/A	N/A	N/A	N/A	88.23	Good

Table A.D.2-12. Turbidity MEQ Scores over Time (Wet Season) (CMP Data 2005-2019)

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**Site**	**MEQ Value**	**MEQ Score**
305BRS	N/A	N/A	34.73	Very Poor	47.39	Poor
305CAN	52.72	Poor	53.38	Poor	68.18	Fair
305CHI	28.35	Very Poor	46.40	Poor	41.46	Very Poor
305COR	40.29	Very Poor	37.99	Very Poor	48.40	Poor
305FRA	11.61	Very Poor	34.89	Very Poor	20.12	Very Poor
305FUF	N/A	N/A	40.06	Very Poor	21.86	Very Poor
305LCS	65.92	Fair	69.76	Fair	44.84	Very Poor
305PJP	36.83	Very Poor	39.40	Very Poor	43.01	Very Poor
305SJA	58.64	Poor	42.85	Very Poor	62.03	Poor
305TSR	22.43	Very Poor	35.75	Very Poor	57.41	Poor
305WCS	N/A	N/A	43.59	Very Poor	54.33	Poor
305WSA	25.47	Very Poor	27.76	Very Poor	42.04	Very Poor
309ALG	4.55	Very Poor	4.25	Very Poor	5.30	Very Poor
309ASB	15.73	Very Poor	25.84	Very Poor	40.92	Very Poor
309BLA	16.35	Very Poor	25.96	Very Poor	56.62	Poor
309CCD	N/A	N/A	6.93	Very Poor	10.57	Very Poor
309CRR	1.72	Very Poor	0.95	Very Poor	1.46	Very Poor
309ESP	7.28	Very Poor	10.57	Very Poor	7.45	Very Poor

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**Site**	**MEQ Value**	**MEQ Score**
309GAB	2.69	Very Poor	3.10	Very Poor	3.82	Very Poor
309GRN	25.13	Very Poor	37.95	Very Poor	48.60	Poor
309JON	6.32	Very Poor	13.36	Very Poor	11.95	Very Poor
309MER	3.96	Very Poor	6.07	Very Poor	6.94	Very Poor
309MOR	30.18	Very Poor	47.74	Poor	67.09	Fair
309NAD	6.11	Very Poor	20.32	Very Poor	5.73	Very Poor
309OLD	4.76	Very Poor	14.70	Very Poor	11.75	Very Poor
309QUI	1.24	Very Poor	2.99	Very Poor	2.74	Very Poor
309RTA	N/A	N/A	0.83	Very Poor	8.83	Very Poor
309SAC	20.40	Very Poor	20.26	Very Poor	33.27	Very Poor
309SAG	24.35	Very Poor	25.51	Very Poor	35.43	Very Poor
309SSP	14.40	Very Poor	57.02	Poor	15.84	Very Poor
309TEH	2.95	Very Poor	2.81	Very Poor	4.07	Very Poor
310CCC	74.76	Fair	73.01	Fair	84.45	Good
310LBC	72.81	Fair	36.50	Very Poor	88.90	Good
310PRE	47.71	Poor	71.02	Fair	68.62	Fair
310USG	44.38	Very Poor	58.14	Poor	54.16	Poor
310WRP	52.35	Poor	49.45	Poor	63.64	Poor
312BCC	9.43	Very Poor	6.36	Very Poor	8.71	Very Poor
312BCJ	5.88	Very Poor	20.07	Very Poor	5.47	Very Poor
312GVS	24.27	Very Poor	23.31	Very Poor	1.03	Very Poor
312MSD	12.42	Very Poor	17.94	Very Poor	10.66	Very Poor
312OFC	2.91	Very Poor	25.15	Very Poor	17.69	Very Poor
312OFN	25.36	Very Poor	47.95	Poor	50.44	Poor
312ORC	3.48	Very Poor	14.62	Very Poor	7.29	Very Poor
312ORI	20.23	Very Poor	29.79	Very Poor	15.63	Very Poor
312SMA	2.64	Very Poor	12.17	Very Poor	14.41	Very Poor

