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

GENERAL WASTE DISCHARGE REQUIREMENTS
FOR
DISCHARGES FROM IRRIGATED LANDS

ORDER NO. R3-2021-0040

April 15, 2021

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, Part 2, Section C**; and the tables in this Attachment A displaying groundwater quality data and surface water quality data (**Section D**).

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

Section A. Background and Resources in the Central Coast

1. Order No. R3-2021-0040, *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 targets and limits to protect water quality (i.e., application targets and limits, discharge targets and limits, and receiving water limits), 2) time schedules to meet the numeric targets and limits, 3) monitoring and reporting to verify compliance with the numeric targets and limits, and 4) consequences for not meeting the numeric targets and 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 targets and limits. Dischargers are required to implement management practices to achieve the established targets and 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.

7. 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.

Agricultural and Water Resources in the Central Coast

8. 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.

9. 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).

10. 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.

11. 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.

12. 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).

13. 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.

14. 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

15. 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.

16. 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.

17. 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.

18. 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.

19. 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 **Section C.1** and **Section C.2** 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 beneficial uses designated in the Basin Plan include municipal and domestic drinking water supply (MUN) and uses of water that support ecosystems for fish, such as Estuarine Habitat

(EST), Warm Fresh Water Habitat (WARM), Cold Fresh Water Habitat (COLD), Marine Habitat (MAR), Migration of Aquatic Organisms (MIGR), and Spawning, Reproduction and/or Early Development (SPWN). The water quality objectives adopted in the Basin Plan and 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 implements the Basin Plan and protects the designated beneficial uses by prescribing terms and conditions, including numeric targets and limits, and prohibitions, with which the Discharger 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 **Section C.1** and **Section C.2** 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 of CEQA 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 certified a Final Environmental Impact Report (FEIR) 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. When establishing monitoring and reporting requirements under Water Code section 13267, the Central Coast Water Board must ensure that the burden, including costs, of the reports bear a reasonable relationship to the need for the reports and the benefits to be obtained from the reports. Many of the costs considered below are costs associated with the monitoring and reporting requirements of this Order. Dischargers can reduce their costs by joining a third-party program for groundwater or surface water monitoring and reporting in lieu of individual monitoring and reporting.

16. The monitoring and reporting requirements of the Order allow the Central Coast Water Board to identify agricultural waste discharges with the highest risk of degrading water quality so that those discharges may be promptly addressed and reduced. Monitoring and reporting of fertilizer application and nitrogen discharges to groundwater and groundwater monitoring and reporting protect human health by informing the Central Coast Water Board of discharges that may affect the quality of water designated as municipal and domestic supply beneficial use and by allowing assessment of the extent to which the water quality objectives are being met in commercial irrigated agricultural land use areas. Surface water monitoring and reporting helps ensure that aquatic life beneficial uses are protected, given the significant toxicity and water quality objective exceedances already observed in

monitoring data in commercial irrigated land use areas of the central coast region. Monitoring and reporting of riparian areas for Dischargers with waterbodies running through or adjacent to their ranches allows the Central Coast Water Board to understand the current state of riparian areas in the commercial irrigated land use areas of the central coast region. As discussed in **Section C.2** of this Attachment A, riparian areas increase groundwater recharge, reduce erosion, and reduce the transport of sediment, nutrients, and other pollutants from agriculture. The protection of riparian and wetland areas is important for aquatic life and beneficial uses.

17. The Central Coast Water Board needs these reports to document and ensure compliance with this Order. The Central Coast Water Board finds that the burden of the requirements of the Order bear a reasonable relationship to the benefits of the requirements.

Regional Agricultural Economic Production

18. The central coast region is one of the most productive agricultural regions in California and the nation. In 2002, the central coast had $14 billion in agricultural production and processing output, accounting for 14 percent of the total agricultural industry production in California (UCCE AIS, 2009). In total, the agricultural production and processing industry in the central coast region directly accounted for 110,686 jobs. **Table A.B-5** shows direct and total economic effects of the agricultural industry in the central coast region.

19. Excluding the “beef and dairy cattle” and “other animals” categories, which would not typically involve irrigated agriculture (although inputs to animal production, such as feedstock, could be grown via irrigated agriculture), farming activities in the central coast region directly resulted in an output of $4,035,000,000; 41,039 jobs; $1,345,000,000 in labor income; and $2,756,000,000 in value added (Agricultural Issues Center 2009). This level of production ranks quite well in comparison to other agricultural regions of California and many of the counties making up the central coast region rank highly among the most productive counties in the state. **Table A.B-6** shows county-level data from the California Department of Food and Agriculture (CDFA) for 2017. Monterey County is one of the top five counties in California in terms of agricultural production (Kern County is the number one county for agricultural production; however, only a small portion of this county is located within the central coast region). Strawberries are a leading commodity for many of the counties within the central coast region, along with broccoli, wine grapes, and vegetables.

Costs of Production for Dischargers in the Central Coast Region

20. Dischargers in the central coast region incur many costs in producing irrigated agricultural commodities, including land ownership/rental costs, equipment costs,

water, labor, fertilizer, pesticide, etc. Additionally, Dischargers are subject to regulatory compliance costs, of which Agricultural Order 3.0 compliance costs (discussed further in the following section) are a part. Production/harvest costs vary by commodity and potentially other factors, and thus it is difficult to generalize across the central coast region.

21. The University of California (U.C.) Cooperative Extension – Agricultural Issues Center (2019) (UCCE, 2019) prepared a detailed analysis of the costs involved in producing and harvesting romaine hearts in the central coast region. Although not necessarily representative of the costs of production for all commodities/crops, the analysis provides a sense of the costs that Dischargers in the central coast region must bear and the returns that may be expected, depending on market conditions. **Table A.B-7** and **Table A.B-8** provide selected results from the U.C. Cooperative Extension study (UCCE, 2019 and Tourte, et al., 2019).

22. **Table A.B-7** shows the numerous inputs and activities that go into producing romaine hearts in the central coast, each of which adds some amount of cost. In addition to direct inputs and cultivation activities, there are also cash and non-cash overhead costs, which must be accounted for. **Table A.B-8** additionally shows that production costs vary to some degree based on the yield achieved; generally, the study found that total costs per acre increase as yield increases, although total costs per carton (of romaine hearts) decrease. The net return that Dischargers would obtain for producing an acre of romaine hearts would depend on the price of the commodity at that time and the yield per acre. If prices are low and/or yield is low in a given growing season, the UCCE 2019 study found that Dischargers could lose money in producing romaine hearts. However, if prices are high and yields are high, Dischargers could also achieve a significant return of up to $3,543 per acre above total costs, or $5,873 per acre above operating costs.

23. If a grower in the central coast region farmed several hundred or more acres of land, the UCCE 2019 study could translate into a substantial overall loss or profit in any given growing season. As noted above, however, romaine hearts are not necessarily representative of all crops in the region.

24. UCCE performed a similar study for strawberries in 2016, which found significantly higher production costs for strawberries in the central coast, but also the potential for significantly higher returns. Specifically, the total cost per acre for strawberry production and harvesting was $67,674 (UCC, 2016) compared to $13,864 for romaine hearts. Much of this increased cost was due to higher labor and materials costs during harvesting of strawberries. While strawberry farming had the potential to lose money with low yields and/or prices, it also had the potential for larger profits with high yields and favorable market conditions. Specifically, the study found that

the net return per acre above total costs could be as high as $53,002 with yields at 10,000 trays per acre and a price of $14 per tray (UCC, 2016).

Costs of Regulatory Compliance

25. Dischargers in the central coast region and throughout California are subject to a number of regulations, including labor, consumer safety and health, environmental, and transportation-related regulations. Although these regulations have a positive effect in terms of safety for workers and the public and reducing the impacts of agriculture on the environment, compliance with regulations increases costs for Dischargers. In this respect, this Order is only one of many regulatory programs that Dischargers must comply with.

26. Although it is difficult to determine specific regulatory compliance costs or generalize across the agricultural industry (which includes many different types and sizes of ranches/farms that grow different types of crops), several studies have attempted to quantify these costs. Generally, regulatory compliance costs include any monitoring and reporting costs, fees, as well as any other capital or operating expenses involved with implementing the relevant requirements, although the costs considered varies by study. One such study (McCullough et al., 2017) looked at 22 farms in the San Joaquin Valley to determine the relative costs of regulatory compliance. **Table A.B-9** and **Table A.B-10** show summary results from this analysis.

27. As shown in **Table A.B-9**, McCullough et al.'s (2017) study found that average annual environmental regulatory costs (including air quality, water quality, and pesticide use regulations), although not insignificant, represented a relatively small portion (less than 5 percent) of the total cash costs for the crops studied. Likewise, the total regulatory costs (also including labor regulatory costs) shown in **Table A.B-10** still represented a relatively small percentage (less than 6 percent) of total cash costs on a per acre basis for the crops studied.

28. McCullough et al.'s (2017) findings are generally consistent with other studies analyzing this topic, which overall indicate that regulatory costs represent a relatively small portion of total costs or income for a given farm, although this cost can still substantially affect profits. Hurley and Noel (2006) studied regulatory costs (e.g., burning fees, air quality fees, chemical use fees, solid waste fees, water quality fees, and workers compensation costs) in comparison to farm income for different size farm operations. **Table A.B-11** shows results from Hurley and Noel's (2006) study.

29. Hurley and Noel (2006) found generally similar, although perhaps slightly higher, regulatory costs per acre as compared to McCullough et al. (2017) (note that the Hurley and Noel study compared regulatory costs to farm income, whereas the McCullough et al. study compared regulatory costs to operating costs). Interestingly, Hurley and Noel (2006) found that the average regulatory cost per acre generally increased as farm income increased (e.g., average regulatory cost of $638 per acre

for farms with incomes over $500,000 compared to $51 per acre for farms with income under $10,000); however, larger farms were generally better able to bear the regulatory costs, as these higher costs still often represented a smaller percentage of the farm income.

30. Paggi et al. (2009) analyzed a representative orange farm in California and found that regulatory costs can have a significant effect on the profitability of a farming operation. It should be noted that Paggi et al. (2009) assumed a total regulatory cost of $401.51 per acre for the orange farm (which had total cultural costs[1] of $2,000 per acre), which is on the upper end of the estimates seen from the McCullough et al. (2017) and Hurley and Noel (2006) studies. **Table A.B-12** shows the effects of regulatory compliance costs on income for the representative orange farm modeled by Paggi et al. (2009).

31. The Paggi et al. (2009) study also modeled the probability distributions of net income after taxes when regulatory costs are included and excluded in the representative orange farm cost of production. This analysis found that the inclusion of regulatory compliance costs in the orange farm cost of production reduces the probability of earning a net income after taxes of over $300,000 by 7 percent and of earning a net income after taxes between $0.00 and $300,000 by 3 percent (Paggi et al., 2009). Taken together, this means that the probability of experiencing a financial loss is increased by 10 percent when regulatory costs are included.

32. Altogether, the studies reviewed above indicate that substantive regulatory compliance costs are placed on Dischargers in California (estimates range from $33/acre to $638/acre, depending on crop type and other factors, across the studies). Regulatory compliance costs, of which environmental and water quality regulations specifically comprise a part, generally account for a relatively small portion of a farm's operating cost per acre; however, some studies show that these costs still have a significant effect on farms' profitability.

Cost of Compliance with the Order

33. The cost of compliance with the Order for Dischargers in the central coast region under existing conditions includes the costs associated with any management practices they may need to implement pursuant to the Order requirements, as well as permit fees, and monitoring and reporting costs. These costs are described further below.

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[1] Cultural costs include costs associated with land preparation, plant/stand establishment, fertilizer and soil amendments, irrigation, and pest management. Essentially, cultural costs are the portion of operating costs not including harvest costs. Cultural costs do not include overhead costs (e.g., land rent, insurance, and equipment).

Permit Fees

34. The State Water Resources Control Board (SWRCB) sets the fee schedule for irrigated lands regulatory programs (e.g., Agricultural Order 3.0) throughout the state, as specified in California Code of Regulations, title 23, section 2200.6. All enrolled ranches must pay the SWRCB fees on an annual basis. Although the SWRCB fees may change from year to year, the fee categories/schedule for 2019-2020 is shown below.

Category 1. [2] If a discharger is a member of a group that has been approved by SWRCB to manage fee collection and payment, then the fee shall be $100 per group plus $0.95 per acre of land.

Category 2. If a discharger is a member of a group that has been approved by SWRCB but that does not manage fee collection and payment, then the fee shall be $250 per farm plus $1.43 per acre of land.

Category 3. If a discharger is not a member of a group that has been approved by SWRCB, the following fee schedule applies:

Acres	**Fee Rate**	**Minimum Fee**	**Maximum Fee**
0-10	$511 + $17.05/Acre	$511	$682
11-100	$1,277 + $8.53/Acre	$1,371	$2,130
101-500	$3,192 + $4.26/Acre	$3,622	$5,322
501 or More	$6,384 + $3.41/Acre	$8,092	No Max Fee

35. The vast majority of Dischargers in the central coast region enrolled under Agricultural Order 3.0 chose to participate in the cooperative monitoring program (CMP) for surface water managed by Central Coast Water Quality Preservation, Inc. (CCWQP) (described further below under “Surface Water Monitoring”). CCWQP is approved by SWRCB to collect permit fees (Category 1), and thus most Dischargers pay fees through CCWQP. A small percentage of Dischargers chose to conduct individual surface water monitoring and pay fees individually (Category 3). There are

[2] The fee schedule in California Code of Regulations, title 23, section 2200.6 refers to “Tiers.” They are referred to as “Categories” here, to avoid confusion with Tiers 1, 2, and 3 that were specified under Agricultural Order 3.0 in reference to a ranch’s relative threat to water quality.

currently no third-party programs or groups in the central coast region that are approved by the SWRCB but does not manage fee collection and payment; therefore, Category 2 is not applicable.

Compliance with Surface Water Targets and Limits

36. All Dischargers must meet nutrient, pesticides and toxicity, and sediment and turbidity targets and limits specified in the Order. Dischargers are not required to implement specific management practices. Rather, individual Dischargers are required to monitor, and report on, their discharges and the management practices they are implementing to manage their discharges, including assessing the effectiveness of the management practices.

37. Dischargers may be required to implement improved or additional management practices, as necessary, and report on the water quality-related outcomes of their management practice implementation. Dischargers must ultimately implement management practices that result in compliance with the Order.

38. A ranch's specific cost information is not reported in the Agricultural Order's Annual Compliance Form (ACF), but cost information on typical agricultural management practices is publicly available from several sources.

39. Management practices associated with irrigation and nutrient management, pesticide management, and sediment and erosion control management are already being implemented by dischargers. This may be due to requirements imposed by other regulatory agencies (e.g., pesticide tracking and reporting by the Department of Pesticide Regulation and Agricultural Commissioners). Counties often have codes that require farms to manage their sediment discharges.

40. Implementation of management practices may also have direct net cost benefits to a farm (e.g., irrigation and nutrient management result in higher crop yields and less fertilizer and irrigation application costs). For example, preventing erosion of valuable topsoil is an incentive for sediment and erosion management on a farm.

41. The Natural Resource Conservation Service (NRCS) has developed standard agricultural management practices to address irrigation and nutrient management, pesticide management, and sediment and erosion control management, some of the more common of which are discussed below. Implementation of many of these practices would result in compliance with multiple requirements of the Order. **Table A.B-13** shows costs of management practices/scenarios Dischargers could implement to meet the nutrient, pesticides and toxicity, and sediment and turbidity limits in the Order, as reported by the U.S. Department of Agriculture (USDA), NRCS.

a. **Conservation Cover** – involves establishing and maintaining a permanent vegetative cover on lands that are either not currently in use/production or lands currently in production that would be taken out of production. The practice does not apply to plantings for forage production or to critical area plantings. This practice can be applied on a portion of the field. The Conservation Cover practice may be implemented to reduce erosion and sedimentation and reduce associated groundwater and surface water quality degradation by nutrients and sediment, as well as other purposes. Costs range between $135 and $1,426 per acre.

b. **Conservation cover crop rotation** – involves growing crops in a planned sequence on the same ground over a period of time (i.e., the rotation cycle). This practice may be implemented to reduce erosion and maintain or increase soil; reduce water quality degradation due to excess nutrients; reduce the concentration of salts and other chemicals from saline seeps, or for other purposes. Costs vary based on whether specialty crops are involved. Costs range between $13 to $35 per acre.

c. **Contour Buffer Strips** – involves establishing narrow strips of permanent, herbaceous vegetative cover around hill slopes, which are alternated down the slope with wider cropped strips that are farmed on the contour. This practice may be implemented to reduce erosion and associated water quality degradation from the transport of sediment and other water-borne contaminants downslope. Costs range between $319 to $404 per acre.

d. **Cover Crop** – involves planting grasses, legumes, and/or forbs for seasonal vegetative cover. The practice may be implemented to reduce erosion, maintain or increase soil health and organic matter content, reduce water quality degradation by utilizing excessive soil nutrients, or for other purposes. Costs range between $67 to $83 per acre.

e. **Denitrifying Bioreactor** – involves installation of a structure that uses a carbon source to reduce the concentration of nitrate nitrogen in subsurface agricultural drainage flow via enhanced denitrification. Woodchips are commonly used as the carbon source. The practice is implemented to improve water quality by reducing the nitrate nitrogen content of subsurface agricultural drainage flow. Costs are estimated between $13,066 to $20,324 per bioreactor.

f. **Filter Strip** – involves establishing a strip or area of herbaceous vegetation that removes contaminants from overland flow. Filter strips can be established anywhere environmentally sensitive areas need to be protected from sediment, or other suspended solids, and dissolved contaminants in runoff. Costs range between $172 to $185 per acre.

g. **Integrated Pest Management (IPM) program** – involves implementing a site-specific combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies. An IPM approach seeks to prevent or mitigate off-site pesticide risks to water quality from leaching, solution runoff and adsorbed runoff losses; and prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact; among other goals. Costs for implementing the IPM practice vary based on whether the practice is implemented on a small farm, whether the target field has high value crops, and the mitigation index score. Costs range between $33 and $184 per acre. Small farms with high mitigation scores could experience significantly higher costs (estimated at $2,372 per acre).

h. **Micro-Irrigation System** – involves implementation of an irrigation system that provides for frequent application of small quantities of water on or below the soil surface (e.g., as drops, tiny streams, or miniature spray through emitters or applicators placed along a water delivery line. Drip tape, tubing, or microsprayers may be used. This practice may be implemented to prevent contamination of groundwater and surface water by efficiently and uniformly applying chemicals, and to maintain soil moisture by efficiently and uniformly applying irrigation water. Costs range between $611 to $4,644 per acre.

i. **Nutrient Management** – involves managing the amount (rate), source, placement (method of application), and timing of plant nutrients and soil amendments. The practice is implemented to minimize agricultural nonpoint source pollution of surface waters and groundwater, among other reasons. Costs associated with this practice include soil testing, analysis, and implementation of the NM plan and recordkeeping. Costs range between $10 and $320 per acre.

j. **Riparian Forest Buffer** – involves establishment of an area of predominantly trees and/or shrubs located adjacent to and up-gradient from waterbodies. The practice may be implemented to reduce excess amounts of sediment, organic material, nutrients and pesticides in surface runoff and reduce excess nutrients and other chemicals in shallow groundwater flow; reduce pesticide drift entering the waterbody; restore riparian plant communities; create shade to lower or maintain water temperatures to improve habitat for aquatic organisms; or to provide other benefits. Costs vary based on whether riparian forest buffer vegetation is established through seeding, cuttings, bare-root plantings, or small or large containers. For scenarios where land is taken out of production to establish the riparian forest buffer, foregone income is considered. Costs range between $255 to $2,242 per acre.

k. **Sediment Control Basin** involves constructing a basin with an engineered outlet, formed by excavating a dugout, constructing an embankment, or a combination of both. The purpose of the sediment basin is to capture and detain sediment-laden runoff, or other debris for a sufficient length of time to allow it to settle out in the basin. Costs are estimated between $5,559 to $12,562 per basin.

