Section 6
Environmental Review and Economic Analysis

6.1 Overview

CV-SALTS completed the required environmental review and economic analyses to support development of the SNMP. SNMP Attachment C provides the complete analyses: (a) Attachment C-1: Environmental Documentation (RBI and CDM Smith 2016); (b) Attachment C-2: Economic Analysis (Larry Walker Associates 2016a); and (c) Attachment C-3: Antidegradation Analysis (Larry Walker Associates 2016b). These analyses were based on recommended clarifications, policies and new regulatory tools described in the policies, strategies, and guidance documents included in Attachment A and summarized in Section 4.2.2 above. The following sections provide a summary of the environmental review process and the key findings from the environmental review and economic analyses.

6.2 CEQA Scoping

To facilitate potential changes to the Basin Plans that could result from the development of the Central Valley SNMP, the Central Valley Water Board staff held four CEQA scoping sessions in October 2013 in Fresno, Modesto, Colusa and Rancho Cordova.[1] These scoping sessions identified likely alternatives under consideration by CV-SALTS for the long-term management of salt and nitrate in the Central Valley and provided opportunity for public input. Through a rigorous stakeholder process, CV-SALTS identified a number of potential alternatives for each of the key elements below, each of which has been built upon and further developed through the CV-SALTS process (see SNMP Attachment D-2):

- Evaluating and establishing appropriate beneficial uses and/or water quality objectives in water bodies and/or classes of water bodies;
- Developing the technical and regulatory basis for the SNMP;
- Evaluating the range of viable salt disposal and nitrate management alternatives;
- Adding implementation strategies or changing existing implementation strategies
    - Proposing a prioritization structure
        - *Ensure safe drinking water supply*
        - *Balance salt and nitrate loading*
        - *Managed restoration where feasible*

[1] http://www.waterboards.ca.gov/centralvalley/water_issues/salinity/index.shtml

  - Allowing point of compliance to be expanded past first encountered groundwater to include available assimilative capacity, while ensuring user protection is considered as part of the compliance determination;

  - New provisions related to variances/exceptions; compliance schedules and alternative compliance strategies, e.g., use of offsets and management zones;

- Ensuring safe drinking water supplies in areas already impacted by salt and nitrates; and/or

- Adopting new policies that would facilitate the management of salt and nitrate

6.3. Environmental Setting and Baseline

Sections 2 and 3 of this SNMP describe the environmental setting and baseline salt and nitrate conditions in the Central Valley Region (also see Section 2 in Attachment C-1 and Section 4 in the Economics and Antidegradation Analyses [Attachments C-2 and C-3, respectively]). Following is a summary of the regulatory baseline against which the SNMP environmental review and economic analyses were conducted (see Attachments C-1, C-2 and C-3 for a more detailed summary).

6.3.1 Federal Laws, Plans, Policies, and Regulations

Federal-based requirements relevant to the SNMP and considered as part of the required environmental analyses include:

- *Clean Water Act* (CWA) (33 United States Code [USC] §1251 *et seq*.) – The CWA establishes the basic structure for establishing water quality standards and regulating discharges of pollutants to surface waters that meet the definition of water of the United States (defined in 40 C.F.R. § 230.3). Three key relevant CWA programs include:

  - *National Pollutant Discharge Elimination System Permit Program* - Section 402 of the CWA authorizes the NPDES permit program. An NPDES permit regulates discharges to surface waters and includes effluent discharge limitations; prohibitions; receiving water limitations; compliance monitoring and reporting requirements; and other provisions. An NPDES permit may be an individual permit issued directly to a single discharger (or in certain instances to multiple co-permittees, e.g., stormwater dischargers) or a general permit written to cover multiple dischargers with similar operations and types of discharges.

  - *Impaired Waters Program* - Section 303(d) of the CWA requires states to develop lists of water bodies or segments of water bodies that will not attain water quality standards after implementation of minimum required levels of treatment by point-source dischargers. Section 303(d) requires states to develop a Total Maximum Daily Load (TMDL) for each of the listed pollutant and water body combinations for which there is an impairment.

  - *Federal Antidegradation Policy* - The federal antidegradation policy is designed to protect existing uses and the level of water quality necessary to protect existing uses,

and provide protection for higher quality and outstanding national resource waters (40 CFR §131.12.

- *Safe Drinking Water Act* (42 USC §300f *et seq*.) was passed in 1974 to regulate the nation's drinking water supply. The law was amended in 1986 and 1996 and requires many actions to protect drinking water and its sources—rivers, lakes, reservoirs, springs, and groundwater.

6.3.2 State Laws, Plans, Policies, and Regulations

The following sections discuss state-related requirements relevant to the Central Valley SNMP:

6.3.2.1 Statutes

- *Porter-Cologne Water Quality Control Act* (Wat. Code §13000 *et seq.*) – This Act is California's statutory authority for the protection of water quality. The Act requires the adoption of water quality control plans, which must consist of designation of beneficial uses, water quality objectives, and a program of implementation for achieving water quality objectives (Wat. Code §13050(j)). The Act also authorizes the State Water Board and regional water quality control boards to issue and enforce permits containing requirements for the discharge of waste to waters of the state, which is defined to mean "any surface water or groundwater, including saline waters, within the boundaries of the state." (Wat. Code § 13050(e).

- *Human Right to Water* - With the enactment of Wat. Code section 106.3, on September 25, 2012, California became the first state in the nation to recognize legislatively the human right to water, following two other state's recognition of the right in their respective constitutions. Following promulgation of this statute the State Water Board adopted Resolution No. 2016-0010 on February 16, 2016, adopting "the human right to water as a core value and adopts the realization of the human right to water as a top priority for the Water Boards." The Central Valley Water Board adopted a similar resolution on April 21, 2016 (Resolution R5-2016-0018).

- *Sustainable Groundwater Management Act* - The Sustainable Groundwater Management Act, which went into effect January 1, 2015, gives local agencies the authorities to manage groundwater in a sustainable manner and allows for limited state intervention when necessary to protect groundwater resources.

6.3.2.2 Water Quality Control Plans

- *Central Valley Water Board Basin Plans* - The Central Valley Water Board has adopted two Water Quality Control Plans: SRSJR Basin Plan and TLB Basin Plan (Central Valley Water Board 2015, 2016, respectively). The Basin Plans define the beneficial uses, water quality objectives, implementation programs, and surveillance and monitoring programs. Unless otherwise designated by the Central Valley Water Board, all groundwaters in the Central Valley Region are considered as suitable or potentially suitable for municipal and domestic supply (MUN) and agricultural supply (AGR) beneficial uses. Further, the Basin Plans specifically identify the designated beneficial uses for major surface water bodies in the Region in a table of beneficial uses. Unless specifically identified otherwise in the Basin

Plans, all surface and groundwaters in the Region are designated with the MUN beneficial use. The AGR beneficial use generally applies to all groundwater basins unless specifically designated otherwise. The Basin Plans identify water quality objectives that are applicable based on the designated beneficial uses of surface water bodies and groundwater or by geographic area.

- *San Francisco Bay/Sacramento-San Joaquin Delta Water Quality Control Plan* – This plan establishes water quality control measures that contribute to the protection of the beneficial uses of the Delta (State Water Board 2006). As with other state water quality control plans, the Bay-Delta WQCP identifies the beneficial uses to be protected, the water quality objectives for reasonable protection of the beneficial uses, and a program of implementation for achieving the water quality objectives.

6.3.2.3 Policies and Programs

- *Recycled Water Policy* (State Water Board Resolution No. 2009-0011; as amended by Resolution No. 2013-0003) - The Recycled Water Policy encourages increased use of recycled water and local stormwater, together with enhanced water conservation. The Recycled Water Policy requires local water and wastewater entities, together with local salt and nutrient contributing stakeholders, to develop salt and nutrient management plans for each groundwater basin in California.

- *Sources of Drinking Water Policy* (State Water Board Resolution No. 88-63) – This Resolution established a policy whereby all waters are considered suitable or potentially suitable to support the MUN beneficial use, with certain exceptions as defined by the policy.

- *State Antidegradation Policy* - The state's antidegradation policy is embodied in State Water Board Resolution 68-16, *Statement of Policy with Respect to Maintaining High Quality Waters in California*. The goal of State Water Board Resolution No. 68-16 is to maintain high quality waters where they exist in the state. Resolution No. 68-16 incorporates the federal antidegradation policy and requires that existing quality of waters be maintained unless degradation is justified based on specific findings.

- *Onsite Wastewater Treatment Systems Policy* (OWTS) (State Water Board Resolution No. 2012-0032) - This Policy establishes a statewide, risk-based, tiered approach for the regulation and management of OWTS installations and replacements and sets the level of performance and protection expected from OWTS.

- *Variance Policy, Salinity Variance Program, and Salinity Exception Program* - The Variance Policy and Salinity Variance Program allow the Central Valley Water Board the authority to grant short-term variances from meeting water quality-based effluent limitations (WQBELs) for non-priority pollutants, including salinity constituents and nitrate, to dischargers subject to NPDES permits. The Salinity Exception Program establishes procedures for dischargers to obtain a short-term exception from meeting effluent or groundwater limitations for EC, TDS, chloride, sulfate, and sodium.

- *Irrigated Lands Regulatory Program* – This program was created to address discharge of wastes (e.g., nitrate) from commercially irrigated lands. The goals of the ILRP are to protect

surface water and groundwater and to reduce impacts of irrigated agricultural discharges to waters of the state. This is done by issuing WDRs or conditional waivers of WDRs to growers. These WDRs contain conditions requiring water quality monitoring of receiving waters and corrective actions when impairments are found. Options for regulatory coverage include joining a coalition, obtaining coverage as an individual grower under general WDRs, or obtaining an individual permit.

- *Dairy Program* - Nearly 1,300 dairies are in the Central Valley, most regulated by a comprehensive Dairy General Order adopted for existing dairies in 2007. This General Order has requirements for corrals, production areas, ponds, and land application areas. New dairies or dairies that have expanded since then, are subject to individual orders with the same requirements.

- *Mixing Zone Policy* - The Central Valley Water Board may designate a mixing zone within a surface water for discharges controlled by NPDES and stormwater permits. A mixing zone provides a small zone of initial dilution in the immediate vicinity of a discharge. A mixing zone comprises a limited volume of water in which the concentration of a specific constituent may exceed its relevant water quality objective provided that the mixing zone is small compared to the total area of the water body, does not impact beneficial uses, and the relevant water quality objective for the constituent in question is met at the edge of the mixing zone.