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**Site**	**MEQ Value**	**MEQ Score**
312SMI	14.48	Very Poor	25.37	Very Poor	0.05	Very Poor
313SAE	N/A	N/A	N/A	N/A	0.93	Very Poor
314SYF	42.12	Very Poor	54.29	Poor	28.34	Very Poor
314SYL	38.77	Very Poor	42.89	Very Poor	33.04	Very Poor
314SYN	37.22	Very Poor	53.30	Poor	61.84	Poor
315APF	52.02	Poor	36.50	Very Poor	63.91	Poor
315BEF	33.72	Very Poor	42.94	Very Poor	64.54	Poor
315FMV	47.36	Poor	71.01	Fair	90.27	Excellent
315GAN	39.51	Very Poor	55.02	Poor	66.55	Fair
315LCC	N/A	N/A	N/A	N/A	85.67	Good

Table A.D.2-13. Turbidity MEQ Values and Scores (CMP Data 2005-2019)

Site	Turbidity Dry Season MEQ Value	Turbidity Dry Season MEQ Score	Turbidity Wet Season MEQ Value	Turbidity Wet Season MEQ Score
305BRS	55.23	Poor	40.25	Very Poor
305CAN	78.66	Fair	55.50	Poor
305CHI	47.46	Poor	38.30	Very Poor
305COR	50.57	Poor	40.20	Very Poor
305FRA	11.08	Very Poor	19.10	Very Poor
305FUF	10.67	Very Poor	25.78	Very Poor
305LCS	85.69	Good	60.51	Poor
305PJP	74.39	Fair	38.49	Very Poor
305SJA	72.96	Fair	51.80	Poor
305TSR	29.07	Very Poor	32.54	Very Poor
305WCS	81.86	Good	50.56	Poor
305WSA	43.10	Very Poor	27.57	Very Poor
309ALG	19.10	Very Poor	4.51	Very Poor
309ASB	37.81	Very Poor	22.56	Very Poor
309BLA	34.13	Very Poor	25.01	Very Poor
309CCD	14.83	Very Poor	7.59	Very Poor
309CRR	4.66	Very Poor	1.59	Very Poor
309ESP	20.59	Very Poor	8.33	Very Poor
309GAB	7.48	Very Poor	2.87	Very Poor
309GRN	41.39	Very Poor	29.63	Very Poor
309JON	35.79	Very Poor	9.66	Very Poor
309MER	13.66	Very Poor	4.84	Very Poor
309MOR	46.77	Poor	39.28	Very Poor
309NAD	9.63	Very Poor	9.14	Very Poor
309OLD	18.27	Very Poor	10.02	Very Poor
309QUI	14.55	Very Poor	1.61	Very Poor
309RTA	1.22	Very Poor	5.31	Very Poor
309SAC	19.28	Very Poor	21.40	Very Poor
309SAG	18.83	Very Poor	25.47	Very Poor
309SSP	31.38	Very Poor	16.55	Very Poor
309TEH	11.73	Very Poor	3.01	Very Poor
310CCC	92.85	Excellent	75.62	Fair
310LBC	88.68	Good	60.85	Poor
310PRE	75.79	Fair	58.86	Poor
310USG	89.92	Good	49.57	Poor
310WRP	94.00	Excellent	52.48	Poor
312BCC	31.87	Very Poor	8.49	Very Poor

Site	Turbidity Dry Season MEQ Value	Turbidity Dry Season MEQ Score	Turbidity Wet Season MEQ Value	Turbidity Wet Season MEQ Score
312BCJ	28.84	Very Poor	10.13	Very Poor
312GVS	50.17	Poor	21.99	Very Poor
312MSD	36.45	Very Poor	13.87	Very Poor
312OFC	27.44	Very Poor	12.72	Very Poor
312OFN	57.58	Poor	33.38	Very Poor
312ORC	10.69	Very Poor	8.05	Very Poor
312ORI	57.47	Poor	21.97	Very Poor
312SMA	20.97	Very Poor	7.82	Very Poor
312SMI	96.73	Excellent	12.54	Very Poor
313SAE	N/A	N/A	1.53	Very Poor
314SYF	83.83	Good	41.66	Very Poor
314SYL	97.17	Excellent	38.62	Very Poor
314SYN	89.20	Good	41.26	Very Poor
315APF	95.07	Excellent	52.41	Poor
315BEF	93.64	Excellent	37.27	Very Poor
315FMV	78.76	Fair	58.47	Poor
315GAN	67.77	Fair	45.96	Poor
315LCC	88.23	Good	85.67	Good