42. These potential costs were considered when the nutrient, pesticides and toxicity, and sediment and turbidity limits were developed for Agricultural Order 4.0.

Groundwater Protection

43. All Dischargers are required to conduct irrigation well monitoring and reporting prior to the start of groundwater quality trend monitoring and reporting, on-farm domestic well monitoring and reporting, and groundwater quality trend monitoring and reporting, either individually or as part of a third-party effort.

44. A subset of Dischargers may be required to conduct ranch-level groundwater monitoring (as required by the Executive Officer based on groundwater quality data or significant and repeated exceedances of the nitrogen discharge targets and limits), either individually or through a third-party program.

45. The costs associated with these monitoring and reporting activities are discussed below.

Groundwater Quality Trend Monitoring and Reporting

46. Under Ag Order 3.0, there are no requirements for groundwater quality trend monitoring and reporting.

47. Under Ag Order 4.0, all Dischargers must conduct groundwater quality trend monitoring and reporting either individually or as part of a third party. The goals of the groundwater quality 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.

48. Dischargers who choose the third-party approach to groundwater quality trend monitoring and reporting must ensure that the third party provides a detailed groundwater trend monitoring and reporting 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.

49. Dischargers who choose the individual approach may opt to install new monitoring wells for trend monitoring purposes. Wells in the individual groundwater quality trend monitoring program must be monitored semi-annually in the first and third quarter of each year.

50. It is not possible to predict the total cost of groundwater quality trend monitoring, tracking, and reporting under Ag Order 4.0. The number of Dischargers who select a

third party versus individual approach is unknown, and the requirements and associated costs are different depending on the approach selected. In general, it is expected that participation in a third-party groundwater quality trend monitoring and reporting program would provide economies of scale and therefore result in significantly less cost to Dischargers.

51. To generate a cost for reference purposes, it can be assumed that some monitoring wells may have to be drilled to conduct groundwater quality trend monitoring, either individually or as part of a third-party program. 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).

Groundwater Monitoring of On-Farm Domestic Wells and Irrigation Wells

52. 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 third-party. 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 Dischargers Laboratory, Monterey Bay Analytical Services, and Oilfield Environmental and Compliance Laboratory).

    a. 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 $205 cost per sample, two sampling events for each well, and inflation, the total groundwater monitoring cost for Dischargers with CCGC membership is estimated at $1,307,000 over the course of five years. The total cost associated with CCGC membership fees, sampling, and laboratory costs are estimated at $2,903,000 ($6.85 per acre) over the course of five years. **Table A.B-14** shows total groundwater monitoring fees for fiscal year 2018-2019.

    b. Approximately 639 operations opted to perform groundwater monitoring individually, representing 1200 domestic wells and 2293 primary irrigation wells. Considering an estimated average of $205 cost per sample, two sampling events for each well, and inflation, the total groundwater monitoring cost for Dischargers sampling individually is estimated at $1,662,000 ($3.92 per acre) over the course of five years.

c. In total, groundwater monitoring under Ag Order 3.0 cost an estimated $4,564,000 ($10.77 per acre) over the course of five years.

53. 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 the **primary** irrigation well once per year until groundwater quality trend monitoring begins, based on their ranch location.

54. Irrigation wells must also be sampled annually for TNA and INMP Summary reporting. In this case, annual sampling will begin with the primary irrigation well for TNA reporting, and will phase into the sampling of all irrigation wells for 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.

a. Dischargers will continue to have the option of performing groundwater monitoring individually or as part of a third-party. 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 third-party effort. Therefore, for this analysis, the cost estimate is based solely on the cost of sampling all wells that are required to be sampled.

b. Considering 6,242 total wells, an estimated average of $205 cost per sample,[3] annual sampling events for each well based on the ranch's Groundwater Phase Area over the course of five years, and inflation, the total groundwater monitoring cost for all irrigation and domestic well monitoring is estimated at $9,158,000 ($21.20 per acre) over the course of five years.

Ranch-Level Groundwater Discharge Monitoring

55. Ranch-level groundwater discharge monitoring and reporting was not required under Ag Order 3.0.

56. Under Ag Order 4.0, a subset of Dischargers may be required to conduct ranch-level groundwater monitoring (as required by the Executive Officer based on groundwater

[3] The average cost per sample may be less than $205 due to (1) the reduction in several monitoring parameters for domestic well and irrigation well monitoring prior to the beginning of groundwater quality trend monitoring, (2) the potential for 1,2,3-trichloropropane sampling and analysis for domestic wells to cease based on initial sampling results, (3) the fact that the primary irrigation well is required to be sampled on an annual basis only until groundwater quality trend monitoring begins, and (3) Dischargers' option to use a precise measurement device for the determination of nitrogen in irrigation well water for TNA/INMP reporting purposes.

quality data or significant and repeated exceedances of the nitrogen discharge targets and limits), either individually or through a third-party program.

57. Ranch-level groundwater discharge monitoring and reporting can be avoided by complying with the requirements of this Order. It is not possible to predict the cost of ranch-level groundwater monitoring and reporting because the number of Dischargers that will be required to conduct this effort is unknown and each ranch's monitoring and reporting program will be tailored to that specific ranch. However, costs associated with ranch-level groundwater monitoring and reporting could include, but not be limited to, hiring a technical assistance provider to develop the ranch-level groundwater discharge monitoring and reporting work plan, collecting data (including the cost of acquiring, operating, and maintaining field equipment), managing data, and developing reports.

58. To generate a cost for reference purposes, the following estimates are associated with a 100-acre ranch on which ranch-level groundwater discharge monitoring is conducted using lysimeters at 10 monitoring locations, each with a lysimeter at two depths[4].

    i. At an approximate cost of $80 per analysis[5] of the nitrate concentration below the root zone, the analytical cost of monitoring all 10 locations would be approximately $1,600 for each monitoring period. Costs associated with developing the work plan to establish the appropriate number of monitoring locations and monitoring frequency, acquisition and installation of lysimeters and other sensors, the addition of data loggers, hiring field personnel, and the overall duration of the monitoring and reporting program would increase the overall cost by an unknown amount.

Surface Water Protection

Surface Receiving Water Monitoring and Reporting

59. All Dischargers are required to conduct surface receiving water quality trend monitoring and reporting, and develop a follow-up surface receiving water implementation program, either individually or as part of a third-party program.

60. A subset of Dischargers may be required to conduct ranch-level surface discharge monitoring and reporting (as required by the Executive Officer based on surface water quality data or significant and repeated exceedances of the surface water

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[4] Dischargers may propose a methodology for conducting ranch-level groundwater discharge monitoring that does not include the use of lysimeters; the example of several lysimeters installed on the 100-acre ranch noted above is merely for reference purposes.

[5] Estimates of lysimeter analytical costs were obtained from Ag Laboratory and Consulting and adjusted for inflation.

quality limits for nutrients, pesticides and toxicity, and sediment or turbidity), either individually or through a third-party program.

61. The costs associated with these monitoring and reporting activities are discussed below.

Surface Receiving Water Quality Trend Monitoring and Reporting

62. All Dischargers are required to conduct surface receiving water quality monitoring and submit reporting and have the option of participating in a third-party program. The current third-party surface water quality trend monitoring (Central Coast Water Quality Preservation, Inc.) charges a monitoring fee and an annual administrative fee. **Table A.B-15** shows CCWQP's 2018-2019 fee structure.

63. For Dischargers who choose not to participate in the third-party program, they would need to pay SWRCB fees. Additionally, they would incur any labor, equipment, laboratory, and administrative costs associated with performing the surface water monitoring tasks individually, including the required preparation of a sampling and analysis plan (SAP) and quality assurance project plan (QAPP). **Table A.B-16** shows total surface water monitoring fees under Agricultural Order 3.0 for Fiscal Year 2018/2019. The State Water Resources Control Board determines fees for the Irrigated Lands Program statewide each fiscal year. It is assumed the permit fees under the Order after adoption may change (increase) but this is unknown at this time.

64. Approximately 99 percent of Dischargers have chosen to participate in the third-party program for surface receiving water quality trend monitoring and reporting under Ag Order 3.0. Although the sample size for individual monitoring is small (only 21 operations), the data show that individual monitoring is more expensive on average in terms of fees paid ($2,034 per operation compared to $890 per operation for third-party program participants). Note that individual monitoring fees do not account for the costs borne by individuals conducting the monitoring (e.g., labor, laboratory costs, etc.), whereas third-party program fees cover the costs of conducting the monitoring activities and annual reporting. Also note that an operation can have one or many ranches under its oversight. The Central Coast Water Board reached out to technical assistance providers (TAPs) to obtain information on the cost to conduct individual surface water discharge monitoring. **Table A.B-17** shows estimated costs obtained from two technical assistance providers (TAPs) that provide these services to Dischargers in the central coast region.

Surface Receiving Water Follow-Up Monitoring and Reporting

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

66. Under Ag Order 4.0, Dischargers are required to develop a follow-up surface water implementation work plan and submit annual reports on nutrient, pesticide, and sediment and erosion control management practice implementation, either individually or as part of a third-party program.

67. 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 depend 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.

68. 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 area.

Ranch-Level Surface Water Discharge Monitoring and Reporting

69. Ranch-level surface discharge monitoring and reporting was required of a subset of Tier 3 ranches under Ag Order 3.0.

70. Under Ag Order 4.0, a subset of Dischargers may be required to conduct ranch-level groundwater monitoring (as required by the Executive Officer based on groundwater quality data or significant and repeated exceedances of the nitrogen discharge targets and limits), either individually or through a third-party program.

71. A small subset of Tier 3 ranches were required to perform individual surface water discharge monitoring, or “edge-of-field” monitoring under Agricultural Order 3.0. The Central Coast Water Board reached out to technical assistance providers (TAPs) to obtain information on the cost to conduct individual surface water discharge monitoring. The information obtained from two TAPs is provided in **Table A.B-17**. Although the information comes from only two TAPs and therefore may not be fully representative, it nonetheless provides context for understanding potential costs associated with individual surface water discharge monitoring under Agricultural Order 3.0. The costs associated with ranch-level surface water discharge monitoring and reporting would be similar to the costs for individual surface water discharge monitoring conducted under Agricultural Order 3.0.

72. 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 surface water discharge monitoring and reporting are not discussed further.

Monitoring and Reporting - General

73. All dischargers are required to report management practice implementation annually on the Annual Compliance Form (ACF), record and report total nitrogen applied to all crops grown on the ranch on the Total Nitrogen Applied (TNA) report, and track and record elements of the INMP Summary report that are not included in the TNA report.

74. The costs associated with this tracking and reporting are discussed below.

Annual Compliance Form (ACF)

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

76. 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 practices).

77. 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.

78. 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.

79. 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.

Total Nitrogen Applied (TNA) Report

80. 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.

81. 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.

    a. 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 with experience would 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.

    b. 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 with experience would 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.

c. 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.

82. 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.

a. 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 with experience would 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 $6.34 and $12.67 per acre) over the course of five years.

b. 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 with experience would 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 per ranch, 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.

c. 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.

Irrigation and Nutrient Management Plan (INMP)

83. Under Agricultural Order 3.0, some Tier 3 ranches are required to develop and implement an Irrigation and Nutrient Management Plan (INMP). The INMP must consider nitrogen applied from all sources (nitrogen applied as fertilizer and in irrigation water), crop nitrogen uptake, nitrogen removed, and irrigation and nutrient management practices. As of April 2019, only 20 ranches (representing 12 operations) were required to submit INMP reports; recall that an operation can have one or many ranches under its oversight. The costs discussed below are estimated based on the INMP requirement included in Agricultural Order 3.0; many Dischargers already track at least a portion of the information that would be included in an INMP through their farm plan.

84. The cost to develop an INMP varies by complexity of ranch characteristics (e.g., ranch size, types of crops grown, number of crops grown, and the number of times crops are grown over a year). For example, vegetable crops are more complex to grow than crops such as vineyards or orchards, so it would likely be more expensive to prepare and implement an INMP for a vegetable ranch as compared to a vineyard or an orchard. Additionally, as a ranch gets bigger, there are more blocks and more area that must be managed, potentially with different soil types, and more complex irrigation system management, which can increase costs. It should be noted that the 20 ranches required to comply with the INMP requirement under Agricultural Order 3.0 were larger ranches.

85. One TAP reported that for a 1,000 to 1,500-acre operation the cost is approximately $15,000 to develop the INMP, $3,000 per year for annual INMP updates, and $10,000 for an INMP effectiveness report every five years. The same TAP reported that implementation of an INMP could take a grower two days per month at $2,000 per day or roughly $48,000 per year. Data collection software development and maintenance runs on average $15,000 per year. Use of software by field personnel was estimated at $72,000 per year. Preparation of data summaries and reporting at $10,000 per year, and field implementation equipment at $50,000 initially and $5,000 per year thereafter. (Richter, 2019).

86. Another TAP reported a cost to develop an INMP of $5,000 for a less than 100-acre ranch ($50 per acre), $12,000 for a 250-acre ranch ($48 per acre), and $25,000 for a 500 plus acre ranch ($50 per acre). The same TAP reported that the average cost to prepare data summaries and submit reporting is $75 per hour, but was unable to provide an average number of hours because there are so many variables associated with ranch size, crops grown, field equipment used, and what standard management practices are already in place. (Richter, 2019).

INMP Summary Report

87. 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.

88. 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). We assumed the additional tracking and reporting of total pounds of crop material removed from the ranch, the volume of irrigation water applied to the ranch, and crop evapotranspiration would take the same amount of time as TNA reporting; it would take about twice as much time to perform tracking and reporting for the INMP Summary report as it did for TNA reporting alone.

    a. 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 with experience would 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 $6.34 and $12.67 per acre) over the course of five years.

    b. 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 with experience would 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.

c. 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.

On-Farm Riparian Area Measurement and Reporting

89. A subset of dischargers with waterbodies within or bordering their ranch must report the current riparian area (average width and length, in feet) annually.

90. Central Coast Water Board staff believes the measurement and reporting of riparian area on their ranch could be accomplished in several ways. An in-house employee could take physical measurements along the waterbody reach for the length and then measurements of transects of the reach (e.g., every 500 feet) and calculate an average width. An in-house employee could use Google Earth and use the measurement tool to do the same thing. Dischargers could pay a technical assistance provider to do one of the two mentioned above.

91. Under any of these scenarios, the Central Coast Water Board does not believe this requirement represents only a minimal cost to Dischargers.

Total Costs to Dischargers

As indicated in the discussion above, it is not possible to determine with accuracy the costs associated with every potential component of Agricultural Order 4.0 compliance. For many of the requirements, the cost of compliance depends on the specific characteristics of an individual ranch or operation and the management practices a grower chooses to implement. Nevertheless, **Table A.B-18** provides a summary of the total potential costs and, where possible, attempts to provide a sense of the per acre costs for Dischargers.

Assumptions, Limitations, and Uncertainties

92. 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.

93. 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 three compliance pathways available for complying with the nitrogen discharge targets and limits. 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.

94. 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 anticipated the Order would 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., third-party surface water quality trend monitoring and reporting costs).

95. 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.

96. 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.

97. 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).

98. 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.

99. 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.

100. Unit costs are based on information available to the Central Coast Water Board and relate primarily to management practices Dischargers may choose to implement to comply with the requirements of this Order. The Central Coast Water Board used their best professional judgment to assess the types of management practices that could be implemented to comply with specific requirements. These include irrigation and nutrient management for groundwater protection (fertilizer nitrogen application targets and limits, nitrogen discharge targets and limits) and irrigation and nutrient management for surface water protection (irrigation and nutrient management, pesticide management, and sediment and erosion management).

101. 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. The table below summarizes key uncertainties and potential effects on estimated costs.

102. In comments submitted on the February 2020 draft order, stakeholders stated they believed there would be significant economic impacts from adopting this Order (Ag Order 4.0). They also stated that costs were underestimated or not considered (e.g., increased reporting and compliance costs, job losses, land use conversion, fallowed land, SAP/QAPP development, road improvements, SGMA implementation,

increased enforcement cost to state, decreased production, increased product costs, lower produce quality/lower produce prices, and hiring professionals). In addition, they stated that cumulative regulatory costs were not considered, the Order would disproportionately impact disadvantaged communities and/or small farms, force farms out of the region or state, should include funding assistance for disadvantaged farmers, would result in a funding reduction for capital improvements. Some also sought incentives for management practices (e.g., reduced monitoring and reporting or a monetary credit). Where applicable, the Board has considered the cost information submitted through these comments. The costs of compliance with this Order for Dischargers participating in a third-party program are likely to reduce once the third-party programs are established and approved and Dischargers shift from being subject to individual requirements to the requirements for third-party program participants.

103. The Central Coast Water Board believes that many Dischargers will participate in the third-party alternative compliance pathway for groundwater protection, third-party groundwater quality trend monitoring and reporting, and third-party monitoring for surface waters. The Central Coast Water Board believes the costs of compliance with this Order for those Dischargers will reduce once the third-party programs are established and approved, and Dischargers shift from being subject to individual requirements to the requirements for third-party program participants.

Costs of Administering the Agricultural Order

104. The costs of administering the Agricultural Order are borne by Dischargers through payment of the SWRCB fees described in the section above. Activities involved in the Central Coast Water Board administration of the Irrigated Lands Regulatory program include review of reports and plans submitted by Dischargers pursuant to the Order requirements, tracking compliance and managing data, interfacing with Dischargers and other stakeholders, and taking any enforcement actions, as necessary. **Table A.B-20** shows annual cost to administer Agricultural Order 3.0, which is dictated by the positions and staff time that must be dedicated to the effort. These costs are estimated at $1,984,510 per year.

Costs of Existing Water Quality Impacts from Agriculture

105. The Central Coast Water Board has compiled substantial empirical data demonstrating that water quality conditions in the agricultural areas of the region are impaired as a result of waste discharges from irrigated agricultural operations, including nitrate pollution of drinking water, widespread toxicity in many surface waters, and elevated levels of turbidity, sedimentation, erosion, and salts. These existing impacts have social and economic costs associated with them that are important to recognize in the context of potential increased regulatory costs.

106. There is widespread evidence that contaminant concentrations in groundwater exceed the maximum contaminant level (MCL) for nitrate in many areas of the central coast region. The most significant areas of nitrate contamination occur within the Salinas Valley, Gilroy-Hollister Valley, Pajaro Valley, and Santa Maria River Valley basins, as well as the southern portions of the San Luis Obispo Valley and the Santa Ynez River Valley basins. The Central Coast Water Board has determined that the vast majority of nitrate pollution is from irrigated agricultural waste discharges, though other common sources of nutrients include fertilizer applied to landscaping, seepage from septic systems, and human and animal waste (CCRWQCB, 2018).

107. Excessive nitrate concentrations in drinking water is a significant public health issue resulting in increased health risk to infants, in particular, as well as possibly adults. While acute health effects from excessive nitrate levels in drinking water are primarily limited to infants (methemoglobinemia or "blue baby syndrome"),[6] other adverse health effects on adults, such as potentially increased risk of cancer or thyroid disease, are possible. It is thought that increased formation of N-nitroso compounds that occurs when nitrate is ingested in drinking water can increase risk of specific cancers and birth defects (Ward et al., 2018). A 2018 review of studies on potential nitrate health effects found that the strongest evidence for a relationship between drinking water nitrate ingestion and adverse health outcomes (besides methemoglobinemia) is for colorectal cancer, thyroid disease, and neural tube defects (Ward et al., 2018). However, the review also concluded that "to date, the number of well-designed studies of individual health outcomes is still too few to draw firm conclusions about risk from drinking water nitrate ingestion" (Ward et al., 2018).

108. The costs of adverse health effects from nitrate contamination are difficult to quantify but are certainly quite substantial for any families or infants experiencing any of these illnesses. In addition to the human cost of the disease itself, there are also the potential costs associated with lost wages, medical expenses, and the need to obtain alternate water supplies (see further discussion below).