6.3.3 Regulation of Waste Discharges

Based on the definitions and requirements of the California Water Code and the CWA, discharges can be generally divided into the discharge of pollutants to surface waters or other types of discharges (i.e., waste discharges to land or discharges that affect groundwater). Discharges to surface waters are regulated by permits issued under the NPDES program while discharges of other types are permitted through WDRs or waivers to WDRs issued under the Porter-Cologne Act. In the Central Valley, as in other regions of California, regulated waste discharges include:

- Municipal and industrial wastewater;

- Municipal and industrial stormwater; and

- Agricultural runoff from irrigated lands and from dairies/confined animal feeding operations.

SED Section 3.2.4 (SNMP Attachment C-1) provides a detailed summary of these different types of permitted discharges, in particular requirements associated with allowable discharges, effluent limitations, and monitoring and reporting requirements.

6.4 Description of Project Alternatives

For the purposes of completing the environmental review and economic analyses of the SNMP, two alternatives were considered: (a) No Project Alternative; and (b) Preferred Alternative. Each of these is described below (See SNMP Attachments C-1 through C-3 for more detailed descriptions).

6.4.1 No Project Alternative

The No Project Alternative represents a future scenario where there would be no amendment to the Basin Plans to incorporate recommendations of the Central Valley SNMP, as described in SNMP Section 4 and supporting Attachment A. The result would be regulation of waste discharges in the Central Valley according to the existing regulatory framework which focuses on source control and does not contain a prioritization framework or specific strategy to address groundwater already impacted by salt and nitrate. Continued regulation of salt and nitrate discharges according to the existing regulatory framework has significant implications relative to permit limitations and time schedules that must be met to achieve water quality objectives in the discharge for salt and nitrate. The future regulatory environment under a no project scenario varies by discharger type, as summarized below.

- *Municipal and Industrial Wastewater Dischargers* - Municipal and industrial wastewater dischargers that currently have an interim effluent limitation for EC, TDS, chloride, sulfate, and/or sodium based on a variance issued under the Salinity Variance Program or an exception issued under the Salinity Exception Program would not be able to have that variance/exception renewed after June 30, 2019, since existing regulations sunset both programs after this date. Once existing variances and exceptions expire, dischargers will be faced with meeting water quality objectives for salts that likely will require the implementation of additional treatment or control of their discharges, or other actions (e.g., new source water supply) that result in reduced loads for salinity. The inclusion of performance-based effluent limitations in current NPDES permits or WDRs tied to participation in CV-SALTS that are higher than AGR- or MUN-based water quality objectives would no longer to be allowed. In the absence of the Central Valley SNMP, these NPDES permits and WDRs would be amended to include final water-quality based effluent limitations. Additionally, discharges to groundwater would be required to comply with EC and nitrate effluent limitations based on applying EC and nitrate water quality objectives at first encountered groundwater.

- *Irrigated Agriculture and Dairy Operators* – The future regulatory environment for these types of dischargers may be described as follows:

  - *Irrigated Agriculture Discharges* - Discharges from irrigated agriculture to surface waters and groundwater would need to come into compliance with water quality objectives for EC, TDS, and nitrate in receiving water within 10 years from the triggering of a surface water or groundwater quality management plan for these constituents. Further, discharges to groundwater would be required to comply with EC and nitrate limitations based on applying EC and nitrate water quality objectives at the first encountered groundwater. Irrigated agriculture would have 10 years to reduce its loads of salt and nitrate to the point that discharges were compliant with water quality objectives for these parameters.

  - *Dairy Discharges* - Discharges from dairies that are determined to cause or contribute to an exceedance of a water quality objective, unreasonably affect beneficial uses, or cause a condition of pollution or nuisance require the discharger to bring its discharge in compliance with groundwater limitations no later than 10 years after the submittal

date of a summary representative monitoring report, which must be submitted by July 1, 2020. Dairies are required to implement management practices/activities (BPTC for high quality waters or best efforts for waters that are not high quality) that will bring the facilities into compliance on a time schedule that is as short as practicable. Also, dairies would need to comply with EC and nitrate limits based on water quality objectives in first encountered groundwater.

For both irrigated agriculture and dairies, the outcome of the No Project Alternative would include an increase in fallowed land and closed dairy facilities as farmers and dairy operators find that achieving compliance with water quality objectives for EC, TDS and nitrate at first encountered groundwater is not feasible. The loss of these agricultural and dairy businesses would be expected to lead to a loss of available jobs within the region. In addition, the legacy of elevated nitrate and salt in Central Valley floor groundwater basins/subbasins would remain unaddressed in areas where farming and dairy operations have ceased and the remaining agricultural and dairy operators would find it increasingly difficult to comply themselves given the loss of potential partners to share costs to address legacy pollutants. Ultimately, under the No Project Alternative the potential impacts to irrigated agriculture and dairies will likely be a mix of dischargers that are able to find a feasible means to comply with water quality objectives at first encountered groundwater and those that are unable to comply and cease operations. The relative mix of these two outcomes will vary locally and regionally.

- *Stormwater Discharges* - Stormwater dischargers would continue to be required to implement stormwater management plans and BMPs, as necessary, to achieve compliance with water quality objectives. Stormwater is not a large contributor of nitrate, but does observe seasonally high EC/TDS concentrations during storm runoff events.

6.4.2 Preferred Alternative

As discussed in SNMP Section 4.1.1, the Central Valley SNMP is built on the following three management goals:

- Goal 1: Ensure a Safe Drinking Water Supply
- Goal 2: Achieve Balanced Salt and Nitrate Loadings
- Goal 3: Implement Managed Aquifer Restoration Program

To support these goals, development of the SNMP included an evaluation of existing policies and requirements in the region's Basin Plans. The outcome of this evaluation was the development of recommended clarifications, policies and new regulatory tools (or strategies) to facilitate SNMP implementation. These recommendations are designed to facilitate implementation of this SNMP and efforts to achieve the salt and nitrate management goals. For the most part, these recommendations are not self-implementing and will require adoption of Basin Plan amendments. A summary of the specific SNMP recommendations for modifications to the Basin

Plans is provided in Section 4.2.2 with detailed supporting information provided in SNMP Attachment A.[2] Collectively, these SNMP recommendations represent the Preferred Alternative.

6.5 Environmental Review

6.5.1 Analysis of the Preferred Alternative

The environmental review provides a detailed analysis of the potential environmental impacts of the Preferred Alternative on each resource category included in the Environmental Checklist (see Section 5 in Attachment C-1). To provide a high level summary, the sections below provide a summary of the key findings from analysis of the three questions associated with the Mandatory Findings of Significance (see Section 5.1.18 in Attachment C-1):

- *Issue (a)* - Does the Project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?
- *Issue (b)* - Does the Project have impacts that are individually limited but cumulatively considerable ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?
- *Issue (c)* - Does the Project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

6.5.1.1 Issue (a) – Biological Considerations

The Preferred Alternative does not directly affect biological resources-related beneficial use designations or associated water quality objectives, or implementation programs related to these beneficial uses or objectives. The Preferred Alternative also does not directly involve the construction of new buildings or other facilities. Thus, the Preferred Alternative would have no direct impact on the quality or quantity of habitat for any fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels; a plant or animal community; or a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory.

Projects that may be constructed as a result of implementation of the Preferred Alternative may result in altered instream flow patterns (e.g., on-farm recharge projects) or new discharges to surface waters (e.g., regulated brine line discharges to San Francisco Bay) may result in indirect impacts to biological resources. Because separate project-specific environmental review would be performed prior to project construction and operation to identify project-specific environmental

[2] The Preferred Alternative analysis is based on the CV-SALTS draft policy documents dated September 12, 2016 (http://www.cvsalinity.org/index.php/docs/central-valley-snmp/draft-snmp.html?showall=&start=1). For some of these documents, the CV-SALTS Executive Committee identified optional approaches to certain elements, based on input from stakeholders. These optional approaches are identified in the descriptions of the Preferred Alternative in Attachments C-1 through C-3 and accordingly were included in environmental review and economic analysis.

impacts and to incorporate any necessary measures to avoid, reduce, or mitigate for any identified significant environmental impacts, no impact determination is made. Nevertheless, decisions makers should recognize the potential of such indirect effects from implementation of the Preferred Alternative on the quality or quantity of habitat for fish or wildlife species; fish or wildlife populations; plant or animal communities; rare or endangered plants or animals; or examples of the major periods of California history or prehistory.

6.5.1.2 Issue (b) - Evaluation of Cumulative Conditions

The Environmental Checklist analysis concluded that the Preferred Alternative would have no direct impacts to aesthetics, agricultural and forestry resources, air quality, biological resources, cultural resources, geology and soils, greenhouse gas emissions, hazards and hazardous materials, hydrology, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation/traffic, and utilities and service systems. As such, the Preferred Alternative would not directly contribute to a cumulative impact to these resource categories.

Implementation of the Preferred Alternative is expected to indirectly result in the need for surface and groundwater dischargers to construct specific projects for salt and nitrate management to achieve compliance with WDRs or other provisions that may result from the Central Valley Water Board's implementation of the Preferred Alternative. These projects may consist of:

- New community water systems as part of creating a long-term drinking water solution;
- Systems to pump, treat, and reinject groundwater for nitrate and salt management;
- Creation of on-farm groundwater recharge basins to reduce groundwater nitrate concentrations; and
- Regional desalter facilities and a pipeline from the San Joaquin Valley to the San Francisco Bay to dispose of brine.

These projects could indirectly cause impacts at the local level from construction of the projects/facilities to air quality, biological resources, cultural resources, geology and soils, greenhouse gas emissions, hazards and hazardous materials, hydrology, noise, and transportation and traffic. However, the construction activities indirectly resulting from the Preferred Alternative would not contribute to any long-term adverse cumulative condition to these resources, because the construction activities would be temporary in nature.

Operation of the projects that would indirectly occur from the Preferred Alternative could result in indirect less than significant and potentially significant impacts to aesthetics, agricultural and forestry resources, air quality, biological resources, cultural resources, geology and soils, greenhouse gas emissions, hazards and hazardous materials, hydrology, land use and planning, noise, population and housing, transportation and traffic, and utilities and service systems. There would be no indirect impacts to mineral resources, public services, and recreation. The specific projects and locations of the projects have not been defined to a level that allows for identifying whether the projects would occur in areas with cumulatively adverse conditions for aesthetics,

agricultural and forestry resources, air quality, biological resources, cultural resources, geology and soils, greenhouse gas emissions, hazards and hazardous materials, hydrology, land use and planning, noise, population and housing, transportation and traffic, and utilities and service systems. This assessment does not speculate on whether the Preferred Alternative would indirectly contribute considerably to a cumulative condition for these resources, because the location and scope of the future projects is unspecified or uncertain. However, decision makers should recognize that a project may be located in a non-attainment area for air quality or where cumulative traffic conditions are forecasted to be adverse, for example, and may contribute considerably to an adverse cumulative condition for one or more resources. Because separate project-specific environmental review would be performed prior to the construction and operation of specific projects for salt and nitrate management to identify project-specific environmental impacts and to incorporate measures to avoid, reduce, or mitigate any identified significant environmental impacts to the extent feasible, and because parties other than the State of California may serve as the project proponents and thus be responsible for mitigation measures, should they be necessary, no mitigation measures are proposed here.