Table A.D.2-14. Percentage of Turbidity Samples Exceeding 25 NTU (wet and dry season) (CMP Data 2005-2019)

Site	Number of Samples Exceeding 25 NTU between 2005-2019 (wet and dry season)	Number of Samples Taken between 2005-2019 (wet and dry season)	Percentage of all samples exceeding 25 NTU between 2005-2019 (wet and dry season)
305BRS	14	36	39%
305CAN	24	118	20%
305CHI	87	175	50%
305COR	56	146	38%
305FRA	128	150	85%
305FUF	28	33	85%
305LCS	18	160	11%
305PJP	51	172	30%
305SJA	34	176	19%
305TSR	98	169	58%
305WCS	6	35	17%
305WSA	73	127	57%
309ALG	146	164	89%
309ASB	103	163	63%
309BLA	109	169	64%
309CCD	55	65	85%
309CRR	45	47	96%
309ESP	134	167	80%
309GAB	44	45	98%
309GRN	51	110	46%
309JON	120	168	71%
309MER	157	168	93%
309MOR	67	168	40%
309NAD	110	124	89%
309OLD	100	120	83%
309QUI	111	123	90%
309RTA	19	20	95%
309SAC	70	93	75%
309SAG	56	77	73%
309SSP	72	93	77%
309TEH	161	168	96%
310CCC	10	140	7%
310LBC	6	51	12%
310PRE	28	162	17%
310USG	9	160	6%

Site	Number of Samples Exceeding 25 NTU between 2005-2019 (wet and dry season)	Number of Samples Taken between 2005-2019 (wet and dry season)	Percentage of all samples exceeding 25 NTU between 2005-2019 (wet and dry season)
310WRP	12	108	11%
312BCC	42	57	74%
312BCJ	123	163	75%
312GVS	48	117	41%
312MSD	110	159	69%
312OFC	120	172	70%
312OFN	63	169	37%
312ORC	150	170	88%
312ORI	79	172	46%
312SMA	138	163	85%
312SMI	16	29	55%
313SAE	3	3	100%
314SYF	18	115	16%
314SYL	10	60	17%
314SYN	14	94	15%
315APF	7	83	8%
315BEF	14	130	11%
315FMV	20	160	13%
315GAN	17	161	11%
315LCC	0	18	0%

Table A.D.2-15. Median, Maximum and Minimum Turbidity Values (NTU) (CMP Data 2005-2019)

Site	Median Turbidity Value between 2005-2019 (wet and dry season) (NTU)	Maximum Turbidity Value between 2005-2019 (wet and dry season) (NTU)	Minimum Turbidity Value between 2005-2019 (wet and dry season) (NTU)
305BRS	18.45	508.00	1.02
305CAN	5.96	601.00	0.00
305CHI	23.90	1000.00	0.00
305COR	19.85	2360.00	0.00
305FRA	112.50	789.00	2.98
305FUF	58.60	315.00	7.72
305LCS	3.79	705.00	0.00
305PJP	16.00	1000.00	0.00
305SJA	13.85	712.00	0.00
305TSR	34.80	2878.00	0.90
305WCS	3.90	253.00	1.34
305WSA	36.50	1200.00	1.70
309ALG	121.25	5492.00	0.00
309ASB	35.60	3000.00	0.10
309BLA	35.70	3000.00	0.10
309CCD	113.00	3000.00	5.00
309CRR	1983.00	5000.00	13.80
309ESP	112.00	3000.00	0.10
309GAB	406.00	3000.00	2.00
309GRN	23.20	5000.00	0.00
309JON	52.40	4620.00	0.00
309MER	106.55	3476.00	4.10
309MOR	16.65	3000.00	0.00
309NAD	98.70	3000.00	10.00
309OLD	88.70	3000.00	0.10
309QUI	189.00	5000.00	0.00
309RTA	357.00	8023.00	21.30
309SAC	52.40	3000.00	0.54
309SAG	50.00	3000.00	0.10
309SSP	46.60	2584.00	0.10
309TEH	116.00	3260.00	5.90
310CCC	2.26	226.30	0.10
310LBC	2.00	1000.00	0.00
310PRE	10.15	251.00	0.10
310USG	2.78	3000.00	0.10