109. If drinking water supplies are severely contaminated with nitrate, it may be necessary for the household or water supplier to obtain alternate supplies in order to

[6] Infant methemoglobinemia or blue baby syndrome is a condition where a baby's skin turns blue due to a decreased amount of hemoglobin in the baby's blood. Hemoglobin is a blood protein that is responsible for carrying oxygen around the body and delivering it to the different cells and tissues (Medical News Today 2018). When nitrite (reduced form of nitrate) is present, hemoglobin can be converted to methemoglobin, which cannot carry oxygen (Cornell University Cooperative Extension 2012). While adults' blood has enzymes that continually convert methemoglobin back to hemoglobin, infants have lower levels of these enzymes and thus are much more susceptible to having elevated levels of methemoglobin/reduced hemoglobin. At higher levels of methemoglobin in the blood, symptoms of cyanosis (bluish mucous membranes) usually appear, and at very high levels, brain damage and death can occur (Cornell University Cooperative Extension 2012).

correct or avoid the potential adverse health effects of nitrate exposure. This may include any number of options, such as drilling a new well, buying bottled water, or moving the household altogether. **Table A.B-21** shows a summary of approximate alternative water supply option costs from a study by individuals at U.C. Davis (Honeycutt et al., 2012). Regardless of which option is pursued, obtaining alternate water supplies as a result of nitrate contamination of primary supplies is expensive, particularly for households or small water suppliers that are in low-income or disadvantages areas, which tend to be the areas hit hardest by nitrate contamination of drinking water. Overall, the study estimated the highly susceptible population in the Tulare Lake Basin and Salinas Valley to be 254,000 people, of which 220,000 are connected to 85 community public or state small water systems and approximately 34,000 people are served by 10,000 self-supplied households or local small water systems (Honeycutt et al., 2012). The study further estimated the economic cost for providing nitrate-compliant water to the total highly susceptible population in the study area (excluding one very large system) to be $20 million per year for the short-term, and $36 million for the long-term (Honeycutt et al., 2012).

Costs of Adverse Effects on the Environment from Agriculture

110. The value of environmental goods is notoriously difficult to quantify because there is no market for clean water or healthy ecosystems where people pay to access or enjoy these goods, such as to establish a price (Swedish Environmental Protection Agency 2019). However, that is not to say that environmental goods do not have significant value. Various methods for valuing the environment have been developed, falling broadly into the two categories of indirect and direct valuation methods (Swedish Environmental Protection Agency, 2019).

111. While a detailed assessment of the value of environmental goods/services in the central coast region has not been performed (to the Central Coast Water Board’s knowledge), it is instructive to consider the theoretical potential value of those goods/services. For example, following an indirect valuation method, the value of tourism in the Monterey Bay area is at least in part based on the vibrant ecosystem of the Monterey Bay and good water quality suitable for surfing and swimming. As such, the value of the tourism industry (and the amount of money that people pay to stay in Monterey to surf, whale watch, etc.) could, in part, be indicative of the value of the Monterey Bay’s water quality and biotic community. As the Monterey Bay receives flows from the Salinas River and Pajaro River (both supporting major agricultural areas upstream), the value of Monterey Bay goods/services is tied, to some degree, to the potential effects of irrigated agriculture.

112. Although direct valuation methods have not been performed, it is possible that individuals in the central coast region would attribute substantial value to the health of the region’s streams, including riparian vegetation and the plants and animals

(including special-status species such as steelhead) that are supported by area waterbodies. Many individuals would also place significant value on uncontaminated groundwater that can provide clean drinking water in the region.

113. Some relevant information on the costs of environmental impacts caused by agricultural activities is available in the literature, as follows:

a. **Nutrients**: Researchers estimated total consumer willingness to pay for reduced nitrate in drinking water in four watersheds of the U.S. (White River, Indiana; Central Nebraska; Lower Susquehanna; Mid-Columbia Basin) to be about $314 million per year (Crutchfield et al., 1997 in USDA, No Date). The benefits of nitrate-free drinking water were estimated to be $351 million (USDA, No Date).

b. **Pesticides**: The cost to 11 small water suppliers in the Midwest to install additional water treatment to remove the herbicide atrazine from drinking water was estimated to be $8.3 million in capital costs, and $180,000 per year in operating costs (Langemeier, 1992 in USDA, No Date). USEPA has estimated that total costs for additional treatment facilities needed to meet current regulations for pesticides and other specific chemicals would be about $400 million, with about another $100 million required over the next 20 years (USDA, No Date).

c. **Sedimentation**: Taking into account damages or costs to navigation, reservoirs, recreational fishing, water treatment, water conveyance systems, and industrial and municipal use, sediment damages from agricultural erosion have been estimated to be between $2 billion and $8 billion per year (Ribaudo, 1989 in USDA, No Date).

TMDLs Established through a Basin Plan Amendment

Total Maximum Daily Loads (TMDLs)

114. 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[7] (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

[7] 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.
[8] State Board Order WQ-2013-0101 is available online at the State Water Resources Control Board website at: **State Water Resources Control Board Order WQ 2013-0101**.

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.

115. 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.

116. 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 implemented into a regulatory program action, such as this Order.

TMDLs Established through a Basin Plan Amendment

117. A TMDL may be established by the Central Coast Water Board through a Basin Plan Amendment. 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.

TMDLs Adopted through a Permitting Action

118. 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.

119. 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 implementation of this Order and associated monitoring and reporting program serve as the solution to the water quality impairments and will continue 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 reestablish the TMDLs listed in the previous paragraph, with attainment deadlines as described in the next paragraph.

120. For the TMDLs the Central Coast Water Board is now reestablishing through this permitting action, the Central Coast Water Board finds that it is appropriate to allow at least an approximate 11 years from the date this Order is adopted to achieve the TMDL, to allow sufficient time to address and meet the load allocations through this Order. This time is needed to allow Dischargers to implement and adapt their management practices through increasingly more effective and innovative methods to achieve the TMDL load allocations, expressed as limits in this Order. Accordingly, for TMDLs with previously-established dates to achieve the TMDL that are earlier

than December 31, 2032 (including TMDLs with dates that have already passed), this Order establishes December 31, 2032, as the date to achieve the TMDL, which will also serve as the permit compliance date in this Order. TMDLs with previously established attainment dates after December 31, 2032, will retain those dates as permit compliance dates in this Order.

Receiving Water Limits Based on TMDLs

121. The surface receiving water limits in Table C.3-2, Table C.3-4, and Table C.3-6 of the Order implement the TMDLs described above.

122. The surface receiving water limits based on TMDLs reestablished through this permitting action include permit compliance dates that reflect the TMDL final attainment dates.

123. For TMDLs established through a Basin Plan Amendment, Water Code section 13263(a) states that WDRs "shall implement any relevant water quality control plans [basin plans] . . . ." The TMDLs established through a Basin Plan Amendment are implemented in this Order by setting numeric surface receiving water limits and permit compliance dates based on the relevant TMDL load allocations and associated dates to achieve the load allocations.

124. In implementing the TMDLs established through Basin Plan Amendments and setting the permit compliance dates for the surface receiving water limits, the Central Coast Water Board finds that it is appropriate to allow at least an approximate 11 years from the date this Order is adopted to achieve the relevant receiving water limits. This time is needed to allow Dischargers to implement and adapt their management practices through increasingly more effective and innovative methods to achieve the TMDL load allocations, expressed as limits in this Order. Allowing additional time for final compliance with the TMDL load allocations when establishing surface receiving water limits is not inconsistent with the requirement to implement the applicable basin plan provisions in this permit. Accordingly, this Order establishes a December 31, 2032 permit compliance date for receiving water limits that are based on TMDLs with final attainment dates prior to December 31, 2032, including those final attainment dates that have already passed. For receiving water limits based on all other TMDLs established through Basin Plan Amendments, this Order sets permit compliance dates that reflect the TMDL final target or attainment dates.

Where a Receiving Water Limit Final Compliance Date Has Passed

125. In the situation where a receiving water limit has not been achieved after the final compliance date has passed, the Order requires that Dischargers implement new or improved management practices, including treatment and source control methods to achieve the numeric receiving water limit(s). Dischargers that anticipate that they will exceed a receiving water limit after 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. A time schedule order must be requested 18 months in advance of a discharger or a group of dischargers anticipating that they will not be able to achieve the receiving water limit by the compliance date. 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 receiving water 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;

   c. Justification of the need for additional time to achieve the numeric receiving water limit(s);

   d. Description of the specific actions the Discharger will take to meet the numeric receiving water 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 receiving water limit(s).

Nonpoint Source Program Implementation

126. 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

127. 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.

128. 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.

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

   i. 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.

b. Enforcement of Best Management Practices: *"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."*

   i. 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.

129. Adoption of Effluent Limitations: *"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."*

a. 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 of discharge targets and limits and receiving water limits 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.

130. 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.

Nonpoint Source Policy

131. 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 defines an "NPS pollution control implementation program" as "*a program developed to comply with*

[State Water Board] or [regional water board] WDRs, waivers of WDRs, or basin plan prohibitions. Implementation programs for NPS pollution control may be developed by a [regional water board], the [State Water Board], an individual discharger or by or for a coalition of dischargers in cooperation with a third-party representative, organization, or government agency." The NPS Policy states that NPS pollution control 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. The Order implements the five key elements through a combination of direct requirements specified in the Order and requirements to develop and implement individual and third-party work plans consistent with frameworks established in the Order.

132. The NPS Policy states: "*The most successful control of nonpoint sources is achieved by prevention or by minimizing the generation of NPS discharges. Most NPS management programs typically* depend*, at least in part, upon discharger implementation of management practices (MPs) to control nonpoint sources of pollution. . . . 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.*"

133. This Order requires compliance with water quality requirements. The Order relies on implementation of management practices to achieve water quality requirements but does not substitute compliance with management practices for compliance with discharge targets and limits and receiving water limits. The Central Coast Water Board finds that there is a high likelihood that this Order will achieve its stated water quality objectives because it includes program elements that require 1) compliance with numeric targets and limits 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 targets and 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 do not achieve compliance with the application and discharge target and limits and receiving water limits (Key Element 5 consequences), and for the additional reasons stated in findings 74-88, and 100-102.

134. 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* ***achieves and maintains water quality objectives and beneficial uses****, including any applicable antidegradation requirements."*

b. This Order is consistent with Key Element 1 because the purpose and objectives of this Order have been explicitly stated in this Order and in the CEQA Project Objectives, and this Order requires compliance with application and discharge targets and limits, and receiving water limits 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.

135. 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. This Order is consistent with Key Element 2 because it requires Dischargers to implement management practices to achieve compliance with the application and discharge targets and limits, and receiving water limits. The Order requires all Dischargers to implement management practices, as necessary, to improve and protect water quality, protect beneficial uses, achieve compliance with applicable water quality objectives, and achieve the limits established in the Order. The Order requires each Discharger to develop a Farm Water Quality Management Plan, with sections addressing management practices for irrigation and nutrient management, pesticide management, sediment and erosion management, and, for a subset of dischargers, stormwater runoff management, and to report implemented management practices to the Central Coast Water Board. With regard to irrigation and nutrient management, elements such as tracking of fertilizer applied to the field and fertilizer removed from the field are mandatory for all Dischargers. With regard to management practices protective of surface water, Dischargers must additionally implement follow-up surface receiving water implementation work plans, either as individually developed or as developed by a third-party program, specifying implementation measures that will be taken to reduce the discharge of relevant pollutants and achieve the applicable surface water limits. The Order additionally incorporates specific requirements with respect to placement of solid wastes, handling and storage of chemicals, installation of backflow prevention devices on wells, destruction of abandoned wells, management of containment structures, construction and maintenance of access roads, management of compost, and disturbance of existing and naturally occurring riparian vegetative cover. Compliance 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 targets and limits.

136. 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 and discharge targets and limits, and receiving water limits. For groundwater discharges, the Order sets nitrogen application limits, nitrogen discharge targets, and nitrogen discharge limits in Tables C.1-2 and C.1-3. The tables include a time schedule for implementation of the targets and limits with interim compliance dates. Dischargers opting to participate in the third-party alternative compliance pathway for groundwater protection must still meet nitrogen application targets and nitrogen discharge targets in accordance with Tables C.2-1 and C.2-2 and are additionally subject to Groundwater Protection Targets that will be developed by the third party and approved by the Executive Officer. The Groundwater Protection Targets must be designed such that there is a clear and quantified means of assessing individual ranch level contribution to the success or failure of complying with the GWP area targets. For surface water discharges, the Order sets receiving water limitations to be achieved in accordance with final deadlines set in Tables C.3.2 through C.3.7. Interim quantifiable milestones toward achievement of the final receiving water limitations are to be developed in follow-up surface receiving water implementation work plans to be approved by the Executive Officer after public review and comment.

c. 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.*

137. 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 and discharge targets and limits, and receiving water limits. 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, and SEMP, including management practices. This monitoring and reporting will allow the regional board to assess whether Dischargers are implementing additional management practices over time.

138. 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 and discharge targets and limits, and receiving water limits. The consequences for failure to achieve application and discharge targets include (1) participation in additional education, (2) updating of the Farm Plan with additional or improved management practices designed to achieve the targets and subsequent reporting on the updated practices in the Annual Compliance Form, (3) professional certification of the Irrigation and Nutrient Management Plan, and (4) increased monitoring and reporting obligations, including ranch-level discharge monitoring. For Dischargers participating in third-party alternatives, sustained failure to achieve targets results in loss of third-party program membership, such that the discharger must immediately comply with the individual targets and limits on a more aggressive schedule. The consequences for failure to achieve discharge limits and receiving water limits may result in all of the same consequences and additionally may be enforced as an order violation. Enforcement of this Order will be conducted consistent with the State Water Board's Enforcement Policy. The Central Coast Water Board will also periodically review the Order as described in the Order Effectiveness Evaluation of the **Order, Part 1, Section A**.

Trial Court and Appellate Court Decisions on State Board Modified Order

139. 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.[8] 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.

[8] State Board Order WQ-2013-0101 is available online at the State Water Resources Control Board website at: **State Water Resources Control Board Order WQ 2013-0101**.

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.

140. 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.

141. 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*."

142. 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." 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.

143. 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 **specific time schedule** and corresponding **quantifiable milestones** 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.'* ***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***" (emphasis added).

144. 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.

145. 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."

146. 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).

147. The court decisions indicate that the inclusion of numeric limits, time schedules, and monitoring and reporting in an order regulating nonpoint source discharges will 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 requires Dischargers not cause or contribute to exceedances of water quality objectives except in accordance with the time schedules and 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 either incorporates quantifiable milestones or the Order requires submission of a work plan incorporating 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 and discharge targets and limits, and receiving water limits. For follow-up surface receiving water implementation work plans, quantifiable milestones include numeric interim quantifiable milestones for relevant constituents (e.g., pollutant load or concentration) and numeric interim quantifiable milestones for management practices implemented that confirm progress towards reducing the discharge of relevant constituents (e.g., volume of discharge water diverted to treatment systems, treatment system pollutant reduction, distance of riparian area improvements, acres no longer receiving conventional pesticide applications).

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.

148. 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 and the State Nonpoint Source Program Implementation Plan

149. 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.

150. 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.

151. 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.[9]

152. 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.

153. 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."

154. A chapter of the CZARA NPS Guidance directly relate to requirements included in this Order: *Management Measures for Agricultural Sources*. This chapter identifies both "management measures" and "management practices."

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

156. 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*

[9] The State Water Board NPS Implementation Plan can be found online at the State Water Resources Control Board website: **Nonpoint Source Pollution (NPS) Control Program.**

programs need to specify or require the implementation of the particular management practices *described in this document*."

157. The CZARA NPS Guidance document describes how USEPA determined that the protection 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.*"

158. 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)*."

159. 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 or bordering 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 protection
    i. Prohibition of removing existing riparian area vegetation.

Conclusion Regarding NPS Policy Compliance

160. This Order complies with the NPS Policy by establishing numeric limits in the form of application and discharge targets and limits, and receiving water limits, 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 and discharge targets and limits, and receiving water limits established as quantifiable milestones in this Order, including the interim milestones specified in the Order for groundwater and the interim milestones to be developed through the follow-up receiving water implementation work plans for surface water, 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.

161. In summary, this Order requires Dischargers to implement, assess, and improve management practices, as needed, to achieve the Order's numeric application and discharge targets and limits, and receiving water limits. 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.

162. 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

163. 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."

164. 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.)

165. 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 Interpretation and Guidance

166. *Asociación de Gente Unida por el Agua v. Central Valley Regional Water Quality Control Board* (2012) 210 Cal.App.4th 1255 (*AGUA*) is the seminal case applying the Antidegradation Policy. The *AGUA* decision 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 decision held that the order was subject to the Antidegradation Policy but did not contain adequate antidegradation findings supported by substantial evidence in the record.

167. State Water Board Order 2018-0002 (ESJ Order) reviewed and modified WDRs by the Central Valley Water Board for agricultural discharges in an area of the central valley region and specifically reviewed the antidegradation findings of the WDRs. The State Water Board stated: "[W]e take this opportunity to provide specific direction to the regional water boards on how to apply the Antidegradation Policy to nonpoint sources." The ESJ Order is a precedential order and constitutes the most current direction to the regional boards on applying the antidegradation policy to agricultural discharges.

168. The ESJ Order states as follows with regard to the baseline for determination of whether a water body is high-quality:

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."

169. The ESJ Order upheld the Central Valley Water Board's WDRs' maximum benefit findings. The findings stated that the state depends on central valley agriculture for food production and that the communities rely on agriculture for employment. The findings considered the social costs of the discharges and "reasonably concluded that the General WDRs' requirements to address all exceedances of water quality objectives according to the terms of a time schedule, implement best practicable treatment and control where irrigated agricultural waste discharges may cause degradation, and the inclusion of performance standards that work to prevent further degradation of surface and groundwater quality, should ensure that local communities not incur any additional treatment costs associated with the limited degradation authorized by the General WDRs."

170. The ESJ Order found that the WDRs, as revised by the State Water Board, implemented best practicable treatment or control through requirements for farm evaluations and irrigation and nutrient management plans, the use of the A and R values, and the development and refinement of management plans to address exceedances, among other provisions.

171. The AGUA court's analysis relied in part on the State Water Board's interpretation of the Antidegradation Policy set forth in older guidance issued in 1990 and 1995.

172. 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, AGUA states that it may be instructive for the implementation of Resolution No. 68-16 on some issues.

173. AGUA states: "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.' If the baseline water quality is equal to or less than the objectives, the objectives set forth the water quality that must be maintained or achieved. . . However, if the baseline water quality is better than the water quality objectives, the baseline water quality must be maintained in the absence of findings required by the antidegradation policy."

174. 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 as of 1995 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 and of better quality than that necessary to protect beneficial uses. The [Water Code] directs the [State Water 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.)

175. The ESJ Order's direction on baseline water quality and the determination of whether a water body is a high-quality water is consistent with *AGUA* and with prior State Board guidance. *AGUA* does not address the granularity with which the determination must be made. The ESJ Order states that "*it is inappropriate to apply a discrete point source discharge approach in the context of a general order regulating both surface water and groundwater discharges from irrigated agriculture operations across a large landscape*." The ESJ Order states that the regional water

boards may conduct a general assessment of the existing water quality data that is reasonably available.

176. *AGUA* also references the Resolution No. 68-16 Guidance Memorandum in discussing the appropriate analyses required to determine maximum benefit and Best Practicable Treatment or Control (BPTC).

177. 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.” The ESJ Order does not reference the four enumerated factors as required for the maximum benefit analysis. In any case, factor (1) is subsumed in Resolution 68-16’s requirement that discharges “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.” Factor (4) is similarly subsumed in the requirement to consider best practicable treatment or control. Factor (3) is a narrow consideration with limited relevance in the nonpoint source context, explained further in APU 90-004 as follows: “The proposed discharge – while actually causing a reduction in water quality in a given water body – may be simultaneously causing an increase in water quality in a more environmentally sensitive body of water from which the discharge in question is being diverted.” Finally, *AGUA* does not consider the granularity with which a maximum benefit analysis must be made, and the ESJ Order did not direct a site-specific or community-specific analysis.