The Environmental Checklist analysis concluded that the Preferred Alternative impacts to water quality degradation would be "no impact," "less than significant," or "potentially significant," depending on the particular SNMP strategy, policy, or guidance document considered (see SNMP Attachment A for documents; see Section 5 in Attachment C-1 for description of these policies, strategies and guidance documents). The constituents of concern to water quality degradation with the Preferred Alternative include salts (EC, TDS, chloride, sulfate and sodium), nitrate, and additional parameters with SMCLs (aluminum, color, copper, iron, manganese, silver, turbidity, and zinc). Thus, the cumulative assessment below focuses on cumulative water quality conditions for these constituents of concern in surface waters and groundwaters within the Central Valley Region.

Cumulative Surface Water Quality Conditions

Past and present projects or actions affecting surface water bodies within the Central Valley Region have resulted in the existing water quality conditions for these water bodies. Aside from the Preferred Alternative, reasonably foreseeable future actions that could affect surface water quality for the constituents of concern to this assessment in the Central Valley Region include the Lower San Joaquin River salt and boron TMDL, ILRP, stormwater management programs, continued implementation of the NPDES program, CVP and SWP operations in compliance with regulatory requirements, and California Water Action Plan. The salt and boron TMDL, ILRP, and stormwater management programs are all aimed at making improvements to water quality in the Central Valley Region. The California Water Plan lays out actions to improve water management in the state and CVP and SWP operations in compliance with regulatory requirements including compliance with Bay-Delta objectives for the salinity parameters EC and chloride.

Section 4.2 and Appendices A and B in SNMP Attachment C-3 provide detailed information on existing surface water quality for salinity parameters, nitrate and parameters with SMCLs. Following is a discussion of the future cumulative condition for each of these parameters.

Salinity Parameters

Salinity (as measured by EC and/or TDS) conditions within surface waters of the Central Valley Region are variable, with some areas of the region having concentrations of these constituents that adversely affect the ability to use the water for AGR and/or MUN uses. Portions of the Sacramento, San Joaquin River, Tulare Lake, and Delta hydrologic regions have water bodies on the state's CWA section 303(d) list of impaired water bodies due to salinity, EC, and/or TDS relative to the protection of AGR and MUN beneficial uses.

In the future cumulative condition under the preferred alternative, the concentrations of salts in surface waters of the Central Valley Region are not expected to be substantially worse and, in fact, are expected to remain at similar levels or improve somewhat, relative to existing conditions in many water bodies, due to implementation of the Central Valley SNMP and other Central Valley Water Board actions, such as development and implementation of TMDLs for impaired water bodies. In the future cumulative condition, through implementation of the SNMP and TMDLs, dischargers in the Central Valley Region will have implemented treatment and control measures and projects to reduce loading of salts to surface waters.

A component of the SNMP is the Salinity Variance Policy, which proposes to amend the existing Salinity Variance Program to allow the authorization of variances up to 15 years following the effective date of the Basin Plan amendments that revise the program, and extend application of variances to salinity parameters for protection of the MUN beneficial use in addition to the AGR use. During this period, municipal wastewater dischargers could be granted variances from meeting WQBELs for salinity constituents, provided that these dischargers or their discharge situation is similar or comparable to the case studies evaluated for the current Salinity Variance Program. An additional condition for obtaining the variance is that the discharger would participate in the Salinity Management Strategy Phase I Prioritization and Optimization Study. Modeling of the effects of granting variances to specific municipal wastewater discharges concluded that the effects on ambient salinity levels both near the point of discharge and at downstream locations would be imperceptible (Central Valley Water Board 2014, Larry Walker Associates 2012). Further, these variances would be limited to the period during which the Salinity Management Strategy is implemented. Consequently, implementation of the Preferred Alternative would not have a considerable contribution to any adverse cumulative condition with respect to salinity parameters.

Nitrate

Within surface waters of the Sacramento River, Tulare Lake, and Delta hydrologic regions, nitrate concentrations are not adverse under existing conditions, relative to protection of the MUN beneficial use, with concentrations well below the primary drinking water MCL of 10 mg/L (nitrate as N). Nitrate concentrations are variable across the San Joaquin River Hydrologic Region. Median concentrations in tributaries and the San Joaquin River are below 10 mg/L (nitrate as N). Mud Slough and Salt Slough have historical concentrations above the 10 mg/L (nitrate as N); however, MUN is not a designated beneficial use of these water bodies. Within primary tributaries that are direct source waters for drinking water supplies (e.g., Merced River, Cosumnes River, Tuolumne River, Stanislaus River, San Joaquin River), nitrate concentrations are below 10 mg/L (nitrate as N) (see water quality summaries in Attachment C-3).

The future cumulative condition assumes implementation of the Central Valley SNMP, as well as continued implementation of other regulatory programs, including the NPDES program and ILRP, to control discharges to meet applicable water quality objectives and protect beneficial uses. Future surface water nitrate conditions within the Central Valley Region are expected to be at similar levels, or possibly be improved, relative to existing conditions. Consequently, implementation of the Preferred Alternative would not have a considerable contribution to any adverse cumulative condition with respect to nitrate.

Secondary MCL Parameters

Evaluated SMCL parameters include aluminum, copper, iron, manganese, silver, zinc, color, and turbidity. There are no CWA section 303(d) listings for these constituents due to impairment of the MUN beneficial use, with the exception of two ephemeral creeks in the foothills above Sacramento for aluminum, iron, and manganese, where total concentrations of these metals have been frequently measured above their respective SMCL levels. Elevated levels of these metals are associated with particulates (i.e., suspended sediments) in surface waters and the dissolved concentrations for these constituents are typically less than the SMCLs and levels of these parameters are not identified as being of concern in watershed sanitary surveys (see water quality summaries in Attachment C-3). Color is a parameter typically not evaluated on drinking water, thus, data to characterize surface water conditions in the Central Valley Region are not available for this assessment; however, color is generally not recognized as a parameter of concern. All surface water bodies within the Central Valley Region have variable turbidity; high turbidity in surface waters does not preclude their use as a drinking water supply.

The future cumulative condition assumes implementation of the Central Valley SNMP, as well as continued implementation of other regulatory programs, including the NPDES program and ILRP, to control discharges to meet applicable water quality objectives and protect beneficial uses. The SMCL Guidance, recommended for implementation under the SNMP (see Attachment A-9), would modify how SMCL-related water quality objectives for aluminum, copper, iron, manganese, silver, zinc, color and turbidity would be implemented in WDRs for surface water discharges. For each of these constituents the following findings were made for surface water:

- *Copper, silver, and zinc* - The aquatic life criteria are more stringent than the SMCLs; therefore, the limitations in WDRs for these metals would be unaffected by the SMCL Guidance.

- *Turbidity and color* – The water quality objectives for these constituents would be unchanged by the SMCL Guidance, thus, implementation of the SMCL Guidance is not expected to result in substantial cumulative increases in turbidity or color relative to existing conditions.

- *Aluminum, iron, and manganese* – These are associated with particulates, and because objectives related to the control of particulates (e.g., turbidity objectives) would be unchanged, the SMCL guidance is not expected to result in substantial cumulative increases in these metals concentrations in surface waters as they relate to agricultural and stormwater discharges. Similarly, increases in aluminum, iron, and manganese concentrations in surface water as related to municipal wastewater discharges are not expected to result in substantial cumulative increases in these metals, because the

discharge quality is a function of the treatment processes in place, which will continue to be utilized into the future unaffected by this process.

Construction of projects and facilities in the future to achieve the SNMP goals could contribute suspended sediments to surface waters near the construction sites, while construction is occurring, which could load additional aluminum, iron, manganese, other metals, color, and turbidity into receiving waters. However, construction BMPs would be implemented to minimize the input of suspended sediments to surface waters from construction projects associated with the SNMP, and any such effects would be temporary in nature and would cease upon construction ending and the site soils being permanently stabilized. Because construction BMPs would be implemented with any SNMP-associated construction project and because any sediment inputs to surface waters would be temporary in nature, such effects would not contribute considerably to the future cumulative condition for the SMCL parameters of aluminum, copper, iron, manganese, silver, zinc, color, and turbidity.

Based on the discussion above, future aluminum, copper, iron, manganese, silver, zinc, color, and turbidity conditions within Central Valley surface waters are expected to remain at similar levels to those that occur under existing conditions. In addition, implementation of the construction projects and facilities under the Preferred Alternative would not have a considerable contribution to any adverse cumulative conditions with respect to aluminum, copper, iron, manganese, silver, zinc, color, or turbidity conditions.

Cumulative Groundwater Quality Conditions

SNMP Section 3, SNMP Section B.2.2, and Section 4.3 in Attachment C-3 provide detailed information on existing groundwater conditions. Following is a discussion of the future cumulative conditions for groundwater quality.

Salinity

Salinity (as measured by EC and/or TDS) conditions within groundwaters of the Central Valley Region are variable, with some areas of the region having concentrations of these constituents that adversely affect the ability to use the water for AGR and/or MUN uses. As such, existing conditions for salts in groundwaters are considered to be adverse in some basins or subbasins.

In the future cumulative condition, the concentrations of salts in the groundwaters are expected to be at similar levels or be improved, relative to existing conditions, largely due to implementation of the Central Valley SNMP. Through implementation of the SNMP, dischargers will have implemented treatment and control measures and projects to reduce loading of salts to groundwaters. There may be localized areas where salts may still be above levels necessary for protection of AGR and MUN uses and stabilized at levels similar to those under existing conditions or at future levels. Finally, there may be localized areas within the region where groundwater degradation with regards to salt continues to occur into the future, and remediation back to existing conditions is not feasible. This may occur, for example, where an offset project has been used to address degradation or a salt management area developed to move salt out of more sensitive areas.