Site	Median Turbidity Value between 2005-2019 (wet and dry season) (NTU)	Maximum Turbidity Value between 2005-2019 (wet and dry season) (NTU)	Minimum Turbidity Value between 2005-2019 (wet and dry season) (NTU)
310WRP	2.57	936.00	0.10
312BCC	141.60	6032.00	3.40
312BCJ	58.60	4184.00	1.97
312GVS	14.50	3000.00	0.10
312MSD	45.20	1206.00	0.10
312OFC	61.95	3000.00	0.10
312OFN	18.60	3000.00	0.10
312ORC	183.05	3000.00	1.27
312ORI	21.05	3000.00	0.10
312SMA	111.20	3000.00	0.97
312SMI	38.30	28400.00	2.00
313SAE	142.00	3696.00	43.90
314SYF	7.41	2092.00	0.10
314SYL	3.50	3000.00	0.00
314SYN	5.19	3000.00	0.10
315APF	1.80	1052.00	0.00
315BEF	2.55	3000.00	0.00
315FMV	3.87	671.60	0.10
315GAN	3.40	3000.00	0.10
315LCC	3.67	24.00	1.24

CMP Site Reference Information

Table A.D.2-16. CMP Monitoring Sites

CMP Site	Site - Waterbody Description
305BRS	Beach Road Ditch at Shell Road
305CAN	Carnadero Creek upstream Pajaro River
305CHI	Pajaro River at Chittenden
305COR	Salsipuedes Creek downstream of Corralitos Creek u/s from Hwy 129
305FRA	Millers Canal at Frazier Lake Road
305FUF	Furlong Creek at Frazier Lake Road
305LCS	Llagas Creek at Southside
305PJP	Pajaro River at Main Street
305SJA	San Juan Creek at Anzar Road
305TSR	Tequisquita Slough upstream Pajaro River at Shore Road
305WCS	Watsonville Creek at Salinas Road/ Hudson Landing
305WSA	Watsonville Slough at San Andreas Road
309ALG	Salinas Reclamation Canal at La Guardia
309ASB	Alisal Slough at White Barn
309BLA	Blanco Drain Below Pump
309CCD	Chualar Creek West of Highway 1 on River Road
309CRR	Chualar Creek North Branch East of Highway 1
309ESP	Espinosa Slough upstream of Alisal Slough
309GAB	Gabilan Creek at Boronda Road
309GRN	Salinas River at Elm Road in Greenfield
309JON	Salinas Reclamation Canal at San Jon Road
309MER	Merrit Ditch upstream of Highway 183
309MOR	Moro Coho Slough at Highway 1
309NAD	Natividad Creek upstream of the Salinas Reclamation Canal
309OLD	Old Salinas River at Monterey Dunes Way
309QUI	Quail Creek at Highway 101
309RTA	Santa Rita Creek at Santa Rita Creek Park
309SAC	Salinas River at Chualar Bridge on River Road
309SAG	Salinas River at Gonzalez River Road Bridge
309SSP	Salinas River at Spreckels Gauge
309TEH	Tembladero Slough at Haro
310CCC	Chorro Creek upstream from Chorro Flats
310LBC	Los Berros Creek at Century
310PRE	Prefumo Creek at Calle Joaquin
310USG	Arroyo Grande Creek at old USGS gage
310WRP	Warden Creek at Wetlands Restoration Preserve

CMP Site	Site - Waterbody Description
312BCC	Bradley Canyon Creek
312BCJ	Bradley Channel at Jones Street
312GVS	Green Valley at Simas
312MSD	Main Street Canal u/s Ray Road at Highway 166
312OFC	Oso Flaco Creek at Oso Flaco Lake Road
312OFN	Little Oso Flaco Creek
312ORC	Orcutt Solomon Creek u/s Santa Maria River
312ORI	Orcutt Solomon Creek at Hwy 1
312SMA	Santa Maria River at Estuary
312SMI	Santa Maria River at Highway 1
313SAE	San Antonio Creek at San Antonio Road East
314SYF	Santa Ynez River at Floradale
314SYL	Santa Ynez River at River Park
314SYN	Santa Ynez River at 13th
315APF	Arroyo Paredon at Via Real
315BEF	Bell Creek at Winchester Canyon Park
315FMV	Franklin at Mountain View Lane
315GAN	Glenn Annie
315LCC	Los Carneros Creek at Calle Real

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