178. 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.” *AGUA* states: “*Thus, the agency should consider current technologies and cost and may, where appropriate, consider federal requirements setting forth the best available technology.*”

Implementation of the Antidegradation Policy

179. 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 or when an objective was established, if later,, 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).

180. When undertaking an antidegradation analysis, the regional board must compare the baseline water quality to the water quality objectives. The determination of whether a water body is high-quality is made 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 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.

181. Depending on the outcome of the 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 the consideration of maximum benefit to the people of the state and the implementation of BPTC to protect, limit degradation of, or restore high-quality water. As a floor, the regional board must include limits to prevent degradation of high-quality waters below objectives or restore water quality to objectives where past degradation has occurred. The regional board must incorporate monitoring and reporting to confirm prescribed requirements are being met.

182. To effectively protect high-quality water, the Antidegradation Policy requires a baseline water quality analysis based on the quality of the waters in 1968 (or the

adoption date of applicable water quality objectives if after 1968) prior to any unauthorized degradation. While degradation permitted by prior regional board action may reset the baseline, the degradation must have occurred consistent with appropriate antidegradation findings. 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.

183. 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 in or 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.

Baseline Water Quality Assessment and Determination of High-Quality Waters

184. 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[10] (e.g., aldicarb, chlorpyrifos, diazinon, imidacloprid, permethrin, glyphosate), chloride, sulfate, turbidity, and total dissolved solids.

185. 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

186. 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 Third-Party Surface Water 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.

187. 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 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

[10] 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.

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).

188. 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.

189. 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.

Potential for Degradation of High-Quality Waters

190. 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).

191. 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).

192. 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.

193. 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.

194. 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 protected, consistent with these antidegradation findings. 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; and time schedules for numeric limits for sediment 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 by 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.

195. 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 targets and limits on pollutants. As directed in the State Water Board's ESJ Order (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. The Order allows time schedules for agricultural discharges to cease causing or contributing to exceedances of water quality objectives. Such time schedules are specifically allowed by Water Code section 13263.

196. The Central Coast Water Board anticipates that the management practices implemented to comply with the numeric targets and 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 of high-quality waters under the requirements of this Order. In particular, the Central Coast Water Board anticipates degradation of some 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 targets and limits via the implementation of management practices. As appropriate controls and management practices are implemented in accordance with time schedules, the degradation is expected to be limited and, in many cases, reversible. In some cases, the Central Coast Water Board anticipates that, over time, impaired water bodies that were historically high-quality can be improved to water quality better than the objectives. In other cases, such as groundwater basins that were historically high-quality but are now impaired for nitrates, the degradation, up to the objectives, may be long-term. In these latter cases, the Order authorizes degradation only up to the level of the objectives and requires implementation of controls and compliance with targets and limits such that agricultural discharges will over time not cause or contribute to exceedances of the objectives. While the Central Coast Water Board makes findings below authorizing degradation of high-quality waters under this Order, the Central Coast Water Board will, wherever feasible, require controls to prevent and reverse degradation by working with dischargers and third parties to ensure controls are implemented in an iterative manner as technology evolves and advances.

197. The Central Coast Water Board finds that allowing degradation of high-quality waters that is unavoidable or irreversible even with successful implementation of and compliance with the conditions of this Order, as periodically revisited and amended by the Board, is consistent with maximum benefit to the people of the state. Agriculture constitutes a significant asset to the central coast region as an economic driver, a producer of jobs, and a source of healthy, local food. The extensive social and economic costs of agricultural discharges similarly laid out in the findings that follow are primarily associated with historic degradation of water bodies below applicable objectives, which is prohibited by the antidegradation policy. These costs

are addressed by the Order's requirement for dischargers to meet receiving water limitations – the floor of the antidegradation policy -- in accordance with time schedules that support restoration of impaired water bodies to objectives over time. This approach is to the maximum benefit of the people of the state because the alternative, i.e. immediate compliance with objectives, may require immediate cessation of agricultural discharges, threatening the benefits associated with continued agricultural production in the region. The Central Coast Water Board recognizes in particular that users of groundwater for drinking water will continue to bear the cost of the historic degradation of high-quality waters for the duration of the time schedules, but such costs are being addressed through other authorities requiring replacement water. Further, the permit does not allow further degradation of such impaired water bodies, but instead requires the establishment of quantifiable interim milestones tied to improved water quality results in agricultural discharges. (See Maximum Benefit findings below.)

198. The Central Coast Water Board further finds that the permitted discharges will be controlled by the Best Practicable Treatment or Control (BPTC). (See BPTC findings below.)

Maximum Benefit to the People of the State

Agricultural Benefits

199. 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).

200. 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).

201. 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).

202. 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

203. 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.

204. 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).

205. 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.

206. 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.

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

208. 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.

209. 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.

210. 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).

211. 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.

212. 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.

213. 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).

214. 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.

215. 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.

216. 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).

217. 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).

218. 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.

219. 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.

220. 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.

221. 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.

222. 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.

223. 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.[11]

224. 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).

225. 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.

226. 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

[11] Reverse osmosis systems cost factors can be bound online at the Best Osmosis Systems website: **Reverse Osmosis System Cost Factors**.

logistically difficult. If the nitrate loading due to agricultural activities is not significantly reduced, these costs will continue to increase.

227. 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).

228. 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.

229. 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).

230. Agricultural discharges also impact beneficial uses protecting aquatic life, wildlife habitat, and rare, threatened, and endangered species habitat. Impacts on these beneficial uses have costs that are difficult to quantify, but impact users of the waterbodies, including the agricultural growers, as well as residents, recreators, and visitors. Because the Order does not authorize degradation below applicable objectives that have been developed to protect these beneficial uses, the costs associated with impacts on the beneficial uses through exceedances of the objectives are addressed through other provisions of the Order. Where waterbodies

are currently impaired, the Order requires compliance with receiving water limitations protective of the beneficial uses in accordance with a compliance schedule, including but not limited to limits for nitrate, ammonia, orthophosphate, diazinon, chlorpyrifos, and sediment. The Order prohibits disturbance of existing, naturally occurring, and established native riparian vegetative cover, unless authorized. Dischargers must avoid disturbance in riparian areas to minimize waste discharges and protect water quality and beneficial uses. In the case where disturbance of riparian areas is authorized, Dischargers must implement appropriate and practicable measures to avoid, minimize, and mitigate erosion and discharges of waste.

Best Practicable Treatment or Control (BPTC)

231. 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.

232. 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.

233. This Order establishes numeric application and discharge targets and limits, and receiving water limits with associated time schedules. In practice, to achieve these numeric targets and 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.

234. On-farm management practices addressing nutrient, pesticide, and sediment discharges 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; and vegetated buffers to protect instream beneficial uses; etc.

235. Current management practices that constitute existing BPTC may not be capable at this time of achieving water quality objectives expressed as final numeric targets and limits required by this Order. However, the phasing-in of more stringent numeric targets and 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 targets and limits. In addition, the Order's monitoring and reporting requirements are intended to evaluate the effectiveness of management practices and their implementation.

236. 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 (groundwater wells, nitrogen applied minus nitrogen removed, ranch-level groundwater discharge when required by the Executive Officer, and ranch-level surface discharge when required by the Executive Officer), receiving water monitoring (surface receiving water and follow-up surface receiving water), and monitoring of riparian areas to reduce pollutant discharges and protect beneficial uses.

237. 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.

238. Full implementation of the Irrigated Lands Program (ILP) 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

239. 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.

240. 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.*"

241. 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.

242. 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.)*"

243. 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.

244. 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.

245. The Central Coast Water Board is implementing the Central Coast Water Board's human right to water resolution through this Order by establishing targets and limits for fertilizer application and nitrogen discharge designed to be quantifiable and enforceable to 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.

246. The Central Coast Water Board will continue to prioritize drinking water and replacement water activities, 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

247. 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.

248. 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.

249. 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."*

250. 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.

251. 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.

252. This Order requires the protection of existing riparian vegetation. 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.2** of this document.

Eastern San Joaquin Watershed Agricultural Order

253. 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. The ESJ Order was upheld by the Sacramento Superior Court.[12] This section discusses the

[12] Ruling on Submitted Matter and Order, Oct. 23, 2020, *Environmental Law Foundation v. State Water Board* (Sacramento Sup. Ct., Case No. 34-2018-80002851, Oct. 23, 2020); *Protectores Del Agua Subterranea v. State Water Board* (Sacramento Sup. Ct. Case No. 34-2018-80002852, Oct. 23, 2020);

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.

254. 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). Further, this Order includes alternative requirements for Dischargers that opt to be regulated individually and Dischargers that opt to be regulated through participation in a third-party group. The third-party alternative compliance pathway is consistent with the third-party approach of the ESJ Order.

255. 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**).

256. Management practice reporting.

Monterey Coastkeeper v. Central Valley Water Board and State Water Board (Sacramento Sup. Ct. Case No. 34-02018-80002853, Oct. 23, 2020). The Superior Court ruling is now on appeal.

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.

257. 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.3; ACF section of the MRP**).

258. 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**).

259. 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. At a minimum, the certification requirement for all low-vulnerability growers that are determined to be outliers. . . is precedential statewide. 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 includes the requirement for a subset of Dischargers to have their INMP certified if the Discharger repeatedly exceeds the Nitrogen Discharge Targets and/or Limits. For INMPs that are required to be certified, the certification language shall be used.

260. 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.

261. 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.

262. 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**).

263. 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.

264. 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 targets and limits to identify outliers; that is, an outlier is a Discharger who applied nitrogen in excess of the relevant nitrogen application limit 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, INMP certification by a qualified professional, implement additional or improved management practices, lower fertilizer nitrogen application limits, and/or increased monitoring and reporting. (**Order, Part 2, Section C.1**).

265. 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 submit proposals for alternative monitoring and reporting requirements for approval by the Executive Officer. (**Order, Part 2, Section C.1**)

266. 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.

267. 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 on an annual basis.[13] 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**).

268. Groundwater quality trend monitoring and reporting.

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*

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[13] 1,2,3-Trichloropropane is also considered a monitoring parameter, but the monitoring frequency will depend on analytical results obtained during the first two years this Order is in effect.

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 quality trend monitoring and reporting 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**).

269. 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 a process for a third-party program to develop the Groundwater Protection Formula, Values, and Targets for designated groundwater protection areas consistent with the precedential direction in the ESJ Order.

d. For Dischargers that do not participate in the third-party program, this Order establishes nitrogen discharge targets and limits based on the calculation of nitrogen applied (A) minus nitrogen removed (R). For Individual Dischargers not participating in the third-party program, 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 ranch 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 for individual Dischargers not participating in a third-party program. (**Order, Part 2, Section C.1; Order, Part 2, Table C.1-3**).

270. Regulatory approach for groundwater protection

a. *"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).

b. Pending the development of the Groundwater Protection Formula, Values, and Targets by the third party, this Order sets Fertilizer Nitrogen Application limits and Nitrogen Discharge targets to be met by individual Dischargers. These targets are not "regulatory" as that term is used in the ESJ Order. Failure to meet the targets is not a permit violation, but the permit establishes consequences for their exceedance, including additional education, implementation of additional or improved management practices, or loss of membership in a third-party program.

c. For Discharges that do not participate in a third-party program, this Order sets nitrogen application limits and A-R targets and limits. The limits are consistent with the ESJ Order's direction for the reasons stated below.

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 2023. 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** of this Attachment A.

f. The A-R data-based nitrogen discharge values established by this Order act only as targets until 2027 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 2027, the A-R values are implemented as limits, with the final limit of 50 pounds per acre not effective until 2051. Additional discussion on the nitrogen discharge targets and limits is included in **Section C.1** of this Attachment A.

g. If prior to 2027 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.1-3**).

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.

Tables Related to 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
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

GROUNDWATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
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:* mical 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

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
Chemical Constituents Waters shall not contain concentrations of chemical constituents in amounts which adversely affect the agricultural 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.	AGR
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 ≤. 0. 004 mg/L in soft water (Hard water is defined as water exceeding 100 mg/L $CaCO_3$).	COLD, WARM

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
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 >3. 0 mmho/cm	AGR

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
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
pH The pH value shall not be depressed below 6. 5 nor above 8. 3.	MUN, REC-1, REC-2, AGR

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
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:* 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.	All Surface Waters

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
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
Temperature At no time or place shall the temperature be increased by more than 5ºF 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.	

SURFACE WATER QUALITY OBJECTIVE (Objectives are numeric unless labeled "narrative")	**BENEFICIAL USE**
Turbidity *Narrative Objective:* rs shall be free of changes in turbidity that cause nuisance or adversely affect beneficial uses. *ators of Narrative Objective:* dity 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.	All Surface Waters

(Source: Shoup and Wahl, 2009)

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)
								Pesticides						
			Chloride	Conductivity	Nitrate	Sulfate	Total Dissolved Solids	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

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)
4.05	Upper Valley Aquifer	Monterey	HQ	HQ	HQ	HQ	HQ	HQ	INSF	INSF	HQ	HQ	HQ	YES
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
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

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)
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
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

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)
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
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

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)
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**
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)							Pesticides						HIGH-QUALITY WATER (for one or more constituents)
			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	INSF	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	INSF	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

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	
331300	San Antonio	Santa Barbara	HQ	HQ	HQ	HQ	INSF	HQ	HQ	ND	ND	ND	ND	ND	ND	YES
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

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	
331420	Santa Rita	Santa Barbara	**HQ**	**HQ**	**HQ**	**HQ**	INSF	INSF	**HQ**	**ND**	INSF	INSF	**ND**	**ND**	**ND**	**YES**
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**

Tables related to Cost Considerations

Table A.B-5. Direct and Total Economic Effects - Central Coast Region Agricultural Industry

	Direct Effects				Total Effects[1, 2]		
	Industry Output (sales)[3] ($million)	**Employment[4] (jobs)**	**Labor Income[5] ($million)**	**Value Added[6] ($million)**	**Employment (jobs)**	**Labor Income ($million)**	**Value Added ($million)**
Agricultural production and processing	14,028	110,686	3,894	6,728	183,606	7,213	12,594
Agricultural processing[7]	8,371	30,069	1,464	3,023	38,118	3,131	5,673
Agricultural production	5,657	80,617	2,430	3,705	112,098	3,728	6,019
Forestry, fishing, hunting	138	1,589	31	59	2,387	62	105
Ag-support activities	1,217	34,052	1,032	852	45,274	1,507	1,653
Farming	4,301	44,976	1,368	2,794	66,628	2,244	4,318
Grains, oilseeds, cotton	7	241	1	3	293	3	6
Vegetables, fruits, nuts	3,095	30,316	892	1,971	50,423	1,689	3,241
Greenhouse & nursery	882	9,935	442	755	14,439	629	1,082
Other crops	51	547	11	27	881	24	49

	Direct Effects				Total Effects[1, 2]		
	Industry Output (sales)[3] ($million)	Employment[4] (jobs)	Labor Income[5] ($million)	Value Added[6] ($million)	Employment (jobs)	Labor Income ($million)	Value Added ($million)
Beef & dairy cattle	185	2,447	10	17	3,524	46	81
Other animals	81	1,490	13	21	1,817	26	45
Total central coast economy	506,351	3,666,203	206,648	303,956	-	-	-

(UCCE AIC, 2009)

Note: Direct and total effects are in nominal dollars.

[1]Total effects include direct, indirect, and induced effects.

[2]Values that utilize multiplier effects cannot be aggregated to get totals.

[3]Industry output: value of production (i.e., total sales) by the group of industries named at the left.

[4]Employment: number of jobs directly employed by the corresponding industry.

[5]Labor income: value of wages and salaries and other proprietary income paid by industry.

[6]Value added equals sum of labor income (employee compensation and proprietor income), property income, and indirect business taxes. This is the same as total sales (industry output) less purchased inputs and services.

[7]This group includes animal feed, food, and beverage industries.

Table A.B-6. Total Value of Agricultural Production and Leading Commodities - County Rank (2017)

Rank[1]	County	Total Value ($1,000)	Leading Commodities
1	Kern[2]	7,254,004	Grapes (Table), Almonds, Milk, Pistachios
4	Monterey	4,425,425	Strawberries, Lettuce, Broccoli, Grapes (Wine)
8	Ventura	2,099,889	Strawberries, Lemons, Celery, Raspberries
13	Santa Barbara	1,590,351	Strawberries, Broccoli, Grapes (Wine), Vegetables
15	San Luis Obispo	924,743	Grapes (Wine), Strawberries, Vegetables, Cattle & Calves
23	Santa Cruz	574,123	Strawberries, Raspberries, Blackberries, Vegetables, Nursery Products
27	San Benito	367,453	Vegetables, Lettuce, Peppers (Bell), Grapes (Wine)
29	Santa Clara	315,456	Mushrooms, Nursery (Products), Nursery (Woody Ornaments), Lettuce
33	San Mateo	138,995	Nursery (Plants), Brussels Sprouts, Flowers (Cut), Vegetables

(CDFA, 2018)

[1]Rank is out of all 58 counties in California.

[2]Only a small portion of Kern County is located in the central coast region.

Table A.B-7. Costs per Acre to Produce and Harvest Romaine Hearts

Operation	Equipment Time (Hrs/Ac.)	Cash and Labor Cost per Acre ($)					
		Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom / Rent	Total Cost
CULTURAL:							
Soil Samples (12 per 250 Ac.)	0.00	0	0	0	0	8	8
Disc & Roll 6X	1.73	51	84	56	0	0	191
Sub-Soil 2X	1.02	30	50	33	0	0	114
Land Plane (1X per 2 Crops)	0.18	5	9	5	0	0	19
Laser Level (1X per 2 Crops)	0.00	0	0	0	0	20	20
Compost-Spread (1X per 2 Crops)	0.00	0	0	0	110	20	130
Chisel 4X	1.42	42	69	45	0	0	157
List Beds 3-Row	0.00	0	0	0	0	23	23
Cultivate-Lilliston 2X	0.40	12	11	8	0	0	31
Power Mulch/Shape Beds	0.48	14	17	7	0	0	38
Fertilizer (Potassium Sulfate)	0.00	0	0	0	137	20	157
Plant/Fertilize (7-0-0-7)	0.57	17	21	18	426	0	482
Herbicide Application	0.00	0	0	0	80	20	100
Sprinkler Setup/Irrigate 4X	0.00	104	0	0	76	0	180
Cultivate-Sled	0.32	9	9	5	0	0	24
Thin Stand-Automated/Fertilize	0.00	0	0	0	50	150	200
Disease/Insect Management	0.00	0	0	0	759	120	879
Cultivate/Break Bottoms	0.22	6	6	4	0	0	16

Operation	Equipment Time (Hrs/Ac.)	Cash and Labor Cost per Acre ($)					
		Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom / Rent	Total Cost
Hand Weed (2X)/Remove Doubles 1X	16.00	299	0	0	0	0	299
Drip Setup/Irrigate	1.32	205	47	24	490	0	766
Fertigate (20-0-0-5) 2X	0.00	0	0	0	87	0	87
PCA/CCA Fee	0.00	0	0	0	0	35	35
Pickup-3/4 Ton Farm Use	1.00	30	7	5	0	0	42
TOTAL CULTURAL COSTS	**24.7**	**826**	**331**	**210**	**2,214**	**415**	**3,997**
HARVEST:							
Harvest/Field Pack	0.00	0	0	0	0	5,400	5,400
Cool/Palletize	0.00	0	0	0	0	1,125	1,125
Market/Sales Fee	0.00	0	0	0	0	900	900
TOTAL HARVESTING COSTS	**0.00**	**0**	**0**	**0**	**0**	**7,425**	**7,425**
Interest on Operating Capital at 6.25%							112
TOTAL OPERATING COSTS/ACRE	**24.7**	**826**	**331**	**210**	**2,214**	**7,840**	**11,534**
CASH OVERHEAD:							
Land Rent	-	-	-	-	-	-	1,450
Liability Insurance	-	-	-	-	-	-	2
Food Safety Program	-	-	-	-	-	-	50
Regulatory Program	-	-	-	-	-	-	60
Office Expense	-	-	-	-	-	-	375
Field Sanitation	-	-	-	-	-	-	12

Operation	Equipment Time (Hrs/Ac.)	Cash and Labor Cost per Acre ($)					
		Labor Cost	Fuel	Lube & Repairs	Material Cost	Custom / Rent	Total Cost
Property Taxes	-	-	-	-	-	-	10
Property Insurance	-	-	-	-	-	-	1
Investment Repairs	-	-	-	-	-	-	22
TOTAL CASH OVERHEAD COSTS/ACRE	-	-	-	-	-	-	**1,981**
TOTAL CASH COSTS/ACRE	-	-	-	-	-	-	**13,515**
NON-CASH OVERHEAD:	**Per Producing Acre**	**Annual Cost Capital Recovery**					**Total Cost**
Building 2400 sq. ft.	64	6					6
Fuel Tanks Overhead	7	1					1
Shop Tools	13	1					1
Sprinkler System	247	20					20
Sprinkler Pipe	759	55					55
Equipment	1,890	265					265
TOTAL NON-CASH OVERHEAD COSTS	**2,981**	**348**					**348**
TOTAL COSTS/ACRE							**13,864**
TOTAL COSTS PER ACRE – HARVEST COSTS PER ACRE = GROWING COSTS PER ACRE $13,864 - $7,425 = $6,239							

(Tourte, et al., 2019)

Notes: See source document for a description of the inputs/cost categories and assumptions used. Costs per acre can vary considerably depending upon many variables including individual grower, production location and weather conditions, land rent and taxes, soil type, water costs, pest pressures, material inputs, and energy costs.