On a basin/subbasin volume-weighted average basis, which is the proposed management structure for controlling and restoring salt, an improvement in groundwater quality relative to

existing conditions is expected under the future cumulative condition as a result of implementing the Preferred Alternative. Moreover, implementation of the Preferred Alternative is not expected to have a considerable contribution to any adverse cumulative conditions with respect to salt conditions at the basin or subbasin level; instead it is expected to have a beneficial impact on the future cumulative salt conditions at the basin and subbasin level.

Implementation of the Preferred Alternative would allow localized areas of groundwater basins/subbasins that are near or over the applicable water quality objective to be further degraded in the future, in part, as anticipated collection areas for discharge into a regulated brine line. As such, because it will not be feasible to remediate all such localized areas of groundwater back to existing conditions or conditions better than existing conditions, the Preferred Alternative would contribute considerably to adverse future cumulative conditions of salts in some localized areas of basins/subbasins within the Central Valley. This is considered to be a potentially significant cumulative impact. Because there is the potential for the degraded water quality conditions to remain over the long-term, this impact is considered potentially significant and unavoidable.

Nitrate

Nitrate conditions within groundwaters of the Central Valley Region are variable, with some areas of the region having concentrations of these constituents that adversely affect the ability to use the water for MUN use. Hence, existing conditions for nitrate in groundwaters are considered to be adverse in some basins or subbasins.

In the future cumulative condition, the nitrate concentrations in groundwaters are expected to be at similar levels or be improved, relative to existing conditions, largely due to implementation of the SNMP. In addition, through implementation of the SNMP, dischargers will have implemented treatment and control measures and projects to reduce loading of nitrate to groundwaters. There may be localized areas within the region where nitrate may still be above levels necessary for protection of MUN uses and stabilized at levels similar to those under existing conditions or at future levels. Finally, there may be localized areas within the region where groundwater nitrate degradation continues to occur into the future, and remediation back to existing conditions is not feasible. This may occur, for example, where an offset project has been used to address degradation.

On a basin/subbasin volume-weighted average basis, which is the proposed management structure for controlling and restoring nitrate, an improvement in groundwater quality relative to existing conditions is expected under the future cumulative condition from implementing the Preferred Alternative. Consequently, implementation of the Preferred Alternative is not expected to have a considerable contribution to any adverse cumulative conditions with respect to nitrate conditions at the basin or subbasin level. Instead, the Preferred Alternative is expected to have a beneficial impact on the future cumulative nitrate conditions at the basin and subbasin level.

Implementation of the Preferred Alternative would allow localized areas of groundwater basins/subbasins that are near or over the applicable water quality objective to be further degraded in the future. Because it will not be feasible to remediate all such localized areas of groundwater back to existing conditions or conditions better than existing conditions, implementation of the Preferred Alternative would contribute considerably to adverse future

cumulative conditions of nitrate in some localized areas of basins/subbasins within the Central Valley. This is considered to be a potentially significant cumulative impact. Because there is the potential for the degraded water quality conditions to remain over the long-term, this impact is considered potentially significant and unavoidable.

Secondary MCL Parameters

Groundwater conditions for the additional SMCL parameters— aluminum, copper, iron, manganese, silver, zinc, color, and turbidity—are considered to not be adverse in the Central Valley Region under existing conditions. While there are localized areas where concentrations of some of these parameters have been measured above SMCLs, on a region-wide basis, the quality relative to these parameters, which address consumer acceptance (i.e., non-health) concerns, is considered generally suitable for MUN and AGR uses (DWR 2003).

The trace metals of concern relative to SMCLs are natural elements and their presence in groundwater is largely a function of the hydrogeological conditions of the aquifers in the region. Similarly, turbidity in groundwater is caused by natural factors and typically less than 1 NTU (State Water Board 2004). Color of groundwater is affected by the presence of other constituents with MCLs that may be present. The natural hydrogeological processes that are occurring under existing conditions that contribute to the existing levels of trace metals, color and turbidity also would occur for the future cumulative condition. Therefore, future cumulative conditions for these parameters within the groundwaters of the Central Valley Region are expected to be similar to existing conditions, and are not expected to be adverse. Consequently, implementation of the Preferred Alternative would not have a considerable contribution to any adverse cumulative groundwater conditions with respect to aluminum, copper, iron, manganese, silver, zinc, color, and turbidity.

6.5.1.3 Issue (c) – Environmental Effects on Human Beings

For salts and nitrate, the Preferred Alternative would put policies, permitting and management strategies, and guidance in place to ensure that a safe, reliable drinking water supply is available to residents of the Central Valley Region. The SNMP implementation policies and management strategies are directed at regulation of salt and nitrate discharges to restore beneficial use protection, including drinking water uses, where reasonable and feasible and minimizing or preventing further degradation of groundwaters that are currently meeting water quality objectives so that they do not become impaired.

With regards to the Resource Category, Hydrology and Water Quality (see Attachment C-1, Section 5.1.9), under the Preferred Alternative, there may be near-term degradation of salts and nitrate that could result in an adverse effect to MUN beneficial uses. To address near-term degradation of nitrate, which is a human health concern that could have an adverse effect on the MUN beneficial use, the SNMP policies require interim actions (e.g., bottled water) in the short-term, permanent solutions (such as well-head treatment or alternative drinking water supplies) in the intermediate term, and efforts to re-attain the water quality objective (where feasible and practicable) over the long-term to protect the MUN beneficial uses (see Nitrate Permitting Strategy, SNMP Attachment A-2). Therefore, the Preferred Alternative would have a less-than-significant impact regarding environmental effects which could cause substantial adverse effects on human beings, either directly or indirectly.

6.5.2 Analysis of the No Project Alternative

The analysis of the No Project Alternative assessed whether the No Project Alternative would: (a) lessen or eliminate any of the potentially significant impacts identified for the Preferred Alternative; (b) cause new or more severe potentially significant impacts compared to those identified for the Preferred Alternative; and (c) achieve the goals of the Preferred Alternative.

6.5.2.1 Assessment of Alternative

Under the No Project Alternative, there would be no adoption of the recommended SNMP permitting strategies, policies, and guidance documents. Thus, WDRs for agriculture, wastewater, and stormwater dischargers would be based on existing water quality objectives, beneficial use designations, and programs of implementation, consistent with existing State Water Board and Central Valley Water Board plans and policies. Specifically:

- *Agriculture* - Actions to achieve compliance with WDRs based on the existing regulatory framework could mean implementation of additional BMPs, such as irrigation water management and tailwater recovery systems, or construction of drainage water collection, treatment, and disposal systems. However, it should be noted that it is uncertain whether implementation of additional BMPs by agriculture could achieve compliance with existing regulations for salts and nitrate. Where discharges to surface water or groundwater cause exceedances of water quality objectives, dischargers would be required to address those exceedances within the ten-year time schedule that is established in current WDRs. If the water quality objective exceedances could not be addressed by the end of the time schedule, then those permittees could potentially be required to cease discharging. Degradation of groundwater salt and nitrate levels that is occurring under existing conditions would continue to occur in some areas of the Central Valley Region for a period of time before necessary actions to stop degradation could be implemented. The ultimate result of such actions, if feasible, would be water quality similar to existing conditions in some areas and somewhat more degraded in other areas, because restoration back to existing conditions is not anticipated to occur in all areas.

- *Wastewater* – For discharges to surface waters and groundwater, implementation of the No Project Alternative would mean implementing new treatment processes to remove constituents that would cause exceedances of water quality objectives for salinity constituents, nitrate, or metals with drinking water MCLs at facilities that do not currently meet WDRs based on the existing regulatory framework. The result of such actions would be water quality at least equivalent to, if not improved, relative to existing conditions.

- *Stormwater* - Discharges that cause exceedance of water quality objectives in the receiving water would be required to address exceedances through modification and implementation of the permittee's stormwater management program. No substantial degradation of water quality would be expected to occur, relative to existing conditions, because BMPs contribute to reduction in pollutant loadings and current BMPs are expected to be implemented into the future.

Based on these considerations, implementation of the No Project Alternative could somewhat lessen the potentially significant impacts identified for the Preferred Alternative for salt and

nitrate levels in areas of groundwater basins/subbasins where levels are currently approaching or exceeding applicable objectives and discharges would cause further degradation in the future. However, because further degradation of such groundwater areas also would occur over a multi-year period into the future before corrective actions would be implemented under the No Project Alternative, this would be considered a potentially significant impact. Therefore, the No Project Alternative may somewhat lesson the potentially significant salt and nitrate water quality degradation impacts identified for the Preferred Alternative, but it is not expected to reduce these impacts to a less-than significant level. In addition, implementation of the No Project Alternative would not result in the ultimate improvements in groundwater quality that are anticipated to occur with full implementation of the SNMP. As such, the No Project Alternative would not achieve the three goals identified for the Preferred Alternative.

For the No Project Alternative, while some agricultural and dairy operators will be able to find a feasible means to comply with TDS, EC and nitrate objectives in first encountered groundwater, the potential outcome for other dischargers could be having to cease agricultural and dairy discharges. This outcome could result in a potentially significant impact on agricultural resources, such as the conversion of farmland to a non-agricultural use (e.g., land fallowing). The loss of agriculture and dairy operators could, in turn, result in the displacement of people that support these industries (those working directly on farms or dairy facilities and those that work for businesses that provide agricultural and dairy-related products and services), which would result in the need for housing elsewhere. This would be a potentially significant impact to population and housing. Further, there would be significant economic impacts from conversion of agriculture to non-agriculture use, as summarized in Section 6.6 below and detailed in the SNMP Economic Analysis (see SNMP Attachment C-2).

The wastewater treatment plant upgrade projects that would be required for wastewater dischargers to achieve compliance with salt, nitrate, and SMCL-based objectives under the No Project Alternative would undergo project-specific CEQA evaluations. Environmental impacts that could occur during wastewater facility improvement projects include temporary impacts to air quality, noise, water quality, biological resources, traffic, and cultural resources associated with construction activities, though these can generally be mitigated to less-than-significant levels. Significant long-term impacts to environmental resources would generally not be expected because these projects typically involve reduction in pollutant loadings, and the new construction is typically within the existing site footprint. There may be increases in impervious areas, but because these areas would be small relative to the watersheds as a whole, this would not be expected to reduce groundwater recharge or adversely increase stormwater runoff amounts or quality. Finally, modifications to wastewater facilities to achieve compliance with WDRs may notably increase power use at such facilities, relative to existing power usage, depending on the type and magnitude of treatment modifications required.