Table A.B-8. Ranging Analysis – Romaine Hearts

OPERATING COSTS/ACRE:	Yield (Carton)						
	600.00	**650.00**	**700.00**	**750.00**	**800.00**	**850.00**	**900.00**
ral	3,997	3,997	3,997	3,997	3,997	3,997	3,997
est	5,940	6,435	6,930	7,425	7,920	8,415	8,910
est on Operating Capital at 6.25%	104	107	109	112	115	117	120
Operating Costs/Acre	10,041	10,539	11,036	11,534	12,031	12,529	13,027
Operating Costs/Carton	16.74	16.21	15.77	15.38	15.04	14.74	14.47
Overhead Costs/Acre	1,981	1,981	1,981	1,981	1,981	1,981	1,981
Cash Costs/Acre	12,023	12,520	13,018	13,515	14,013	14,511	15,008
Cash Costs/Carton	20.04	19.26	18.60	18.02	17.52	17.07	16.68
Cash Overhead Costs/Acre	348	348	348	348	348	348	348
Costs/Acre	12,371	12,869	13,366	13,864	14,361	14,859	15,357
Costs/Carton	21.00	20.00	19.00	18.00	18.00	17.00	17.00
Net Return per Acre above Operating Costs for Romaine Hearts							
Price ($/Carton)	**Yield (Carton/Acre)**						
Romaine Hearts	**600.00**	**650.00**	**700.00**	**750.00**	**800.00**	**850.00**	**900.00**
9.00	-4,641	-4,689	-4,736	-4,784	-4,831	-4,879	-4,927
11.00	-3,441	-3389	-3,336	-3,284	-3,231	-3,179	-3,127
13.00	-2,241	-2,089	-1,936	-1,784	-1,631	-1,479	-1,327
15.00	-1,041	-789	-536	-284	-31	221	473
17.00	159	511	864	1,216	1,569	1,921	2,273
19.00	1,359	1,811	2,264	2,716	3,169	3,621	4,073
21.00	2,559	3,111	3,664	4,2216	4,769	5,321	5,873
Net Return per Acre above Cash Costs for Romaine Hearts							
Price ($/Carton)	**Yield (Carton/Acre)**						
Romaine Hearts	**600.00**	**650.00**	**700.00**	**750.00**	**800.00**	**850.00**	**900.00**
9.00	-6,623	-6,670	-6,718	-6,765	-6,813	-6861	-6,908
11.00	-5,423	-5,370	-5,318	-5,265	-5,213	-5,161	-5,108
13.00	-4,223	-4,070	-3,918	-3,765	-3,613	-3,461	-3,308

OPERATING COSTS/ACRE:	**Yield (Carton)**						
	600.00	**650.00**	**700.00**	**750.00**	**800.00**	**850.00**	**900.00**
15.00	-3,023	-2,770	-2,518	-2,265	-2,013	-1,761	-1,508
17.00	-1,823	-1,470	-1,118	-765	-413	-61	292
19.00	-623	-170	282	735	1,187	1,639	2,092
21.00	577	1,130	1,682	2,235	2,787	3,339	3,892
Net Return per Acre above Total Costs for Romaine Hearts							
Price ($/Carton)	**Yield (Carton/Acre)**						
Romaine Hearts	**600.00**	**650.00**	**700.00**	**750.00**	**800.00**	**850.00**	**900.00**
9.00	-6,971	-7,019	-7,066	-7,114	-7,161	-7,209	-7,257
11.00	-5,771	-5,719	-5,666	-5,614	-5,561	-5,509	-5,457
13.00	-4,571	-4,419	-4,266	-4,114	-3,961	-3,809	-3,657
15.00	-3,371	-3,119	-2,866	-2,614	-2,361	-2,109	-1,857
17.00	-2,171	-1,819	-1,466	-1,114	-761	-409	-57
19.00	-971	-519	-66	386	839	1,291	1,743
21.00	229	781	1,334	1,886	2,439	2,991	3,543

(Tourte, et al., 2019)

Notes: See source document for a description of the inputs/cost categories and assumptions used. Costs per acre can vary considerably depending upon many variables including individual grower, production location and weather conditions, land rent and taxes, soil type, water costs, pest pressures, material inputs, and energy costs.

Table A.B-9. Average Annual Environmental Regulatory Costs by Crop

	Average Total Cash Costs ($/Acre)	**Air Quality Requirements ($/Acre)**	**Water Quality Requirements ($/Acre)**	**Pesticide Use Requirements ($/Acre)**	**Total Environmental ($/Acre)**	**Share of Total Cash Costs (%)**
Citrus	$5,862.12	$41.97	$9.16	$15.95	$67.09	1.14%
Cotton	$1,089.76	$0.40	$45.65	$1.84	$47.88	4.39%
Grape	$6,434.18	$21.60	$8.02	$4.97	$34.59	0.54%
Tree Nut	$2,746.40	$57.99	$6.45	$10.81	$75.25	2.74%
Silage	$940.97	$14.58	$10.93	$0.76	$26.27	2.79%
Stone Fruit	$9,035.73	$52.89	$1.98	$197.57	$252.43	2.79%
Tomato	$2,558.47	$36.43	$4.67	$57.34	$98.44	3.85%

(McCullough, et al., 2017)

Table A.B-10. Average Total Regulatory Costs as a Share of Average Operating Costs

	Average Total Cash Costs ($/Acre)	Average Total Regulatory Costs ($/Acre)	Share of Total Cash Costs (%)
Citrus	$5,862	$98	1.67%
Cotton	$1,090	$61	5.59%
Grape	$6,434	$63	0.98%
Tree Nut	$2,746	$122	4.43%
Silage	$941	$33	3.55%
Stone Fruit	$9,036	$180	1.99%
Tomato	$2,558	$113	4.43%

(McCullough, et al., 2017)

Table A.B-11. Estimated Regulatory Cost by Farm Income

Farm Income Range	Total California Regulatory Cost by Farm Income	Average Regulatory Cost per Farm	Average Regulatory Cost per Acre	Regulatory Cost as a Percentage of Farm Income
Under $10,000	$9,306,511	$262	$51	5.24%
$10,000 - $49,999	$39,190,084	$2,447	$189	8.16%
$50,000 - $99,999	$30,816,042	$4,708	$152	6.28%
$100,000 - $249,999	$112,659,422	$16,078	$167	9.19%
$250,000 - $449,999	$82,966,217	$20,721	$271	5.53%
$500,000 +	$1,924,943,890	$252,518	$638	6.33%
All Incomes	$2,199,882,166	$28,570	$162	6.41%

(Hurley and Noel, 2006)

This table shows results for Scenario 2 in the study, which used farm income estimates at the median of the income ranges.

Table A.B-12. Comparisons of Net Income after Taxes With and Without Regulatory Costs on a California Orange Farm (2008 – 2012)

Year	Net Income after Taxes when Regulatory Compliance Costs are Included in the Cost of Production, 2008-2012 (Mean)	Net Income after Taxes when Regulatory Compliance Costs are Excluded from the Cost of Production, 2008-2012 (Mean)
2008	$35,159	$112,784
2009	$58,957	$133,211
2010	$82,855	$154,697
2011	$130,608	$199,226
2012	$174,317	$239,942
Average	$96,379	$167,972

(Paggi, et al., 2009)

Table A.B-13. Example Management Practice (MP) Implementation Cost

No.[1]	MP Name[2]	MP General Practice Description[2]		Scenario[3] Name/Descriptor	Scenario Unit	Feature Measure	Scenario Typical Size	Scenario Total Cost	Scenario Cost Per Unit
327	Conservation Cover	This practice involves establishing and maintaining a permanent vegetative cover on lands that are either not currently in use/production or lands currently in production that would be taken out of production. The practice does not apply to plantings for forage production or to critical area plantings. This practice can be applied on a portion of the field. The Conservation Cover practice may be implemented to reduce erosion and sedimentation and reduce associated groundwater and surface water quality degradation by nutrients and sediment, as well as other purposes. As shown in the scenarios at right, costs of implementation vary based on the type of vegetative cover species used (e.g., introduced, native, or a mix that provides habitat for pollinators and/or monarch butterflies) and whether the vegetative cover is established in orchard and vineyard alleyways. Foregone income is considered in situations where land is taken out of production to make way for the conservation cover.	1	Introduced species	Acre	Area planted	50	$6,724.50	$134.49
			2	Native species	Acre	Area planted	50	$9,413.50	$188.27
			3	Orchard or vineyard alleyways	Acre	Area planted	20	$1,849.56	$92.48
			4	Pollinator species	Acre	Area planted	1	$1,088.86	$1,088.86
			22	Monarch species mix	Acre	Area planted	1	$1,403.97	$1,403.97
			27	Introduced with foregone income	Acre	Area planted	50	$16,016.75	$320.34
			28	Native species with foregone income	Acre	Area planted	50	$19,417.75	$388.36
			29	Pollinator species with foregone income	Acre	Area planted	1	$1,288.95	$1,288.95
			56	Monarch species mix with foregone income	Acre	Acre	1	$1,426.57	$1,426.57
328	Conservation Crop Rotation	This practice involves growing crops in a planned sequence on the same ground over a period of time (i.e., the rotation cycle). This practice may be implemented to reduce erosion and maintain or increase soil; reduce water quality degradation due to excess nutrients; reduce the concentration of salts and other chemicals from saline seeps, or for other purposes. As shown in the scenarios at right, costs vary based on whether specialty crops are involved.	1	Basic rotation organic and non-organic	Acre	Area planted	100	$1,330.80	$13.31
			5	Specialty crops organic and non-organic	Acre	Area planted	50	$1,774.40	$35.49
			68	Specialty crops, small farm	Each	Crop rotations developed	1	$1,153.36	$1,153.36
332	Contour Buffer Strips	This practice involves establishing narrow strips of permanent, herbaceous vegetative cover around hill slopes, which are alternated down the slope with wider cropped strips that are farmed on the contour. This practice may be implemented to reduce erosion and associated water quality degradation from the transport of sediment and other water-borne contaminants downslope. For the scenarios shown at right, it is assumed that the area of the contour grass strip is taken out of production. Foregone income is included in the calculations.	9	Introduced species, foregone income (organic and non-organic	Acre	Number of acres	1	$318.68	$318.68
			10	Native species, foregone income (organic and non-organic)	Acre	Number of acres	1	$322.24	$322.34
			11	Wildlife/pollinator, foregone income (organic and non-organic)	Acre	Number of acres	1	$404.15	$404.15
340	Cover Crop	This practice involves planting grasses, legumes, and/or forbs for seasonal vegetative cover. The practice may be implemented to reduce erosion, maintain or increase soil health and organic matter content, reduce water quality degradation by utilizing excessive soil nutrients, or for other purposes. Scenario costs at right vary based on whether organic crop species/methods are used, and whether multiple crop species are implemented. The adaptive management scenario includes implementing replicated strip trials on a field	1	Basic (organic and non-organic)	Acre	Area planted	40	$2,696.00	$67.40
			6	Adaptive management	Each	Area planted	1	$2,543.70	$2,543.70
			11	Multiple species (organic and non-organic)	Acre	Area planted	40	$3,019.60	$75.49
			36	Basic organic	Acre	Area planted	30	$2,482.50	$82.75

		plot to evaluate, identify, and implement a particular cover crop management strategy.							
350	Sediment Basin	This practice involves constructing a basin with an engineered outlet, formed by excavating a dugout, constructing an embankment, or a combination of both. The purpose of the sediment basin is to capture and detain sediment-laden runoff, or other debris for a sufficient length of time to allow it to settle out in the basin.	1	Excavated Basin	Cubic yard	Excavated vol.	1,200	$5,558.74	$4.63
			2	Embankment earthen basin with no pipe	Cubic yard	Embankment vol.	1,500	$7,208.84	$4.81
			3	Embankment earthen basin with pipe	Cubic yard	Embankment vol.	1,500	$12,561.66	$8.37
390	Riparian Herbaceous Cover	This practice involves establishment of riparian herbaceous cover in areas adjacent to streams. Vegetation planted should be tolerant of intermittent flooding or saturated soils (e.g., grasses, sedges, rushes, ferns, legumes, and forbs), and be established or managed as the dominant vegetation in the transitional zone between upland and aquatic habitats. The practice may be implemented as part of a conservation management system to improve and maintain water quality; reduce erosion and improve stability to stream banks and shorelines; provide or improve food and cover for fish, wildlife, and livestock; and/or to provide other benefits. As shown in the scenarios at right, costs vary based on whether the riparian herbaceous cover is established through seeding or plug planting or a combination of the two, and whether species conducive to pollinator habitat are used. Foregone income is considered in situations where land is taken out of production to make way for the establishment of the riparian herbaceous cover.	1	Riparian broadcast seeding	Acre	Acres of rip. cover	1	$1,422.47	$1,422.47
			2	Plug planting	Acre	Acres of rip. cover	0.5	$11,056.45	$22,112.89
			3	Combination broadcast seeding and plug planting	Acre	Acres of rip. cover	1	$11,242.30	$11,242.30
			4	Pollinator cover	Acre	Acre	0.5	$1,342.90	$2,685.80
			5	Broadcast seeding with foregone income	Acre	Acres of rip. cover	0.5	$1,100.39	$2,200.78
			6	Plug planting with foregone income	Acre	Acres of rip. cover	0.5	$11,281.38	$22,562.75
			7	Combination broadcast seeding and plug planting with foregone income	Acre	Acres of rip. cover	0.5	$6,048.24	$12,096.48
			8	Pollinator cover with foregone income	Acre	Acre	0.5	$1,542.29	$3,084.58
391	Riparian Forest Buffer	This practice involves establishment of an area of predominantly trees and/or shrubs located adjacent to and up-gradient from watercourses or water bodies. The practice may be implemented to reduce excess amounts of sediment, organic material, nutrients and pesticides in surface runoff and reduce excess nutrients and other chemicals in shallow groundwater flow; reduce pesticide drift entering the waterbody; restore riparian plant communities; create shade to lower or maintain water temperatures to improve habitat for aquatic organisms; or to provide other benefits. As shown in the scenarios at right, costs vary based on whether riparian forest buffer vegetation is established through seeding, cuttings, bare-root plantings, or small or large containers. For scenarios where land is taken out of production to establish the riparian forest buffer, foregone income is considered.	1	Seeding	Acre	Area of planting	10	$2,553.30	$255.33
			2	Cuttings, small to medium	Acre	Area of planting	1	$1,933.36	$1,933.36
			3	Cuttings, medium to large	Acre	Area of planting	1	$4,673.04	$4,673.04
			4	Bare-root, hand planted	Acre	Area of planting	3	$4,958.12	$1,652.71
			5	Bare-root, machine planted	Acre	Area of planting	3	$4,691.80	$1,563.93
			6	Small container, hand planted	Acre	Area of planting	3	$7,730.39	$2,576.80
			7	Small container, machine planted	Acre	Area of planting	3	$6,719.22	$2,239.74
			8	Large container, hand planted	Acre	Area of planting	3	$20,178.96	$6,726.32
			23	Cuttings, small to medium, with foregone income	Acre	Area of planting	1	$2,215.50	$2,215.50
			24	Small container, hand planted, with foregone income	Acre	Area of planting	3	$8,376.83	$2,792.28
393	Filter Strip	This practice involves establishing a strip or area of herbaceous vegetation that removes contaminants from	5	Filter strip, native species	Acre	Number of acres	1	$171.79	$171.79

		overland flow. Filter strips can be established anywhere environmentally sensitive areas need to be protected from sediment, or other suspended solids, and dissolved contaminants in runoff.	6	Filter strip, introduced species	Acre	Number of acres	1	$185.11	$185.11
441	Irrigation System, Microirrigation	This practice involves implementation of an irrigation system that provides for frequent application of small quantities of water on or below the soil surface (e.g., as drops, tiny streams, or miniature spray through emitters or applicators placed along a water delivery line. Drip tape, tubing, or microsprayers may be used. This practice may be implemented to prevent contamination of groundwater and surface water by efficiently and uniformly applying chemicals, and to maintain soil moisture by efficiently and uniformly applying irrigation water. As shown in the scenarios at right, costs vary based on the size and type of the farming operation (e.g., orchard-vineyard or row crop). Scenarios are also provided for retrofitting an existing irrigation system and replacing filters in a microirrigation system.	1	Vegetation establishment	Acre	Acres in system	1	$610.79	$610.79
			2	Orchard-vineyard, 10 acres or less	Acre	Acres in system	7	$18,793.27	$2,684.75
			3	Orchard-Vineyard, >10 acres	Acre	Acres in system	40	$60,766.00	$1,519.15
			4	Orchard-vineyard, durable tubing replace	Acre	Acres in system	40	$30,492.00	$762.30
			5	Small acreage	Acre	Acres in system	2	$9,288.64	$4,644.32
			6	Row crop, buried manifold	Acre	Acres in system	20	$39,113.64	$1,955.68
			7	Row crop, above-ground PE manifold	Acre	Acres in system	20	$73,469.89	$3,673.49
			8	Retrofit, irrigation automation	Each	Per system	1	$33,935.77	$33,935.77
			9	Filter replace	Acre	Acres in system	40	$16,239.30	$405.98
			13	Subsurface drip irrigation	Acre	Acres in system	60	$124,398.62	$2,073.31
			19	Orchard-vineyard, >10 acres with automation	Acre	Acres in irrigation system	40	$72,934.91	$1,823.37
590	Nutrient Management (NM)	This practice involves managing the amount (rate), source, placement (method of application), and timing of plant nutrients and soil amendments. The practice is implemented to minimize agricultural nonpoint source pollution of surface waters and groundwater, among other reasons. Costs associated with this practice include soil testing, analysis, and implementation of the NM plan and recordkeeping. As shown in the scenarios at right, costs vary based on whether manure injection is used, and whether the NM techniques are implemented on a small farm, with or without diversified crops. The adaptive NM scenario includes implementing replicated strip trials on a field plot to evaluate, identify, and implement various nutrient use efficiency improvement methods for timing, rate, method of application, or source of nutrients.	1	Basic NM (non-organic/organic)	Acre	N/A	40	$389.86	$9.75
			2	Basic NM with manure injection or incorporation	Acre	N/A	40	$1,492.29	$37.31
			3	Small farm NM (non-organic/organic)	Each	N/A	1	$318.43	$318.43
			4	NM with manure and/or compost (non-organic/organic)	Acre	N/A	40	$830.69	$20.77
			5	Basic precision NM (non-organic/organic)	Acre	N/A	40	$2,231.22	$55.78
			8	Adaptive NM	Each	Small plot	1	$2,994.54	$2,994.54
			275	Small farm, diversified crops	Each	Field or mgmt. zone	1	$1,019.46	$1,019.46
595	Integrated Pest Management (IPM)	This practice involves implementing a site-specific combination of pest prevention, pest avoidance, pest monitoring, and pest suppression strategies. An IPM approach seeks to prevent or mitigate off-site pesticide risks to water quality from leaching, solution runoff and adsorbed runoff losses; and prevent or mitigate on-site pesticide risks to pollinators and other beneficial species through direct contact; among other goals. The minimum mitigation index score	1	Field crop less than or equal to 20 mitigation score	Acre	Acres of mgmt. applied	40	$1,044.08	$26.10
			2	Field crop 21 to 40 mitigation index score	Acre	Acres of mgmt. applied	40	$1,324.28	$33.11
			3	Field crop greater than 40 mitigation index score	Acre	Acres of mgmt. applied	40	$1,642.84	$41.07
			4	High value crop less than or equal to 20 mitigation index score	Acre	Acres of mgmt. applied	10	$1,120.80	$112.08