Finally, additional BMP actions that may be required for stormwater discharges are not themselves expected to result in any new or more severe environmental impacts compared to those identified for the Preferred Alternative. Any BMP actions that would be implemented by stormwater permittees that have the potential for environmental impacts would undergo separate, project-specific CEQA analyses prior to implementation.

6.5.2.2 Cumulative Impacts Assessment

Similar to the Preferred Alternative, the No Project Alternative could indirectly cause impacts at the local level to air quality, greenhouse gas emissions, noise, transportation, and utilities and service systems from construction and operation of projects/facilities necessary to achieve current regulatory requirements. Because such projects are not adequately defined for environmental review at the time this assessment was prepared, and because separate project-specific environmental review will be performed prior to project construction and operation, no cumulative impact determination is made here. Nevertheless, decisions makers should recognize the potential for indirect, cumulative effects to air quality, greenhouse gas emissions, noise, transportation, and utilities and service systems from implementation of the No Project Alternative exists, just as it does for the Preferred Alternative. These impacts will be further addressed, and cumulative impact determinations made, in separate project-specific environmental reviews prior to constructing the projects/facilities necessary to achieve current regulations under the No Project Alternative. Consequently, the concerns with regard to cumulative impacts to air quality, greenhouse gas emissions, noise, transportation, and utilities and service systems under the Preferred Alternative also would be of concern under the No Project Alternative; however, the specific projects that would be the drivers of such effects would differ between the Preferred Alternative and the No Project Alternative.

Under the No Project Alternative, growers and dairy operators may not be able to ensure that discharges to groundwater will not exceed water quality objectives at first encountered groundwater. Costly projects to collect agricultural drainage for centralized treatment and disposal or other actions would be needed to comply with current regulations. Some farmers and dairy operators would not be able to afford such projects/actions on their properties and thus may be forced to stop operations and possibly sell their property. For farmers that are able to participate in these projects/actions, there might still be a need to fallow land in support of the projects. If such efforts were not made to comply with existing regulations, and the Central Valley Water Board did not allow agriculture to use surface water bodies to drain salts from agricultural soils to the extent that may be needed (due to impacts to surface water quality), the salt levels in agricultural soils in the San Joaquin Valley and possibly elsewhere would eventually increase to a point where agriculture lands could no longer support current crop production, or even alternative crop production. The selling or fallowing of farmlands in an effort to comply with existing water quality regulations under the No Project Alternative and/or increasing soil salt levels over time would contribute considerably to a potentially significant cumulative impact to agriculture. This is a new potentially significant cumulative impact that would not occur under the Preferred Alternative.

The remainder of the assessment focused on cumulative impacts to water quality from implementing the No Project Alternative. This cumulative assessment is focused on cumulative water quality conditions for the same constituents of concern in surface waters and groundwaters within the Central Valley Region that were assessed for the Preferred Alternative (see Section 6.5.1).

Cumulative Surface Water Quality Conditions

Under the future cumulative condition for the No Project Alternative, the concentrations of salts, nitrate, and secondary MCL parameters (i.e., aluminum, copper, iron, manganese, silver, zinc,

color, and turbidity) in surface waters of the Central Valley Region are expected to be at similar levels, relative to existing conditions, due to implementation of Central Valley Water Board TMDLs for impaired water bodies and other actions driven by current regulations, i.e. without implementation of the SNMP. In the future cumulative condition, dischargers would have to implement treatment and control measures and projects to reduce loading of salts, nitrate, and SMCL parameters to surface waters, as needed, to achieve compliance with current regulations. Consequently, implementation of the No Project Alternative would not have a considerable contribution to any adverse cumulative condition with respect to salinity, nitrate, or SMCL parameters in surface waters.

Cumulative Groundwater Quality Conditions

Salinity Parameters and Nitrate

Existing conditions for salts and nitrate in groundwaters are considered to be adverse in some areas of certain basins or subbasins. In the future cumulative condition under the No Project Alternative, the concentrations of salts and nitrate in the groundwaters of the Central Valley Region are expected to be similar or possibly improved, relative to existing conditions, due to implementation of treatment and control measures and projects to reduce loading of salts and nitrate to groundwaters, as needed, to achieve compliance with current regulations. However, because the No Project Alternative would allow localized areas of groundwater basins/subbasins that are near or over the applicable water quality objective to be further degraded in the future until corrective actions are taken, and because it will not be feasible to remediate all such localized areas of groundwater back to existing conditions or conditions better than existing conditions, the No Project Alternative (like the Preferred Alternative) would contribute considerably to adverse future cumulative conditions of salts and nitrate in some localized areas of basins/subbasins within the Central Valley Region. This is considered to be a potentially significant. Because it is expected that some areas will remain degraded, on a localized basis, relative to existing conditions, this impact would be potentially significant and unavoidable. Consequently, implementation of the No Project Alternative would not eliminate this potentially significant impact identified for the Preferred Alternative for salts and nitrate in groundwater.

Secondary MCL Parameters

Groundwater conditions for the SMCL parameters— aluminum, copper, iron, manganese, silver, zinc, color, and turbidity—are considered to not be adverse in the Central Valley Region under existing conditions. Future cumulative conditions under the No Project Alternative for these parameters within the groundwaters of the Central Valley Region are expected to be similar to existing conditions, and are not expected to be adverse. Consequently, implementation of the No Project Alternative would not have a considerable contribution to any adverse cumulative groundwater conditions with respect to aluminum, copper, iron, manganese, silver, zinc, color, and turbidity. The No Project Alternative would not be expected to result in any new impacts with regard to these parameters that were not identified for the Preferred Alternative.

6.6 Economic Analyses

The following sections provide an overview of the findings from the economics analysis completed on the preferred and no project alternatives. The complete analysis is provided in SNMP Attachment C-2.

6.6.1 Introduction

The SNMP recommends the adoption of new policies, strategies, and guidance to facilitate implementation of this SNMP to address legacy and ongoing loading of salt and nitrate to the receiving waters in the diverse region. To varying degrees, these new policies, strategies, and guidance require a suite of actions to be taken by various parties, including the Central Valley Board and the regulated entities that currently discharge salt and nitrate to Central Valley receiving waters, as well as those that propose to discharge in the future. The Central Valley SNMP recommends a comprehensive regulatory and programmatic approach for the sustainable management of salt and nitrate; this approach sets the stage for a host of future compliance strategies and associated projects to be implemented by individuals, as well as groups of individuals operating together in newly defined management zones. Given the future unknown nature of such individual and group actions, the ability to precisely define these actions and therefore, estimate the economic costs of such individual and group actions is challenging.

In the absence of details regarding specific salt and nitrate management actions that will take place in the future, the economics analysis offers planning level cost estimates for short- and long-term actions to address nitrate contamination of groundwater and long-term actions to address salinity management.

The Central Valley Water Board must consider four legal requirements related to economics when adopting a Basin Plan Amendment:

- Wat. Code §13141 - requires that prior to implementation of any agricultural water quality control program, the Central Valley Water Board must include an estimated cost of such a program, together with an identification of potential sources of funding, in the Basin Plans.
- Wat. Code §13241(d) - requires that the Central Valley Water Board consider economics when establishing water quality objectives.
- Wat. Code §13242 - requires the Central Valley Water Board to develop a program of implementation for achieving water quality objectives which includes (a) a description of the nature of actions which are necessary to achieve the objectives, including recommendations for appropriate action by any entity, public or private; (b) a time schedule for the actions to be taken; and (c) a description of surveillance to be undertaken to determine compliance with objectives.
- Public Resources Code §21159 - requires the Central Valley Water Board, when adopting an amendment that will require the installation of pollution control equipment or is a performance standard or treatment requirement, to include an environmental analysis of the reasonably foreseeable methods of compliance. This environmental analysis is required to take into account a reasonable range of environmental, economic, and technical factors, population and geographic areas, and specific sites.

The following sections provide a summary of the planning level cost estimates associated with the No Project Alternative and the Preferred Alternative. These have been developed with consideration of various cost estimates already developed under earlier CV-SALTS efforts (e.g., see SNMP Attachment B, Section B.2.3).

6.6.2 Analysis of the No Project Alternative

6.6.2.1 Economic Impacts to Dischargers

Municipal and industrial wastewater dischargers that currently have an interim effluent limitation for EC, TDS, chloride, sulfate, and/or sodium based on a variance issued under the Salinity Variance Program or exception issued under the Salinity Exception Program would not be able to have that variance/exception renewed after June 30, 2019, via the program. The Central Valley Water Board can still grant new variances applicable to surface water discharges for EC, TDS, chloride, sulfate, and/or sodium before June 30, 2019, subject to USEPA approval. Once existing variances and exceptions expire, dischargers will be faced with meeting water quality objectives for salts that likely will require the implementation of additional treatment or control of their discharges, or other actions (e.g., new source water supply) that result in reduced loads for salinity. The current inclusion of performance-based effluent limitations in existing NPDES permits or WDRs tied to participation in CV-SALTS that are higher than AGR or MUN-based water quality objectives would no longer to be allowed. In the absence of the Central Valley SNMP, these NPDES permits and WDRs would be amended to include final water-quality based effluent limitations.

Municipal and industrial wastewater discharges to groundwater would also be required to comply with EC and nitrate limitations based on applying EC and nitrate water quality objectives at the first encountered groundwater. The future compliance costs for these dischargers cannot be quantified because these costs will be case-specific and information supporting such an analysis has not been developed by CV-SALTS and is not otherwise available.

Discharges from irrigated agriculture to surface waters and groundwater would need to come into compliance with water quality objectives for EC, TDS, and nitrate in receiving water within 10 years from the triggering of a surface water or groundwater quality management plan for these constituents. Further, discharges to groundwater would be required to comply with EC and nitrate limitations based on applying EC and nitrate water quality objectives at the first encountered groundwater. Irrigated agriculture would have 10 years to reduce its loads of salt and nitrate to the point that discharges were compliant with water quality objectives for these parameters. Because existing WDRs and Conditional Waivers for irrigated agriculture have been written to describe CV-SALTS as providing future guidance on how and to what degree salt and nitrate loads will be controlled by agriculture, growers in the Central Valley have focused their attention on preventing the discharge of pesticides to surface waters. Salt and nitrate management for agricultural discharges are in the initial stages of development. The future compliance costs for these dischargers cannot be quantified because these costs will be case-specific and information supporting such an analysis has not been developed by CV-SALTS and is not otherwise available. It is unknown if future compliance costs will drive growers to fallow or retire land as a means to balance the cost of compliance with maintaining viable agricultural operations.

Discharges from dairies that are determined to cause or contribute to an exceedance of a water quality objective, unreasonably affect beneficial uses, or cause a condition of pollution or nuisance require the discharger to bring its discharge in compliance with groundwater limitations no later than 10 years after the submittal date of a summary representative monitoring report, which must be submitted by July 1, 2020. Dairies are required to implement

management practices/activities (BPTC for high quality waters or best efforts for waters that are not high quality) that will bring the facilities into compliance on a time schedule that is as short as practicable. Also, dairies would need to comply with EC and nitrate limits based on water quality objectives in first encountered groundwater. Similar to irrigated agriculture, existing WDRs for dairies have been written to include language that CV-SALTS will provide future guidance on how and to what degree salt and nitrate loads will be controlled. Without the regulatory flexibility afforded by the SNMP's policies, strategies, and guidance, dairies will be faced with meeting water quality objectives for salts that likely will require the implementation of additional treatment or control of their discharges. The future compliance costs for these dischargers are difficult to quantify because these costs will be case-specific and information supporting such an analysis has not been developed by CV-SALTS and is not otherwise available. However, a 2013 cost estimate for retrofitting existing and constructing new lagoons for select dairy sizes ranged from $180,000 (New single liner lagoon construction for a 300 cow dairy) to $1,400,000 (Retrofitting of existing lagoon with double liner for a 3,000 cow dairy per lagoon) (Provost & Pritchard 2013). Where the expected compliance costs cannot be feasibly met, these dairy operators will likely have to cease operations, impacting local economies.

Stormwater dischargers would continue to be required to implement stormwater management plans and BMPs, as necessary, to achieve compliance with water quality objectives. Stormwater is not a large contributor of nitrate, but does observe seasonally high EC/TDS concentrations during storm runoff events. Increased costs to this discharge sector could occur as a result of being required to implement additional BMPs (e.g., education and outreach) to reduce TDS. Although future cost increases to stormwater programs would not be expected to be significant.

6.6.2.2 Projected Future Economic Impacts of Not Controlling Salinity

Howitt et al. (2009) released a report describing future economic impacts to 2030 that could occur in the Central Valley if salinity discharges to groundwater continue at their current pace in the absence of new regulation aimed to control the groundwater degradation caused by salts. The study assumed no changes to current policies or programs as of 2009 and, as such, represents the economic impacts associated with the No Project Alternative.

Projected increases in salinity in the Central Valley were based on two factors:

- Growth of the areas of shallow saline groundwater based on 30 years of historical records; and
- Increased levels of salts that result indirectly from imported water.

Based on increasing salinity from these factors, the research team measured the direct economic effects on industry, residential, food processing, confined animal operations, and irrigated agricultural production. The study assumed that economic and social impacts will occur in the Central Valley as salinity levels increase, creating changes in water quality, water supply, production of goods and services, income, and employment. A major component of the study was to determine the direct (initial changes) and indirect (inter-business commerce) effects of increasing salinity on water demand and usage in various economic sectors in the Sacramento, San Joaquin, and Tulare basins, including municipal and industrial water treatment, food processing, confined animal feeding operations, and agriculture.

Direct impacts are usually measured as direct physical costs on water users including industry, urban users and agriculture. Examples of direct impacts from increased salinity include:

- Changes to water taste for consumers and degradation of water appliances
- Accelerated degradation of pipes and other water infrastructure.
- Additional treatment costs for animal feeding operations and food processing facilities
- Reduced crop yields for agriculture

The economic impacts of not implementing a salinity management program, similar to the Central Valley SNMP, were empirically estimated by assuming that salinity continues to accumulate at its current rate (in mg/L per year of TDS): 2.63 mg/L/year for the San Joaquin and Tulare basins, and a range of 0 – 1.53 mg/L per year for the Sacramento Basin. The analysis looked at three salinity accumulation scenarios: baseline, medium, and high. The 2.63 mg/L per year rate was used for the Tulare and San Joaquin basin in all three scenarios, while the rate was varied for the Sacramento Basin: 0 mg/L per year (baseline), 0.64 mg/L per year (medium), and 1.53 mg/L per year (high) (Howitt et al. 2009).

Based on three salinity accumulation scenarios (baseline, medium and high) within hydrologic regions, the study projected economic activity and social conditions to 2030 using the Regional Economic Modeling, Inc. (REMI) model. The model estimated direct economic effects (loss of production in various sectors) and indirect effects (loss of income, output, employment, and population):

- *Direct Economic Effect* –Across all three basins, the total direct loss ranged from $988 million to $1.543 billion for the year 2030, depending on the salinity scenario. The San Joaquin Basin was estimated to experience the greatest impacts for most sectors except for concentrated animal feeding operations and irrigated agriculture, whereas the Tulare Basin was estimated to experience the largest economic impacts.
- *Indirect Economic Effect* – Effects were estimated for various scenarios and areas. Under the medium salinity accumulation scenario assumptions, annual California income was expected to decline by $2.251 billion, output by $6.485 billion, employment by 46,299, and population by 65,013 in the year 2030. Under the baseline salinity assumptions, impact estimates were reduced by approximately 25 percent and under the high assumptions, increased by approximately 35 percent.

Howitt et al. (2009) acknowledged that a detailed understanding of salinity levels, distribution, and rates of accumulation in the Central Valley was lacking at the time the modeling was conducted and therefore, the results of the study should not be used to develop regional policies for the control of salt. The researchers noted that the principal uncertainties associated with the results were caused by a lack of information on the physical parameters of salinity accumulation rather than the economic parameters and future efforts should be targeted on improving the hydrological knowledge of salinity accumulation.

6.6.3 Analysis of the Preferred Alternative

The Central Valley SNMP recommends the adoption of new policies, strategies, and guidance that the Central Valley Water Board to support the implementation of short- and long-term solutions to salt and nitrate legacy problems in the Central Valley. Implementation of the recommendations will create flexibility in the manner that the Central Valley Water Board may regulate dischargers contributing salt and nitrate loads to Central Valley receiving waters and groundwater basins.

The Preferred Alternative includes a number of recommendations for which planning level cost estimates may be derived, e.g., supply of replacement drinking water to affected communities, long-term actions to address salt and nitrate contamination of groundwater, and numerous studies and investigations required under the proposed policies and strategies. Proposed policies, strategies, and guidance collectively identify various discharge-specific studies, and in some cases monitoring and surveillance efforts, that would be needed as a means to characterize current impacts of a discharge on the receiving water, establish current ambient water quality, and monitor future ambient water quality resulting from the implementation of control measures. For other aspects of the Preferred Alternative, cost estimates are not possible because future actions or projects to control salt and nitrate are too speculative, e.g., future actions will be dependent upon the concentrations of these pollutants in the discharges and the available assimilative capacity of the receiving water or groundwater basin to which these discharges occur.

Using available information derived from existing analyses and cost estimates completed for other CV-SALTS studies, the economic analysis further developed planning level cost estimates. These cost estimates focused on short-term drinking water solutions, long-term drinking water solutions, long-term nitrate management, and long-term salinity management that support the three SNMP management goals (see Section 6 of Attachment C-2). Short-term is defined as the period prior to implementation of long-term salt or nitrate management actions (typically within 20 years). Long-term is defined as a greater than 20-year time period. Cost estimates based on site-specific conceptual projects are scaled to the regional level, where possible.

With regard to discharge-specific studies required under the SNMP, the completion of an antidegradation analysis (including an estimation of available assimilative capacity in the receiving water) for most discharges to surface waters and groundwater in the Central Valley will become a common practice. In addition, the Groundwater Management Zone Policy (SNMP Attachment A-1) and Nitrate Permitting Strategy (SNMP Attachment A-2) require various levels of analysis and submittal of documentation depending on the estimated impacts of a discharge to groundwater and the available assimilative capacity of the groundwater basin. The economics analysis includes estimated costs for studies on a policy-by-policy basis, where adequate information is available.

6.6.3.1 Drinking Water

The economics evaluation considered both short and long-term solutions for ensuring a safe supply of drinking water in areas with groundwater impacted by nitrate (see Section 6.3.2 and 6.3.3 in Attachment C-2 for additional details).

Short-term Drinking Water Solution

For areas where groundwater well nitrate concentrations are elevated, a short-term drinking water solution is to provide bottled water to individuals and households. This analysis considered areas where nitrate was either ≥ 7.5 mg/L (as N) or ≥ 10 mg/L (as N). The analysis was conducted first for the Alta Irrigation District (AID) area (Kings Subbasin; DWR B118 Code: 5-22.08) and then extrapolated to the Central Valley area. The following assumptions were used to calculate the annual cost to provide bottled water to individuals and households:

- Drinking water consumption per household is 2.25 gallons per day (gpd).
- Drinking water cost is $1.63 per gallon.
- Cities with populations greater than 5,000 were assumed to currently provide their residents with drinking water in community systems that met the primary MCL for nitrate of 10 mg/L (as N) and therefore, were excluded from the analysis.

The estimated annual cost to provide bottled water to the AID area ranged from $3.9 million to $6.6 million where nitrate was ≥ 10 mg/L (as N) and ≥ 7.5 mg/L (as N), respectively. When extrapolated to the Central Valley, the annual costs ranged from $80 million to $117 million, respectively.

Long-term Drinking Water Solution – Community Water Systems

Connecting households impacted by nitrate levels in groundwater to either existing community water systems or new community systems is a viable solution for providing drinking water that meets drinking water standards to affected households. Consistent with the CV-SALTS Nitrogen Implementation Measures Study (NIMS) Report (CDM Smith 2016a), the economic analysis relied on the pump, treat and serve (PTS) model of a community water system to develop an approximate cost basis for the AID area and then extrapolated those findings to nitrate-impacted areas in the Central Valley. CDM Smith (2016a) developed costs for three different treatment processes to significantly reduce nitrate concentrations (1 mg/L as N or lower) in groundwater before providing as finished drinking water to consumers. The three nitrate removal processes evaluated by NIMS were reverse osmosis, ion-exchange, and biological denitrification.

For the AID area the economics analysis assumes two water treatment plants would be needed to provide treated groundwater to the smaller communities[3] in the District. **Table 6-1** summarizes the estimated PTS costs for the three different types of treatment technologies.

Using the PTS costs developed for the AID area, a PTS cost per capita was developed and then extrapolated to similar nitrate-impacted areas in the Central Valley, based on the following assumptions:

[3] Cutler, Delft Colony, Dinuba, East Orosi, London, Monson, Orosi, Seville, Sultana, Traver, and Yettem.

Table 6-1. Community Water System Estimated Costs for the AID Area Using Different Treatment Technologies for Nitrate Removal (adapted from CDM Smith 2016a).