		needed is related to the hazard rating identified through the NRCS WIN-PST[4] program. As shown in the scenarios at right, costs for implementing the IPM practice vary based on the mitigation index score; whether the target field has high value crops, and whether the practice is implemented on a small farm.	5	High value crop 21 to 40 mitigation index score	Acre	Acres of mgmt. applied	10	$1,439.36	$143.94
			6	High value crop greater than 40 mitigation index score	Acre	Acres of mgmt. applied	10	$1,834.64	$183.46
			7	Small farm, less than or equal to 20 mitigation index score	Each	Fields, typ. ≤10 acre	1	$1,059.08	$1,059.08
			8	Small farm, 21 to 40 mitigation index score	Each	Fields, typ. ≤10 acre	1	$2,053.12	$2,053.12
			9	Small farm, greater than 40 mitigation index score	Each	Fields, typ. ≤10 acre	1	$2,371.68	$2,371.68
605	Denitrifying Bioreactor	This practice involves installation of a structure that uses a carbon source to reduce the concentration of nitrate nitrogen in subsurface agricultural drainage flow via enhanced denitrification. Woodchips are commonly used as the carbon source. The practice is implemented to improve water quality by reducing the nitrate nitrogen content of subsurface agricultural drainage flow.	13	Denitrifying bioreactor	Cubic yard	Volume of pit excavation	333	$20,324.41	$61.03
			14	Denitrifying bioreactor, no liner	Cubic yard	Volume of carbon source	222	$13,065.90	$58.86
638	Water and Sediment Control Basin	This practice is defined as an earth embankment or a combination ridge and channel constructed across the slope of a minor drainageway. The embankment may be constructed or could be formed through excavation of the basin. The practice is implemented to reduce gully erosion, trap sediment, and/or reduce and manage runoff.	1	Embankment	Cubic yard	Embankment	700	$3,888.96	$5.56
			2	Embankment, topsoil stockpiled	Cubic yard	Embankment	700	$4,107.36	$5.87
			3	Excavated basin	Cubic yard	Excavated volume	120	$1,562.57	$13.02

(USDA NRCS, 2019)

[1]The practice number refers to the number assigned by NRCS. See the full list of NRCS Conservation Practices here: **USDA, Natural Resources Conservation Services, Conservation Practices.**

[2]NRCS Conservation Practice

[3]Scenarios are developed specifically for California. Refer to the NRCS California Practice Scenarios (**USDA, Natural Resources Conservation Service, California Payment Schedules**) for additional information on the parameters of each scenario and a line item breakdown of implementation costs. Costs provided are in 2019 dollars.

[4]The **Windows Pesticide Screening Tool** (WIN-PST) is a pesticide environmental risk screening tool that NRCS field office conservations, extension agents, crop consultants, pesticide dealers and producers can use to evaluate the potential for pesticides to move with water and eroded soil/organic matter and affect non-targeted organisms.

Table A.B-14. Groundwater Monitoring Participation and Fees (Fiscal Year 2018-2019)

	Central Coast Groundwater Coalition	**Individual Monitoring**
# of Operations	458	579
# of Acres	197,842	101,918
# of Domestic Wells[1]	736	1,642
# of Agricultural Wells[2]	1,642	2,529
Annual Membership Fee	$350	N/A
Total Annual Membership Fees	$160,300	N/A

[1]All domestic wells must be tested.

[2]Only the primary irrigation well must be tested.

Table A.B-15. Central Coast Water Quality Preservation, Inc. (Fiscal Year 2018-2019 Fee Structure)

Fee Type	**Fee Class**	**Cost**
Monitoring Fee	Type 1 – Irrigated Acres Total	$2.36 per acre
	Type 2 – Off Property Tailwater Acres	$2.36 per acre
Annual Administrative Fee Per Operator	50 acres or less	$50.00
	51 acres to 499 acres	$1.00 per acre
	500 or more acres	$500.00 plus $0.20 per acre over 500 acres
SWRCB Fee	N/A	$0.98 per irrigated acre[1]

(CCWQP, 2018)

[1]This includes $0.95 per irrigated acre per SWRCB fee Category 1, plus $0.03 per acre to cover CCWQP administrative costs.

Table A.B-16. Surface Water Monitoring Fees (Fiscal Year 2018-2019)

	Third-Party Monitoring Program	**Individual Monitoring**
# of Operations	2,185	21
# of Acres	427,154	1,225
Total SWRCB Fees	$398,425	$42,722
Total CMP Fees	$1,553,656	N/A
Total Fees	$1,945,194	$42,722
Avg. Fees Per Operation	$890	$2,034
Avg. Fees Per Acre	$4.55	$34.88

Table A.B-17. Estimated Costs for Individual Surface Water Discharge Monitoring (Reported by Technical Assistance Providers in the Central Coast Region)

TAP[1]	Monitoring Task / Component	Minimum Cost	Maximum Cost	Notes
#1	Staff time for sampling	$80	$150	Could also be representative of reporting and QAPP[2]/SAP[3] preparation
#2	Two growers splitting costs except on-farm time; cost expressed for each grower.	$2,073	$2,749	Includes staff time, mileage, per diem, and meter rentals for two team members (for safety) – approximately 2.5 hours roundtrip travel time
#2	Single grower	$3,582	$4,366	Includes staff time, mileage, per diem, and meter rentals for two team members (for safety) – approximately 2.5 hours roundtrip travel time
#2	Lab testing	$1,632	-	Single sample for required nutrients and toxicity testing under Ag Order 3.0
#2	Reporting	$50	$250	Costs vary depending on the number of samples collected
#2	QAPP/SAP preparation	$2,500	$2,500	Costs vary depending on the number of monitoring locations
#2	Annual Individual Surface Water Quality Trend Monitoring Report	$2,500	$5,000	Costs vary depending on the number of samples collected

[1]TAP = technical assistance provider

[2]QAPP = quality assurance project plan

[3]SAP = sampling and analysis plan

Table A.B-18. Summary of Costs of Compliance with Agricultural Order 4.0

	Costs of Compliance (Ag Order 4.0)
Management Practices Implement management practices as needed to comply with the Order. Wide cost range depending on measure.	
Conservation Cover	$135 to $1,426 per acre
Conservation Cover Crop Rotation	$13 to $35 per acre
Cover Crop	$319 to $404 per acre
Denitrifying Bioreactor	$13,066 to $20,324 per bioreactor
Filter Strip	$172 to $185 per acre
Integrated Pest Management	$33 and $184 per acre
Micro-Irrigation System	$611 to $4,644 per acre
Nutrient Management	$10 and $320 per acre
Riparian Forest Buffer	$255 to $2,242 per acre
Sediment Basin	$5,559 to $12,562 per basin
Permit Fees Fees differ based on whether discharger participates in CMP (cooperative) or pays individually.	
Cooperative	$0.098 per acre (average)
Individual	$34.88 per acre (average)

	Costs of Compliance (Ag Order 4.0)
Monitoring and Reporting Costs	
Surface Water Quality Trend Monitoring	Applies to all Dischargers. Cost differs based on whether discharger participates in a third-party program or monitors surface water individually. Most (~99%) Dischargers participate in the current third-party surface water quality trend monitoring program. The average cost for third-party monitoring and reporting is estimated at $3.64 per acre.
Groundwater Quality Monitoring	Applies to all Dischargers. Costs may differ depending on whether dischargers choose to participate in groundwater third-party program or monitor individually. Groundwater third-party program has charged an annual membership fee of $350 per operation (changed to $750 per operation in 2019). Costs associated with monitoring activities (e.g., labor, laboratory, and administrative fees) not included in third-party membership fee.
Cooperative	$120 to $350 per sampling event
Individual	$120 to $350 per sampling event
Annual Compliance Form	Applies to all Dischargers Costs associated with preparing and submitting the ACF varies by ranch depending on ranch characteristics. Costs include labor hours for ranch employees to obtain/track information and fill out the ACF on an annual basis.
In-house Employees	$20 to $75 per hour (approximately one hour for first-time reporters and 15 minutes for experienced reporters)
Technical Assistance Providers	$75 to $250 per hour (approximately one hour for first-time reporters and 15 minutes for experienced reporters)

	Costs of Compliance (Ag Order 4.0)
Total Nitrogen Applied	Applies to all Dischargers. Cost of TNA reporting varies based on experience of preparer and history of ranch tracking the required information. A reasonable estimate is that costs are roughly $400 per ranch in the first year, declining to $100 per ranch by the third year. Given that the average ranch size in the region is roughly 64 acres, this would equate to a cost of $6.25/acre in the first year, declining to roughly $1.5/acre by the third year.
In-house Employees	$3 to $320 per ranch, per year (experienced grower) $11 to $1,200 per ranch, per year (inexperienced grower)
Technical Assistance Providers	$3,000 to $20,000 per ranch, per year
Irrigation and Nutrient Management Plan (INMP)	Applies to all Dischargers.
Large operation (greater than 500 acres)	$25,000 – develop INMP $75 per hour – INMP updates, effectiveness report, implementation, software development/maintenance/use, data summaries and reporting
Very large operation (1,000 to 1,500 acres)	$15,000 – develop INMP $3,000 per year – INMP updates $10,000 every five years – INMP effectiveness report $48,000 per year – INMP implementation $15,000 per year – INMP software development/maintenance $72,000 per year – INMP software use by in-house employees $10,000 per year – INMP data summaries and reporting $50,000 initial, plus $5,000 per year – INMP field implementation equipment

Table A.B-19. Key Uncertainties and Potential Effects

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 third-party 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 third-party 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.

Table A.B-20. Central Coast Water Board Annual Cost to Administer Program

Classification	Cost/Position	# of Positions	Total Cost
Environmental Scientist	$138,368	2	$276,736
Senior Environmental Scientist, Supervisor	$198,264	1	$198,264
Senior Environmental Scientist, Specialist	$151,748	1	$151,748
Environmental Program Manager	$229,876	1	$229,876
Engineering Geologist	$175,160	1	$175,160
Senior Engineering Geologist	$206,676	.5	$103,338
Water Resource Control Engineer	$174,524	4	$698,096
Sanitary Engineering Associate	$137,192	1	$137,192
Office Technician, Typing	$70,500	0.2	$14,100
	All Positions:	**11.7**	**$1,984,510**

Table A.B-21. Approximate Alternative Water Supply Option Costs (Households and Small Community Public Water Suppliers in the Tulare Lake Basin and Salinas Valley)

Option	**Estimated Annual Cost Range ($/year)**	
	Self-Supplied Household	**Small Community Public Water Supplier (1,000 Households)**
Improve Existing Water Source		
Blending	N/A	$85,000 - $150,000
Drill Deeper Well	$860 - $3,300	$80,000 - $100,000
Drill a New Well	$2,100 - $3,100	$40,000 - $290,000
Community Supply Treatment	N/A	$135,000 - $1,090,000
Household Supply Treatment	$250 - $360	$223,000
Alternative Supplies		
Piped Connection to an Existing System	$52,400 - $185,500	$59,700 - $192,800
Trucked Water	$950	$350,000
Bottled Water	$1,339	$1,340,000
Relocate Households	$15,090	$15,100,000
Ancillary Activities		
Well Water Quality Testing	$15 - $50	N/A
Dual System	$575 - $1,580	$260,000 - $900,000

(Honeycutt et al., 2012)

Section C. Rationale for Requirements

Section C describes the rationale for the requirements included in the **Order, Part 2, Sections C.1 to C.3**. Additional tables displaying groundwater quality data and surface water quality data are included in **Section D**.

Section C. 1. 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[14] 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.

[14] 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.

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 polluting the air and water.

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.

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 Targets and 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	248	236
2015	150	188	147	185	212	200
2016	161	190	141	198	221	178
2017	179	201	163	211	227	190
2018	170	199	162	219	229	162
2019	180	209	166	213	228	168
All Years	171	200	160	206	225	181

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 that could affect the quality of groundwater. While it is possible in some situations that subsequent crops may uptake the excess nitrogen, the over-application of synthetic fertilizer nitrogen creates the risk that excess nitrogen will become a waste discharged to groundwater.

20. Based on TNA data from 2014 through 2019, 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 arising from the over-application of synthetic fertilizer nitrogen and to reduce the risk of nitrogen discharge, this Order establishes fertilizer application targets and limits. Targets apply to Dischargers that are members in good standing with an approved Third-Party Alternative Compliance Pathway Program for Groundwater Protection. Limits apply to all other Dischargers.

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[15] (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 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).

[15] California Fertilization Guidelines on the California Department of Food and Agriculture website: **California Crop Fertilization Guidelines**.

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 targets and limits apply only to fertilizer nitrogen (A_{FER}). This Order does not establish a target or 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 target or limit no longer applies because the discharge has been mitigated despite the high-risk nitrogen application.

23. In establishing the nitrogen application targets and 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 90th percentile of fertilizer nitrogen application for each crop is used to establish the application targets and limits for the top six crops reported in the region. Similar to the median values, the 90th percentile and 85th percentile values have also not changed significantly over the course of 2014 through 2019 reporting. **Table A.C.1-3.A** displays the 90th percentile values and **Table A.C.1-3.B** displays the 85th percentile values and the established application targets and limits for each crop.

Table A.C.1-3.A. 90th Percentile Fertilizer Nitrogen Application Targets and Limits

	Lettuce	Broccoli	Spinach	Cauliflower	Celery	Strawberry
2014	286	312	229	294	436	420
2015	255	286	226	279	312	314
2016	259	282	227	298	325	295
2017	278	288	260	306	368	321
2018	272	287	235	311	345	304
2019	276	306	250	330	359	315
All Years	275	293	245	309	360	320
App. Target and Limit	275	295	245	310	360	320

All units are pounds of nitrogen per acre per crop.

Table A.C.1-3.B. 85th Percentile Fertilizer Nitrogen Application Targets and Limits

	Lettuce	Broccoli	Spinach	Cauliflower	Celery	Strawberry
2014	267	291	204	283	401	390
2015	240	260	207	256	300	297
2016	238	263	194	284	311	287
2017	263	275	242	284	336	281
2018	255	274	223	284	330	287
2019	257	284	242	300	330	291
All Years	255	278	227	284	330	296
App. Target and Limit	255	280	230	285	330	295

All units are pounds of nitrogen per acre per crop.

24. This Order only establishes a crop-specific application targets and limits 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 targets and limits are also near or greater than the application recommendations from the California Fertilization Guidelines. For all other crops, this Order establishes an application target and limit of 500 or 480 pounds of nitrogen per acre per crop. Over 98 percent of all crops are currently achieving the 500 pounds per acre per crop target and limit. It is anticipated that future iterations of this Order may establish crop-specific application targets and limits for additional crops based on future reporting.

Nitrogen Discharge Targets and Limits

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 2019 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%	32%	44%	65%	78%	86%
2019	13%	21%	31%	42%	61%	72%	80%
All Years	10%	17%	27%	38%	58%	73%	83%

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 three pathways: the standard A-R pathway that accounts for all nitrogen applied and removed,[16] a second pathway that incentivizes the use of irrigation water nitrogen by not including

[16] With the exception of a portion of the compost nitrogen when the compost discount factor is used.

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, and a third pathway that also incentivizes the use of irrigation water nitrogen by not including it in the compliance calculation.[17] There will be interim check-ins as we approach each limit (e.g., 300, 200, 150, 100, 50) to assess dischargers' compliance and whether revisions to the limits are warranted based on new information. The current discharge limit(s) are based on the best data currently available; the additional reported nitrogen removal and irrigation water information will allow the Central Coast Water Board to revisit discharge limit(s) in the future and adjust the limit(s) higher or lower, or develop different limits for specific areas within the region.

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 nitrogen 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.

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

[17] See previous footnote.

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 (e.g., A-R, 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 ≤ 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).

Organic Fertilizer and Amendment Discount Factor

42. This Order incentives the use of organic fertilizers and amendments through an organic fertilizer discount factor. Dischargers have the option of applying an organic fertilizer discount factor to effectively reduce the amount of nitrogen that is included in their annual nitrogen discharge target or limit calculation (e.g., A-R, A=R). The organic fertilizer discount factor applies to organic fertilizers and amendments applications for crop production and soil improvement. Using the organic fertilizer discount factor results in a discount for the nitrogen that is not mineralized in the first 12 weeks after application or incorporation. The organic fertilizer discount varies and is dependent on each organic fertilizer or amendment and its carbon to nitrogen ratio (C:N) and corresponding mineralization rate.

43. Similar to the nitrogen compost discount factor, products that contain nitrogen in the organic form are part of and tied up in long carbon molecules and depend on microbial mineralization to make the nitrogen available to the crop(s). The rate of the mineralization process depends on multiple factors, from temperature and soil

moisture content, and the products ratio between the carbon and the nitrogen content. Ultimately the microbial organisms need time to digest and then release the nitrogen to the simple mineral form and make it available for root uptake. The amount of nitrogen mineralized is based on the “predicted mineralization rate” (mineralization regression equation), which in turn also depends on a products C:N ratio (Lazicki, et.al, 2019).

44. The following products are not eligible to receive an organic fertilizer discount: a) products with no organic compounds (long chain carbon) molecules, such as conventional fertilizer, slow release fertilizers, b) products that do not depend on microbial mineralization to release nitrogen to mineral form to make it available for crop uptake.; c) products without C:N ratio information available, and d) organic liquid fertilizers that are in the liquid and/or emulsified form.

Nitrogen Scavenging Cover Crop and High Carbon Amendment Credit

45. This Order incentivizes the use of cover crops and high carbon amendments management practices to reduce nitrogen leaching. The Board indicated support, and the University of California Agriculture and Natural Resources advocated for, incentives for Dischargers to use cover crops and high carbon amendments management practices to reduce nitrogen leaching during the wet season (October 1 to April 30). University of California Agriculture and Natural Resources provided written public comment on June 22, 2020 and presented its recommendations to the Board during the September 22-23, 2020 Board Meeting. In these communications, cover crops and high carbon amendments were described as currently implementable mitigations dischargers can use to reduce nitrogen leaching to groundwater during the wet season.

46. Available research in the Salinas Valley demonstrates successful nitrogen sequestration with cover crops and high carbon amendments during the winter months. Even with the Mediterranean climate in the Central Coast region, crop evapotranspiration during the winter months is lower such that leaching is more likely during the wet/rainy season. Researchers from the University of California Agriculture and Natural Resources recommend the use of nitrogen scavenging cover crops and high carbon amendments during the wet/rainy season to reduce leaching.

47. Researchers from the University of California Agriculture and Natural Resources recommend the use of nitrogen scavenging cover crops and high carbon amendments and recommend that for them to be effective they should be implemented for at least three (3) months during the wet/rainy season. Dischargers that claim this credit must keep the nitrogen scavenging cover crop and/or high carbon amendments in place for three (3) months during the wet/rainy season (October 1^{st} to April 30^{th}).