Treatment Technologies for Nitrate Removal	Capital Costs (Millions)	Operations and Maintenance (Millions/Year)	Annualized Cost (Millions)[1]
Reverse Osmosis	$71.25	$6.92	$9.42
Ion Exchange	$47.28	$3.35	$6.08
Biological Denitrification	$42.97	$1.32	$3.80

[1] Annualized costs were based on annual operations and maintenance (O&M) costs plus annualized capital costs at a 4% annual interest rate

- The AID area's per capita treatment cost is representative of other areas with communities that require a PTS.
- Cities with populations greater than 5,000 were assumed to currently provide their residents with drinking water from community water systems that meet the primary MCL of 10 mg/L (as N) for nitrate and therefore, were excluded from the analysis.
- All community water systems will fall between production rates of 0.5 and 5 million gallons per day (MGD). This assumption is based on the two water treatment plants evaluated for the AID area and supported by the exclusion of cities with > 5000 population from the current study area.
- Either ion exchange or biological denitrification provide the most cost-effective means to remove elevated nitrate concentrations except areas that also have wells with high TDS. For areas with TDS > 1,500 mg/L, it was assumed that reverse osmosis treatment would be used for removal of both salts and nitrates. An analysis of groundwater areas with high nitrate and TDS found that 30% of the area in the Central Valley with nitrate concentrations ≥ 10 mg/L (as N) and 27% of areas with nitrate concentrations ≥ 7.5 mg/L (as N) also have TDS levels at or above 1,500 mg/L TDS. In these areas, a reverse osmosis system was assumed. In the remaining areas in the Central Valley, biological denitrification treatment was assumed.

Table 6-2 provides the results of the extrapolation of AID area findings to the Central Valley, based on the above assumptions.

Long-term Drinking Water Solution – Point of Use (POU) Treatment

Areas of dispersed population with elevated nitrate concentrations in groundwater that will not be serviced by a community water system will require installation of a POU treatment system in each household. POU treatment systems for nitrate consist of whole house nitrate ion exchange (IX) systems, whole house reverse osmosis (RO) systems, and under-the-sink (UTS) RO systems. For the economic analysis, UTS RO systems were assumed to be the most practical device for servicing nitrate-impacted households, given the drawbacks of the other two systems: (a) Whole house RO systems are cost prohibitive and would require in many households extensive plumbing modifications to ensure that the treated water does not leach metals from existing plumbing; and (b) Nitrate IX systems treat all of the household's water, but they do so by adding

salt, which can cause taste issues in the drinking water as well as add salt load to the household's wastewater.

Table 6-2. Community Water System Estimated Costs for Areas in the Central Valley with Elevated Nitrate Concentrations in Groundwater (adapted from CDM Smith 2016a).

Pump, Treat and Serve in the Central Valley	Population[1]	Capital Cost (Millions)[2]	Operations and Maintenance Cost (Millions/Year)[2]	Annualized Cost (Millions)[2]
Upper or Lower Zone - Nitrate ≥ 10 mg/L as N	85,250	$108.50	$6.00	$11.57
Upper or Lower Zone - Nitrate ≥ 7.5 mg/L as N	117,728	$147.64	$8.29	$15.98

[1] Population data taken from U.S. Census Bureau 2010
[2] Costs per capita were calculated from the CDM Smith (2016a)

The cost basis for UTS RO systems assumes that they are leased (at a monthly rate) and will require RO membrane replacement every three to five years. Costs were developed for the AID area and then extrapolated to the Central Valley.

The number of households in the AID area that would not be connected to the community water system was estimated using GIS and census data (2010) and available nitrate data. **Table 6-3** provides the estimated annual costs for leasing UTS RO systems within areas with different nitrate conditions

Table 6-3. Point-of-Use Treatment System Estimated Costs for the AID Area

Point-of-Use Treatment Area in AID	Population[1]	Number of Households[1]	Monthly Unit Cost[2]	Total Annual Cost[3]
Upper or Lower Zone - Nitrate ≥ 10 mg/L as N	6,483	1,752	$40	$0.9 million
Upper or Lower Zone Nitrate - ≥ 7.5 mg/L as N	12,103	3,162	$40	$1.6 million

[1] U.S. Census Bureau 2010
[2] Based on conservative quote for monthly lease of an RO system
[3] Total Annual Cost includes the cost of membrane replacement for POU treatment system every three years

The costs of POU devices for the entire Central Valley were calculated from the number of households located in areas with varying nitrate concentrations and not served by community water systems. These annual cost estimates are shown in **Table 6-4.**

6.6.3.2 Long-term Nitrate Management

The SNMP management goals applicable to the long term management of nitrate include:

Table 6-4. Point-of-Use Treatment System Estimated Costs for Areas in the Central Valley with Elevated Nitrate Concentrations in Groundwater

Point-of-Use Treatment Area in the Central Valley	Population[1]	Number of Households[1]	Monthly Unit Cost[2]	Total Annual Cost[3]
Upper or Lower Zone - Nitrate ≥ 10 mg/L as N	123,418	36,906	$40	$19 million
Upper or Lower Zone Nitrate - ≥ 7.5 mg/L as N	184,688	55,747	$40	$29 million

[1] U.S. Census Bureau 2010
[2] Based on conservative quote for monthly lease of an RO system
[3] Total Annual Cost includes the cost of membrane replacement for POU treatment system every three years

- Ensuring a safe drinking water supply for all residents in the valley;
- Balancing salt and nitrate loading to eliminate further degradation where reasonable and feasible; and
- Implementing management restoration where reasonable and feasible

The first goal, ensure a safe drinking water supply, has been evaluated above in Section 6.6.3.1. For the purposes of developing cost estimates for management measures intended to address the second and third goals, the following general approach was followed:

- Cost estimates for aggressive restoration actions were developed for two subareas within the AID area (Dinuba and Cutler-Orosi) (Luhdorff & Scalmanini Consulting Engineers and Larry Walker Associates [2016b]).
- Local information for the Cutler-Orosi and Dinuba subareas was used to estimate costs for the entire AID study area; and
- AID area costs were extrapolated to estimate costs to meet the long-term nitrate management goals in the Central Valley in areas impacted by elevated nitrate levels in groundwater.

The sections below summarize cost estimates for the AID area and the Central Valley. SNMP Attachment C-2, Luhdorff & Scalmanini Consulting Engineers and Larry Walker Associates (2016b) and CDM Smith (2016a) provide additional information regarding the costs developed for the Cutler-Orosi and Dinuba subareas.

Long Term Nitrate Management in the Alta Irrigation District

In order to change the ambient nitrate concentration in groundwater in the AID study area, aggressive measures were modeled. Removing nitrate mass is accomplished by pumping groundwater out of the aquifer system. That water can either be treated and served, treated and reinjected, or applied directly to agricultural lands. An additional aggressive measure to reduce nitrate concentrations in the groundwater basin is through artificial winter season recharge on agricultural fields (on-farm winter recharge), e.g., application of excess Kings River water during winter months (November through March) to areas where the potential for accepting recharge is

high. These two concepts (pumping and recharge) were considered in the development of this cost estimate.

To develop a cost estimate for the entire AID area, which was then used to provide a Central Valley-wide cost estimate, two AID subareas, Dinuba and Cutler-Orosi, were prioritized for pump, treat, and reinject based on their status as economically disadvantaged communities, ambient nitrate levels, land uses, and mass loadings. A third area located north of Dinuba and east of Reedley was selected to evaluate the on-farm winter recharge scenario based on its high recharge potential (soil type, depth to water, etc.). Four different management scenarios (Plans A through D) were modeled for several different well pumping rates and based on assumed well field engineering designs, modeling was completed for each of the two subareas to estimate water quality benefits achieved under each scenario. This information was then extrapolated to the larger AID area (see Attachment C-2 for detailed information regarding the modeled management scenarios, well-field engineering designs, and development of costs for the Dinuba and Cutler-Orosi areas).

Using the costs developed for the two AID subareas costs were estimated for the entire AID area (see Attachment C-2 for subarea cost information). As before, it was assumed that regional treatment facilities with ion exchange technologies and evaporation ponds would be used to reduce nitrate prior to reinjection. The standard capacity of a treatment facility was assumed to be 25 MGD. Based on data for the AID area, it was estimated that seven treatment facilities of this size would be needed to handle extracted water from the upper zone, and eleven treatment facilities would be needed to meet the treatment needs for the lower zone. Evaporation ponds would be needed for residuals; it is estimated that an evaporation pond area of approximately 3.5 acres (assuming 5-ft depth) would be needed for each 25 MGD treatment facility. Based on these assumptions, **Table 6-5** provides the estimated costs for long-term nitrate management in the AID area under Restoration Plan B. Plan C and D costs would be incrementally higher (see Attachment C-2 for information regarding characteristics of Plans B, C and D).

Table 6-5. Estimated Capital and O&M Costs for Long-Term Nitrate Management in Entire AID Area Based on Restoration Plan B

Aquifer Zones	Capital Costs ($ Millions)					Annual O&M Costs ($ Millions)				
	Wells	Treatment		Total		Wells	Treatment		Total	
		Low	High	Low	High		Low	High	Low	High
Upper	$867	$202	$427	$1,069	$1,294	$87	$25	$57	$112	$143
Lower	$1,373	$318	$670	$1,691	$2,043	$137	$39	$89	$176	$227
Project Total	$2,240	$520	$1,097	$2,760	$3,377	$224	$64	$146	$288	$370
Contingency (30%)				$828	$1,001				$86	$111
Total, with contingency				$3,588	$4,338				$374	$481
Annualized capital cost (20 yrs., 3% interest)				$241	$292					
Total annual cost (annualized capital & O&M)				Low	High					
				$615	$773					

Long-Term Nitrate Management in the Central Valley

The cost estimates for the AID area were scaled up to the Central Valley based on the AID modeling findings and the area of nitrate-impacted areas in the Central Valley. However, as noted by Luhdorff & Scalmanini Consulting Engineers and Larry Walker Associates (2016b) this approach has to be strongly qualified. Applying pump, treat, and reinject designs to large regional areas may not be practicable. Instead, localized management efforts in areas of high priority (based on proximity to communities and existing ambient conditions) may be a more feasible approach to achieving restoration. With that caveat, to obtain a planning-level understanding of the potential costs of a valley-wide restoration effort, the economic analysis estimated the required number of wells and treatment facilities needed for the Central Valley area and the total volumes to be treated daily. The planning level estimate assumed that areas with existing nitrate concentrations above 7.5 mg/L nitrate (as N) would be aggressively restored (note that this is an extrapolation and has not been modeled; it is unknown how long it would take to reach target concentration goals or whether they are attainable at all). **Table 6-6** summarizes the area requiring treatment and required numbers of extraction/ injection wells for both the AID area and Central Valley.