48. Cover crops are known to decrease nitrogen leaching during the winter fallow period in vegetable crop systems (Jackson, 2000). Still, there is a lack of scientific research for quantifying the reduction of leaching or the quantity of nitrogen sequestered in

cover crops (Jackson, 2000) or high carbon amendments (Smith et al.,2019). Dischargers must properly manage fertilizers and irrigation after incorporating the low C:N ratio cover crop plant material to avoid nitrogen leaching (Jackson, 2000). Less is known about how quickly available nitrogen sequestered in high carbon amendments is available for plant use or leaching.

49. Based on recent research, both the quantity of carbon applied and the material's particle size are essential to allow soil microbes to obtain sufficient carbon for nitrogen immobilization during the wet season (Smith et al., 2019). Initial experiments with coarse high carbon amendments of green waste did not successfully immobilize nitrogen in the wet season (Smith et al.,2018). The nitrogen in the soil leached below the crop root zone during the experiment. Successful immobilization of nitrogen in the wet season only occurred when using very finely ground applications of high carbon amendments less than 0.25-inch diameter material and applications of 5 tons (10,000 pounds) or more per acre (Smith et al., 2018; Smith et al., 2019). Experiments that were successful at immobilizing a minimum of 100 pounds of nitrogen per acre during the wet season used:

    a. 5 tons per acre of finely ground almond shells
    b. 10 tons per acre of finely ground almond shells
    c. 1.25 tons per acre of glycerol along with 5 tons of finely ground almond shells per acre
    d. 2.5 tons per acre of glycerol

50. To incentivize these practices and reduce nitrogen leaching, the Central Coast Water Board provides a 30 pound of nitrogen per acre per year removal credit. This credit was derived as ten percent of the first nitrogen discharge limit of 300 pounds of nitrogen per ranch acre. As additional research and information becomes available, this incentive will be revisited to adjust the credit higher or lower or to develop a different incentive.

CropManage – Free Online Irrigation and Nutrient Management Tool

51. 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[18]. 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.

52. 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

[18] CropManage can be accessed online at the **Crop Manage website**.

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.

Nitrogen Removal Conversion Coefficients

53. 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 Plant 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.[19]
    c. Information provided to Central Coast Water Board staff by UC Cooperative Extension researchers at the March 2019 board meeting (Smith and Cahn, 2019).

54. 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.

55. 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

56. 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

[19]See CDFA’s website **California Crop Fertilizer Guidelines**.

discharge such that it no longer causes or contributes to 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.

57. 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.

58. 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.

59. 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

60. 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.

61. 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.

62. 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

63. 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.

64. 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.

65. 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

66. 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.

67. 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.

68. 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

69. 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.

70. 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 Program.[20] 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.

71. 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.

72. 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 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.

[20] 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**.

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)

73. 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.

74. 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

75. 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.

76. 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.

77. 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.

78. Third-Party Alternative Compliance Pathway for Groundwater Protection Under the ESJ Order, the development of the groundwater protection areas, formula, values, and targets for third party programs is precedential.

79. The Central Coast Regional Water Board incorporated this precedential approach for third-party programs to define specific groundwater protection areas and to determine collective numeric interim and final targets for nitrogen discharge within those groundwater protection areas.

80. The groundwater protection areas, formula, values, and collective numeric and final targets are subject to Executive Officer approval following public review and comment.

81. The assessment and evaluation program will evaluate the performance of the third-party alternative compliance pathway program and associated GWP collective

numeric and final targets in achieving tangible groundwater quality improvements over time at the individual GWP area scale. The third-party alternative compliance pathway program's effectiveness assessment and evaluation and the groundwater regional trend monitoring program described in **Part 2, Section C.1** of the **Order** must be closely aligned and coordinated such that they are effectively measuring the outcomes the programs are trying to achieve. Consequently, the work plan requirements prescribed in the MRP for the third-party alternative compliance pathway program must include provisions for the development and implementation of an effectiveness assessment and evaluation program.

Pesticides in Groundwater

82. 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).

83. 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 continue and, if so, under what conditions to protect groundwater (DPR, 2016).[21]

84. 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).

85. The EPA has established primary MCLs for a number of pesticides. The EPA has also updated its Human Health Benchmarks for Pesticides[22] (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

[21] 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/**.

[22] The database of HHBPs can be found online: **https://iaspub.epa.gov/apex/pesticides/f?p=HHBP:home:28116553285476**.

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.

86. 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.

87. In 1985, the Legislature passed the Pesticide Contamination Prevention Act (PCPA). The PCPA was designed to prevent further pesticide pollution of groundwater by agricultural use pesticides, with emphasis on the protection of drinking water supplies. DPR established a Groundwater Protection List which identifies specific chemicals that are designated as having the potential to pollute groundwater. The Groundwater Protection List (**Table A.D.1-7** in **Section D.1** of this Attachment A) includes active ingredients in parts (a) and (b) of California Code of Regulations, Title 3, Section 6800. 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

88. Historical sampling results collected by DPR[23] from 1988 to 2019 are summarized in **Table A.D.1-8** herein.

89. A summary of regulated pesticides listed in part (a) of Section 6800 and their degradation products that have been found in groundwater by DPR monitoring from 1988 to 2019 is presented in **Table A.D.1-10** herein.

90. 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

[23] All collected monitoring data is organized and managed in DPR's internal Well Inventory Database (WIDB). The monitoring data is publicly available as Microsoft Excel csv files by county at the following DPR website: **Well Inventory Database.**

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.

91. 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.

Recent Groundwater Pesticide Monitoring Results

92. 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[24] 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. During 2017, DPR sampled 38 wells located in Santa Barbara, San Luis Obispo, and Monterey counties and analyzed those samples for 52 or more different pesticide active ingredients or degradation products. During 2019, DPR (in collaboration with Central Coast Water Board staff) sampled another 39 wells located in Monterey, San Benito, and Santa Clara counties and analyzed those samples for 75 different pesticide active ingredients or degradation products. A summary of DPR sampling in Region 3 during 2017 and 2019 is presented in **Table A.D.1-9** herein.

93. Recent monitoring for imidacloprid has resulted in detections in Fresno, Tulare, and Santa Barbara counties. During 2017 and 2019, DPR sampled 77 wells and analyzed the samples for imidacloprid and 52 or more different active ingredients or degradation products. In 2017, DPR sampled for imidacloprid in 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

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

sampled for imidacloprid and one well had a detection at trace concentrations while another well had a high concentration detection (see **Table A.D.1-9)** . 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.

94. 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 acid (TPA; a degradate of the herbicide DCPA). Bromacil was also detected in one of these wells, as was a trace amount of mefenoxam/metalaxyl in another well with a TPA detection.

95. 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 bromacil 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.

Future Groundwater Pesticide Monitoring

96. 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.

97. Based on consultation with DPR and other relevant agencies, the Central Coast Water Board will evaluate data gaps in groundwater pesticide information and determine if further Water Board investigation is appropriate. The Central Coast Water Board anticipates requiring specific Dischargers enrolled in this Order to conduct groundwater monitoring for specific pesticides in specific groundwater basins via Water Code section 13267 authority. In such cases, there may be situations where Dischargers choose to coordinate with DPR for sample collection and analysis. Regardless of DPR's level of involvement with sample collection, however, Dischargers will to be responsible for compliance with future monitoring and reporting requirements.

98. 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 many 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 should it be required by the Central Coast Water Board under Water Code section 13267 authority.

1,2,3-TCP in Groundwater

99. 1,2,3-Trichloropropane (1,2,3-TCP) is an organic compound that easily migrates with groundwater. It has been detected throughout California, including within the central coast region in some public water systems and monitoring wells, as well as in some private domestic wells. 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) was commonly used in agricultural activities from the 1950s until the 1990s.

100. The Basin Plan does not specify a numerical water quality objective for 1,2,3-TCP. However, in accordance with the Basin Plan, water with the municipal and domestic supply beneficial use (i.e., groundwater in this case) “. . . shall not contain concentrations of organic chemicals in excess of the maximum contaminant levels [MCLs] for primary drinking water standards . . .”. Therefore, the following paragraphs refer to the water quality standard of the MCL for 1,2,3-TCP, rather than any other specific water quality objective.

101. 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.

102. 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),[25] 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.

103. 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 February 2020, 22 out of 325 private domestic wells sampled in central coast counties by the DWSP tested positive for 1,2,3-TCP. Nineteen detections are in

[25]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.**

Monterey County and 3 are in San Benito County, with 21 exceeding 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.

104. 1,2,3-TCP is a known groundwater contaminant associated with agriculture. Under Water Code section 13267(b), "the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region, . . . shall furnish. . . technical or monitoring program reports . . . " The term "discharge" includes the passive migration of waste from soils to groundwater or from contaminated groundwater to uncontaminated groundwater. (e.g., In the Matter of Zoecon Corporation, State Board Order WQ 86-2). Current landowners are dischargers when wastes continue to be discharged into waters of the state. Given the potential health risk to users who drink 1,2,3-TCP contaminated groundwater, the Board also finds that the burden of adding sampling and analysis for 1,2,3-TCP to existing sampling of on-farm domestic wells is reasonably related to the need for the sampling and reporting and the benefits to be obtained. See discussion in the Cost Considerations section related to domestic well sampling and analysis.

Monitoring and Reporting

105. 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.

106. 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 Surface Water Protection

Surface Water Priority Areas and Magnitude Exceedance Quotients

1. The findings in this sub-section apply the surface water section (**Section C.2**) of the Order; 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[26] 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) Third-Party Surface Water 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.2** 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.

    a. 100 to 90: Excellent water quality
    b. 89.9 to 80: Good water quality
    c. 79.9 to 65: Fair water quality

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

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.

Surface Water Priority Areas (Third Party Surface Water Follow-Up Program)

12. In response to stakeholder comments, different third-party program surface water priority areas are incorporated into the Order to allow a third-party program to address exceedances at third-party monitoring program (CMP) sites based on a scale of high, medium, and low priority.

    a. High Priority: Recent history of repeated, high-concentration exceedances for nitrate, turbidity, and aquatic toxicity (i.e. all 3 parameters). 19 CMP sites.
    b. Medium Priority: Recent history of at least some exceedances for nitrate, turbidity, and/or aquatic toxicity (i.e. 1 or 2 parameters). 26 CMP sites.
    c. Low Priority: Least history of exceedances for nitrate, turbidity, and aquatic toxicity. 10 CMP sites. Also includes all other areas not listed as high, medium or low priority.

13. Ranches that are enrolled as part of an approved third-party surface water follow-up program are assigned the Surface Water Priority of the drainage unit where the ranch is located, as shown in Table C.3-1.ACP and the map shown in Figure C.3-1.ACP of the Order. All ranches enrolled as part of a third-party program are assigned a Surface Water Priority of high priority, medium priority, or low priority.

14. Prioritizing CMP sites and requiring third party program follow-up implementation plans to be developed over time will allow time for a third-party program to increase their capacity to provide compliance assistance to Dischargers.

Impacts to Surface Water – General

15. The findings in this sub-section relate to surface water impairments and monitoring efforts in general, and so apply the surface water section of the **Order (Part 2, Section C.2**).

16. 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.

17. 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).

18. **Section D.2** 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.

19. 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).

20. 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. Third-Party Surface Water Quality 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

21. 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).

22. 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.

23. 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).

24. 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).

25. 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.

26. **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).

27. 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.

28. 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**).

29. 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.

30. 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.

31. 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

32. 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.

33. 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.

34. 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.

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

Un-Ionized Ammonia

36. 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.”

37. 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).

38. 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).

39. 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

40. Analysis of CMP Data collected between 2005-2019 indicate that 58 percent of all CMP sites with orthophosphate load allocations[27] have a total average orthophosphate concentration that exceed the 0.3 mg/L reference number[28] (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; one 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).

[27] 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.
[28] The reference number is the State of Nevada phosphate criteria for streams.

41. 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 Compliance Dates

42. 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 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.

43. Many waterbodies in the central coast region have established nutrient TMDLs. In those cases, the numeric limits and compliance dates are established in this Order as described in **Section B** (*Receiving Water Limits Based on TMDLs* discussion) of this Attachment A .

44. 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.

45. 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.

46. In establishing the compliance dates for achieving the numeric limits in non-TMDL areas, the typical attainment 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 in non-TMDL areas to be achieved within 11 years. This time schedule is reasonable given the similarity to TMDL attainment 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

47. The monitoring and reporting requirement discussed in the following finding applies to all surface water monitoring; therefore, the finding applies to **Section C.2** of this Attachment A.

48. 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** 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.

Impacts to Surface Water – Pesticides and Toxicity

General Information

49. 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*."

50. 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."*

51. 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.

52. 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.

53. 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).

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

55. 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	

56. 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).

57. 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).

58. 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).

59. 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.

60. 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).

61. 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).

62. 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

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

64. 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).

65. 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

66. 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.

67. 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.

68. 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.

69. 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.

70. 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)[29] 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.

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

71. 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

72. 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.

73. 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
    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

74. More than 26 percent of all CMP sites monitored from 2010 to 2018 have an average bifenthrin concentration o.c.[30] 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).

75. 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.

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

Bifenthrin in Sediment

76. 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.

77. 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).

78. 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).

79. 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

80. 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.

81. 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.

82. 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.

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

Metals and Phenols

84. 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).

85. 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.

86. 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).

87. 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

88. 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.

89. 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

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

91. 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.

92. 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.

93. 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

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

95. 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.

96. 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

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

98. 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).

99. 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

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

101. 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

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

103. 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

104. 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.

105. 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.

106. 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.

107. 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 Compliance Dates

108. 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

109. 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 compliance dates are established in this Order as described in **Section B** (Receiving Water Limits Based on TMDLs discussion) of this Attachment A.

110. Waterbodies that do not have established toxicity TMDLs for particular pesticides are assigned numeric limits based on the narrative water quality objectives and values from the sources shown in **Table A.C.3-2**, which are protective of aquatic life and address acute risk (short-term effects such as survival and growth) and chronic risk (longer term effects such as reproduction) for the listed constituent.

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	USEPA Office of Pesticide Programs Aquatic Life Benchmarks for Invertebrate Chronic Effects
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 [4,5]
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.

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

112. In establishing the compliance date for achieving the numeric limits in non-TMDL areas, the typical attainment 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 in non-TMDL areas to be achieved within 11 years. This time schedule is

reasonable given the similarity to TMDL attainment 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.

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

113. 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.

114. 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

115. 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.

116. 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.

117. 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.

118. 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.

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

120. Agricultural discharges cause and contribute to sustained turbidity[31] 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

[31] In many cases, the upper limit of the turbidity meter used to collect turbidity data is 3000 NTU. Any value reported by the CMP exceeding 3000 NTU is an estimated value.

watersheds. The CMP detected some increasing trends in turbidity on the main stem of the Salinas River (CCRWQCB, 2009a; CCAMP, 2010a; CCWQP, 2009a).

121. Agricultural land use practices, such as removal of vegetation and stream channelization, and discharges from agricultural fields (including but not limited to surface runoff, tile drains, and agricultural drainage pumps), can cause erosion, turbidity, and 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).

122. 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:

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

123. 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

124. 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.

125. 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.

126. 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.

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

Impermeable Surfaces

128. 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).

129. 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).

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

131. 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.

132. 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).

133. 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).

134. 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.

135. 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.

136. 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).

137. 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.

138. 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.

139. 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).

140. Research conducted in the central coast region indicates that 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. Reducing these impacts can be achieved through a combination of structural practices and/or agricultural techniques. Management practices to eliminate stormwater runoff and erosion from impermeable surfaces include, but are not limited to, contour planting or row arrangement, vegetated filter strips, grassed furrows, hoop house anchor row protection, cover crops, plant-based mulch, soil quality practices, conservation tillage, and sediment and stormwater control basins. The design of management methods should be informed by the determination of peak rates of runoff and runoff volume (Monterey County RCD, 2014).

141. Stormwater performance requirements use watershed processes and precipitation data to determine how much runoff must be retained from impermeable

surfaces to maintain or restore pre-development hydrology and reduce pollutant loading to receiving waters. Where impermeable surfaces are located determines the absolute volume and intensity of the storm that must be designed for, called the design storm.

142. The Central Cost Water Board Post Construction Requirements (PCRs) include stormwater performance standards for impermeable surface cover thresholds starting at 2,500 square feet, about 0.06 acre. Agricultural use of impermeable surfaces predominates in areas of the central coast region where 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. Rainstorms smaller than the 95^{th} percentile storm are considered small storms. Runoff produced by these small storms and the initial portion of larger storms has a strong negative cumulative impact on receiving water hydrology and water quality. Retaining runoff from these percentile storms best represents the volume that is fully infiltrated in a natural condition. In areas with impermeable surfaces, runoff is generated from almost all storms, both small and large due to the loss of soils and vegetation. In contrast, natural areas discharge little or no runoff from small storms because rain is absorbed by the landscape and vegetation. In general, only large storms generate signification runoff under natural conditions. Retaining both the runoff produce by small storms and the first part of larger storms provides broad support to watershed processes and can reduce the cumulative impacts of altered flow regimes on receiving water hydrology, including pollutant loading, channel degradation, and diminished baseflow (CCRWQB, 2013).

143. This approach is transferrable to agricultural development in the central coast region where impermeable surfaces decrease field area available for infiltration and evapotranspiration and result in a greater volume and velocity of stormwater runoff, erosion, and sediment discharges.

Sediment and Turbidity Limits and Compliance Dates

144. 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.

145. 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 compliance dates are established

in this Order as described in **Section B** (*Receiving Water Limits Based on TMDLs* discussion) of this Attachment A.

146. 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.

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

148. In establishing the compliance dates 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.

Riparian Area Removal Prohibition for Water Quality Protection

149. This section includes findings that discuss impacts to water quality and beneficial uses due to riparian area removal and monitoring and reporting requirements.

Impacts to Water Quality and Beneficial Uses

150. 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.

151. Agricultural waste 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).

152. 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).

153. 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).

Current Conditions

154. 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).

155. 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.

156. 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

157. 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

158. 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.

159. 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.

160. 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.

161. 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.

Physical Habitat

162. Nearly all the Third-Party Surface Water Quality 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.

163. 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).

164. 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

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

Wetlands

166. 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.

167. **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.

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

Wetland Type	Acres	Wetland density at the landscape level[32]
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%

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

168. **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).

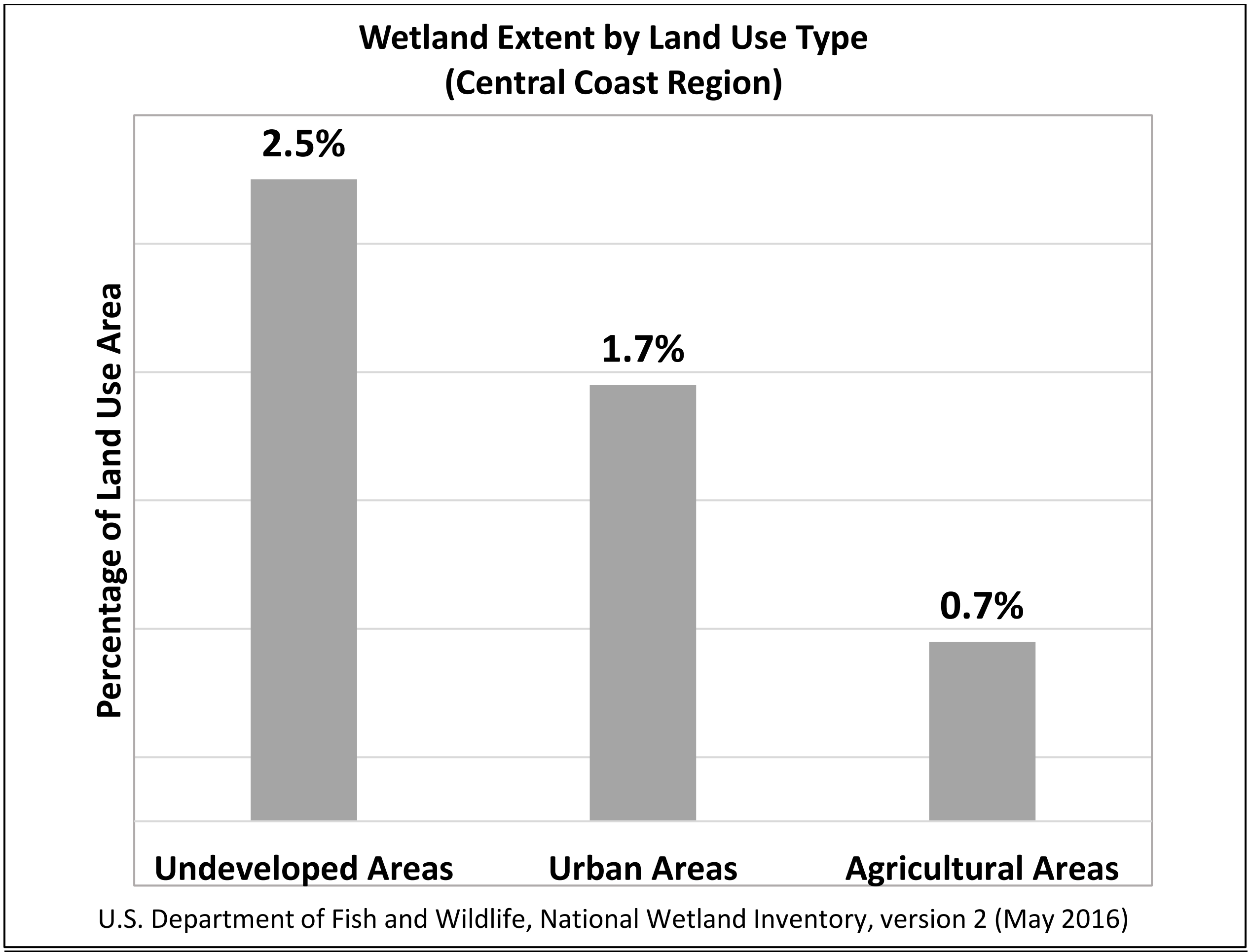

Figure A.C.5-1. Wetland Extent by Land Use Type

Riparian Areas

169. 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[33]
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 [34]			**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[35]
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[36]			**49,982**
0 (non-riparian areas, no asset)	0 percent canopy cover	90.1%	485,323

170. **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).[37]

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

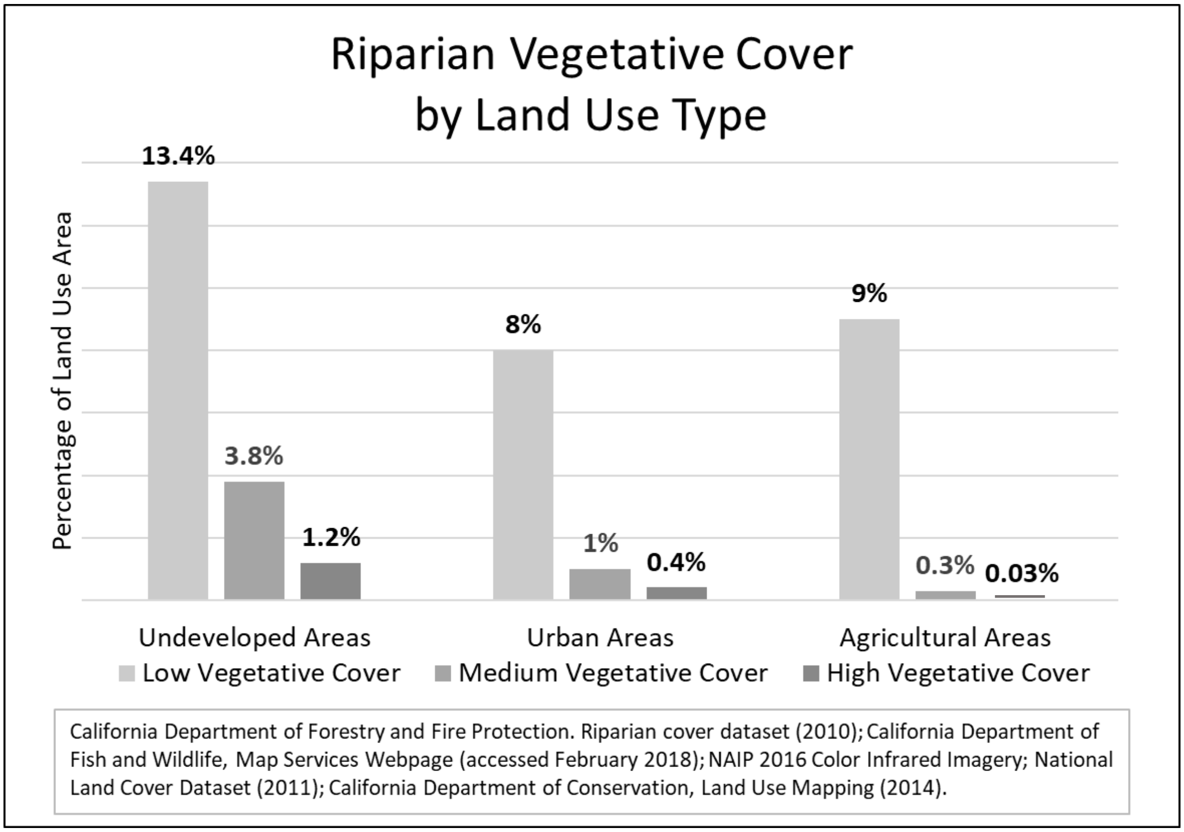

Figure A.C.5-2. Riparian Vegetative Cover by Land Use Type

Aerial Imagery

171. 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.

172. 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.

173. There are image-based services available online; however, many of them require subscriptions or "pay for specified products" (e.g., PrecisionHawk,[38] Maxar,[39] nearmap,[40] etc.). There are a variety of services offered through ESRI online,[41] USGS,[42] and a couple of additional "user friendly" options such as Google Maps and Google Earth.

174. 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

175. 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.

176. 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.

177. 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:

a. Ground Water Recharge;
b. Fresh Water Replenishment;
c. Warm Fresh Water Habitat;

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[38] Image-based services available online at PrecisionHawk: **Precision Hawk website**.
[39] Image-based services available online at Maxar: **Maxar website**.
[40] Image-based services available online at nearmap: **NearMap website**.
[41] Image-based services available online at ESRI: **ESRI website**.
[42] Image-based services available online at USGS: **Earth Explorer website**.

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.

178. 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.

179. “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).

180. 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.

Ecological Functions and Values

181. 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).

182. 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).

183. 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).

184. 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.

185. 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).

186. 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.

187. 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.

188. 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.

189. 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

190. 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.

191. 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

192. 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).

193. 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).

194. 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

195. 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).

196. 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).

197. 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

198. 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).

199. 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

200. 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.

201. 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).

202. 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

203. 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.

204. 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).

205. 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).

206. 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

207. 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).

208. 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).

209. 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 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*."

210. Functioning riparian areas address multiple categories of nonpoint source pollution that affect water quality(sediment, nitrogen, phosphorus, and temperature) (CZARA, 1993).

211. 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 prohibitions that focus on protecting riparian areas to avoid such discharges and their impacts on water quality.

212. CZARA supports this Order's incorporation of the following management measures: Protection of Wetlands and Riparian Areas.

Food Safety

213. 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.

214. 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).

215. Evidence suggests that much conversion from non-crop vegetation to bare ground or croplands occurred relatively recently, following food safety events. For example, 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).

216. 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).

217. 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.

218. 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).

219. **Leafy Greens Products Handling Marketing Agreement**. 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).

220. 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)

221. **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).

222. 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.

223. Well-documented scientific evidence indicates that vegetated conservation measures (e.g., riparian areas, 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.

224. Riparian vegetation is critically important to prevent the transport of sediment and bacteria, which may include the downstream transport of *Escherichia coli* O157:H7 bacteria. 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 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.

225. 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.

226. 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).

227. 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).

228. A central coast grower follow-up survey[43] 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.

229. 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.

Monitoring and Reporting

230. The MRP requires all Dischargers with waterbodies running through or adjacent to their ranches to monitor and report the current riparian area (average width and reach length for riparian areas and acreage for wetlands). 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 Central Coast Water Board needs these reports to document and ensure compliance with this Order. Findings in **Section C.2** of this Attachment A document the impacts of agricultural discharges and reduced or degraded riparian areas on

[43] The survey was sent to 647 known irrigated row crop operations with 178 complete responses.

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

1. Section D includes tables and figures related to groundwater requirements (**Section C.1**) and surface water requirements (**Section C.2**). Key findings from the tables and narrative report are incorporated into the findings in this Order.

Section D.1. Groundwater Tables

2. 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**.

3. 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

Basin Name	Min.	Max.	Mean	Med.	SD	25%	75%	ND	Samples	Wells	Well % Exceed.	Sample % Exceed.
SV - ATASCADERO AREA	0.1	21.7	3.2	2.3	3.5	0.7	4.6	14	128	49	6.1	5.3
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

Basin Name	Min.	Max.	Mean	Med.	SD	25%	75%	ND	Samples	Wells	Well % exceed.	Sample % exceed
POZO VALLEY	1.7	3.3	2.4	2.4	NA	2.4	2.4	0	4	1	0.0	0.0
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

Basin Name	Min.	Max.	Mean	Med.	SD	25%	75%	ND	Samples	Wells	Well % exceed.	Sample % exceed
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

Basin Name	Min.	Max.	Mean	Med.	SD	25%	75%	ND	Samples	Wells	Well % Exceed.	Sample % Exceed.
MAJORS CREEK	0.1	0.4	0.2	0.1	0.2	0.1	0.2	7	10	4	0.0	0.0
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

Basin Name	Min.	Max.	Mean	Med.	SD	25%	75%	ND	Samples	Wells	Well % Exceed.	Sample % Exceed.
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
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
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

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 (%)
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. DPR Groundwater Monitoring for Pesticides in the Central Coast Region (1988 – 2019)*

County	No. unique wells sampled	No. pesticide lab analyses conducted	No. confirmed or verified pesticide detections	No. non-detections or unconfirmed pesticide detections	No. unique pesticides analyzed	No. unique pesticides detected
Monterey	229	4434	40	4390	116	8
San Benito	29	1508	9	1499	91	1
San Luis Obispo	56	897	6	889	68	2
Santa Barbara	99	1994	23	1969	78	5
Santa Clara	44	490	13	475	85	3
Santa Cruz	20	153	0	153	30	0
Total	**477**	**9476**	**91**	**9375**	**120**	**9**

*Information provided by DPR

Confirmed detection = 2 or more positive detections in the same well and summary year.

Verified detection = a detection obtained from an unequivocal laboratory detection method.

Unconfirmed detection = only 1 positive detection in the same well and summary year.

Non-detection = a concentration equal to zero. Detections less than the reporting level on 0.05 parts per billion are designated as non-detections in the DPR Well Inventory Database.

Table A.D.1-9. DPR Groundwater Monitoring for Pesticides in Central Coast Region (2017 and 2019)*

Sampling Month Year	County	No. wells sampled	No. unique pesticides analyzed	No. TPA detections	TPA range (ppb)	No. MTP detections	MTP range (ppb)	Bromacil (ppb)	DACT (ppb)	Diuron (ppb)	Imidacloprid (ppb)
Jan 2017	Monterey	7	52	3	0.916-101	2	0.073-0.13		0.068		
May 2017	Monterey	7	52	3	8.22-38.2	1	0.056				
Jun 2017	Monterey	1	52	1	10.9						
Oct 2017	San Luis Obispo	2	52								
Oct 2017	Santa Barbara	7	52	3	0.521-10.1					0.189	
Nov 2017	San Luis Obispo	5	55	4	0.046-0.383						
Nov 2017	Santa Barbara	9	55	7	0.435-159	3	0.063-0.101				0.104
Apr-May 2019	Monterey	20	75	10	0.086-20.8			0.054			
Aug 2019	San Benito	18	75	9	0.072-3.97						
Aug 2019	Santa Clara	1	75	1	27.6						
Totals		**77**	**84**	**41**		**6**					

*Information provided by DRP
ppb = parts per billion

Table A.D.1-10. Detections of Groundwater Protection List 6800(a) Pesticides by DPR Monitoring in Central Coast Region (1988 – 2019)*

Pesticide/Degradate	**Number of detections/(Concentration in ppb)**					
	Monterey Co.	**Santa Clara Co.**	**Santa Cruz Co.**	**San Luis Obispo Co.**	**Santa Barbara Co.**	**San Benito Co.**
Atrazine						
Bromacil	3/(0.088, 0.036, 0.054)					
Diuron	1/(0.078)				1/(0.189)	
Norflurazon						
Simazine	3/(0.041, 0.055, 0.076)					
Prometon						
Bentazon						
DEA (degradate)						
ACET (degradate)	2/(0.056, 0.048)					
DACT (degradate)	1/(0.068)					

*Information provided by DPR
ppb = parts per billion

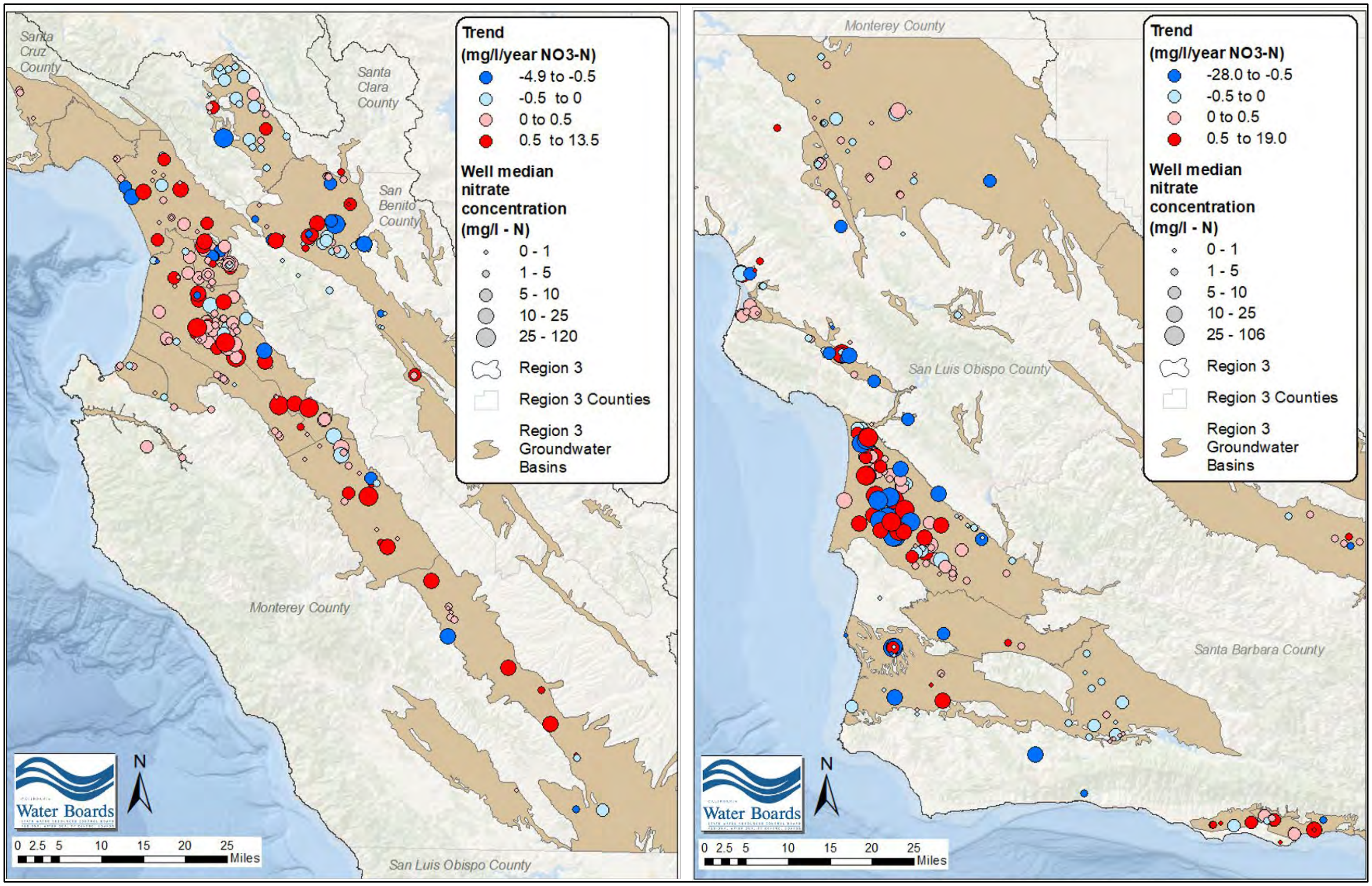

Figure A.D.1-1. Map of Wells (with statistically significant nitrate concentrations based on calculation of Kendall's Tau and the Akritas-Theil-Sen slope). Bubble size indicates the median concentration of samples used in the well trend analysis. Bubble colors represent whether the trend is increasing nitrate concentration (red) or decreasing nitrate concentration (blue).

Section D.2. Surface Water Tables

1. 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).

2. The information in the findings in **Section C.2**, 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.

3. 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

	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**
309MOR	99.16	Excellent	97.04	Excellent	96.61	Excellent
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

	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**
314SYF	49.66	Poor	80.71	Good	78.41	Fair
314SYL	99.75	Excellent	99.71	Excellent	99.78	Excellent
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
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

	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**
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
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

	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	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

Site	Nitrate Dry Season MEQ Value	Nitrate Dry Season Score	Nitrate Wet Season MEQ Value	Nitrate Wet Season Score
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
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%
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%

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)
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%
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
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

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)
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			

	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**
309NAD	Bifenthrin	N/A	N/A	N/A		Bifenthrin, Cypermethrin
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	

	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
312BCC	Bifenthrin, Fenpropathrin	N/A	N/A	N/A	N/A	
312BCJ	Bifenthrin, Chlorpyrifos, Cyhalothrin-lambda, Cypermethrin, Fenpropathrin, Permethrin	N/A	Bifenthrin, Cypermethrin	N/A		Bifenthrin, Chlorpyrifos
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	N/A		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**
			Fenvalerate, Permethrin			
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		
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

	Agricultural Order 3.0	
CMP Site	**Dry Season**	**Wet Season**
309RTA	Clothianidin, Imidacloprid	Clothianidin, Imidacloprid
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%

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
310WRP	1	1	1	100%	100%
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%

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
310LBC	0	1	2	0%	50%
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

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**Site**	**MEQ Value**	**MEQ Score**
309NAD	6.13	Very Poor	16.13	Very Poor	17.87	Very Poor
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

	Agricultural Order 1.0		**Agricultural Order 2.0**		**Agricultural Order 3.0**	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**Site**	**MEQ Value**	**MEQ Score**
314SYN	95.48	Excellent	98.24	Excellent	74.70	Fair
315APF	96.82	Excellent	81.36	Good	89.66	Good
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
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

	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	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
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

	Agricultural Order 1.0		Agricultural Order 2.0		Agricultural Order 3.0	
Site	**MEQ Value**	**MEQ Score**	**MEQ Value**	**Site**	**MEQ Value**	**MEQ Score**
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

Site	Turbidity Dry Season MEQ Value	Turbidity Dry Season MEQ Score	Turbidity Wet Season MEQ Value	Turbidity Wet Season MEQ Score
310WRP	94.00	Excellent	52.48	Poor
312BCC	31.87	Very Poor	8.49	Very Poor
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%

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)
310PRE	28	162	17%
310USG	9	160	6%
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

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)
310PRE	10.15	251.00	0.10
310USG	2.78	3000.00	0.10
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

CMP Site	Site - Waterbody Description
310USG	Arroyo Grande Creek at old USGS gage
310WRP	Warden Creek at Wetlands Restoration Preserve
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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