To estimate costs, it was again assumed that regional treatment facilities with ion exchange technologies and evaporation ponds would be built for treating the pumped groundwater valley-wide. At a proposed 25 MGD capacity per facility and given estimated treatment volumes, 204 and 185 treatment facilities were projected for the upper and lower zones, respectively, under Plan B. Evaporation ponds of approximately 3.5 acres (assuming 5-ft depth) would be needed for each 25 MGD treatment facility. **Table 6-7** provides the resulting estimated Central Valley costs in billions of dollars. These estimates are intended to only present a planning-level understanding of the financial effort involved in aggressively restoring such a large area. Because of all of the generalizations, estimations, and 'scaling up' factors involved, actual costs could easily be plus or minus 50% of estimated costs.

Table 6-6. Estimates of the Number of Wells and Area Requiring Treatment in the AID Area and Projections for the Central Valley

Area	Area Needing Treatment (square miles)	No. of Extraction Wells	No. of Injection Wells
Alta Irrigation District			
Upper Zone	208	238	381
Lower Zone	254	377	604
Total	462	615	985
Central Valley			
Upper Zone	6,154	7,053	11,291
Lower Zone	4,324	6,418	10,283
Total	10,478	13,471	21,574

Table 6-7. Estimated Capital and O&M Costs for Long-Term Nitrate Management in the Central Valley based on Restoration Plan B

Aquifer Zones	Capital Costs ($ Billions)					Annual O&M Costs ($ Billions)				
	Wells	Treatment		Total		Wells	Treatment		Total	
		Low	High	Low	High		Low	High	Low	High
Upper	$26	$6	$12	$32	$38	$2.6	$0.7	$1.7	$3.3	$4.3
Lower	$23	$5	$11	$28	$34	$2.3	$0.7	$1.5	$3.0	$3.8
Project Total				$60	$72				$6.3	$8.1
Contingency (30%)				$18	$22				$1.9	$2.4
Total, with contingency				$78	$94				$8.2	$10.5
Annualized capital cost (20 yrs., 3% interest)				$5.2	$6.3					
Total annual cost (annualized capital & O&M)				Low	High					
				$13.4	$16.8					

6.6.3.3 Salt Management

The Central Valley SNMP proposes that the management of salt be addressed through the adoption and implementation of the Salinity Management Strategy (SNMP Attachment A-3). This three-phased strategy includes implementation of a Phase I Prioritization & Optimization Study for a period of about 10 years. This study, which is estimated to cost between $7 and $13 million, will identify recommended salt management projects for implementation by hydrologic region. Projects may range from those that would be implemented on a local or subregional basis to larger, regional projects such as a regulated brine line (CDM Smith 2016b). As part of the Prioritization & Optimization Study, costs for recommended local or subregional salt management projects will be developed. In addition, CDM Smith (2014) provides estimated planning level costs for various treatment technologies evaluated. In addition,

CV-SALTS developed costs for a regulated brine line (CDM Smith 2014). Per this study, brine would be discharged via either the East Bay Municipal Utility District (EBMUD) outfall or an alternative outfall location in saline waters. The Bay Area disposal option potentially has the capacity to manage all of the current salt accumulation in the Central Valley. **Table 6-8** provides the planning costs developed for this project in 2014 based on salt accumulation estimates in key IAZs (see SNMP Section 3.1) (CDM Smith 2014).

Table 6-8. Estimated Central Valley Regulated Brine Line Costs (adapted from CDM Smith 2014)

Component	IAZs 9, 10, 14, 15, 19, 21, and 22				IAZ 6				Entire Project	
	Capital Cost			O&M Cost ($M)	Capital Cost			O&M Cost ($M)	Total Capital Cost ($B)	Total O&M Cost ($B)
	Number of Units	Unit Cost	Total ($M)		Number of Units	Unit Cost	Total ($M)			
Extraction wells	693	$1.4M	$970	$97	155	$1.4M	$217	$22		
Desalter facilities	33	$150M	$4,950	$495	7	$150M	$1,050	$105		
Post-RO brine treatment	37.25MGD	$4/gal	$149	$15						
Reinjection wells	624	$1.4M	$874	$87	16	$1.4M	$22	$2		
Brine line[1]	• 24” diam, 50mi • 36” diam, 22 mi • 48” diam, 63 mi • 2 x 48” diam, 90 mi • 2 x 48” diam, 56 mi	• $6/ LF diam in • $6/ LF diam in • $6/ LF diam in • $6/ LF diam in • $15/ LF diam in	$38 $25 $96 $239 $373							
Subtotal Brine Line			$771	$77						
Brine line pump stations	7	$36.85M	$258	$72						
Brine disposal at EBMUD	74.5MGD	$0.04/gal		$1,088						
Deep well brine disposal					35	$2.53M	$89	$9		
Total costs			$7,972	$1,938			$1,378	$138	$9.3	$2.1
Contingency (30%)									$2.8	$0.6
Total plus contingency									$12.1	$2.7
Estimated annual cost (over 30 years at 3% interest rate)									$0.6	$2.7
Total estimated annual cost									$3.3	

[1] A 1.75 multiplier (instead of 2) is applied for segments where two parallel pipes are used (to account for cost savings from using the same alignment).

6.6.3.4 Economic Costs Attributable to Individual CV-SALTS Policies, Strategies, and Guidance

Different elements of the policies, strategies, and guidance recommended by the SNMP will require resources to implement. This will be true regardless of whether the work is performed by an individual discharger or by a group of dischargers within an approved management zone. In addition, the proposed SNMP does not specify the salt and nitrate control methods or projects that individual dischargers or groups of dischargers may implement in the future to meet water quality objectives and satisfy the requirements of the SNMP. As a consequence, dischargers may be required to complete studies or analyses to support the development of a management program. Given the expectation of these types of implementation costs, the economics analysis summarized the types of studies, plans, or analyses that may be required to support implementation of a particular policy, strategy or guidance. For example, for implementation of the Groundwater Management Zone Policy, the economics analysis includes estimated costs for development of the Preliminary Management Zone Proposal, Early Action Plan, Initial Assessment, Notice of Intent, Final Management Zone Proposal, and Management Zone Implementation Plan. See Section 6.3.6 in Attachment C-2 for more information.

6.6.3.5 SNMP Surveillance and Monitoring Program

The SAMP establishes a template for development of a groundwater surveillance and monitoring program to support implementation of the SNMP (see SNMP Section 5). The monitoring program will be further developed while the Basin Plan amendment process is underway to incorporate the SNMP into the Basin Plans. The purpose of a surveillance and monitoring program is to provide the means for determining if the implementation program is achieving its goals to improve nitrate and salt conditions in groundwater. The program is intended to provide a means to periodically assess salt and nitrate to evaluate progress toward meeting those goals.

The surveillance and monitoring program domain is the Central Valley as a whole, but local monitoring programs associated with WDRs or the execution of Management Zone Implementation Plans established for newly defined management zones could be linked with the monitoring program. For example, local or management zone monitoring programs could serve the purposes of the SNMP surveillance and monitoring program within those local areas. The SAMP report identifies several tasks, both to start-up and implement the program (See SNMP Sections 5.4 and 5.5). It is anticipated that a project budget between $2.7 and $5 million would be needed to fund the first 10 years of the monitoring program (includes start-up costs and reporting at 5 year intervals). With additional administration and contracting costs, estimated annual cost over the first 10-year period is between $300 and $550 thousand dollars (CDM Smith 2016e). These costs are not necessarily new costs since to the extent practical, the surveillance and monitoring program will rely on existing monitoring programs.

6.7 Antidegradation Analysis

6.7.1 Overview

As described in SNMP Section 4.2.2 the SNMP recommends a number of new policies, regulatory tools, and clarifications to the Central Valley Basin Plans. The SNMP and related policies (included as attachments A1-A11 to the SNMP) may be adopted, by the Central Valley Water Board, as amendments to the Basin Plans. The Central Valley Water Board amends its Basin Plans through a

structured process involving scientific peer review (as necessary), public participation, and environmental and regulatory reviews. Part of the review is an evaluation to ensure that the basin plan amendments (BPAs) comply with both federal and state antidegradation policies, which ensure the actions resulting from the adoption do not unreasonably degrade water quality, do not unreasonably affect present and anticipated beneficial uses, and maintain the highest water quality consistent with the maximum benefit to the people of the State. The information provided below provides an overview of the approach to the antidegradation analysis of the SNMP's recommendations and describes the basis for making water quality findings. The complete Antidegradation Analysis and the detailed basis for water quality findings is provided in SNMP Attachment C-3, in particular Section 6.

6.7.2 Analysis of Preferred Alternative

Given the geographic extent of the area in which the SNMP will be implemented, the antidegradation analysis was a programmatic assessment of potential impacts. Subsequent project-level antidegradation analyses would be performed by the local agencies that will implement projects resulting from implementation of the SNMP. This analysis is for the reasonably foreseeable environmental impacts associated with the reasonably foreseeable actions to be implemented, based on information developed for the SNMP. The analysis ensures that the impacts associated with implementing the SNMP and related policies within the Central Valley are consistent with the federal and state antidegradation policies.

The intent of the Preferred Alternative is to establish a regulatory framework to achieve long-term improvements in ambient water quality conditions in surface and groundwaters under the jurisdiction of the Central Valley Water Board while prioritizing direct user protection. As such, the intent of the Preferred Alternative is fundamentally consistent with the state and federal antidegradation policies, which are intended to maintain and protect current ambient water quality and beneficial uses and provide maximum benefit to the people of the State. The Federal Antidegradation Policy (40 CFR 131.12) is only applicable to surface waters of the United States. The State Antidegradation Policy (State Water Board Resolution No. 68-16) pertains to high quality waters of the State and is applicable to both surface waters and groundwater. Resolution No. 68-16 states, in part:

(1) Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been 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 uses of such water and will not result in water quality less than that prescribed in the policies.

(2) 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 water 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.

In evaluating consistency with State Water Board Resolution No. 68-16, the following four questions were answered for each of the recommended policies, strategies and guidance included in the Preferred Alternative (see SNMP Section 4.2.2 and Attachment A):

- Will the policy ensure that any change to existing high quality waters will be consistent with a finding of "maximum benefit to the people of the State"?
- Will the policy ensure that any change to high quality waters will not unreasonably affect present and anticipated beneficial uses of such water?
- Will the policy ensure that any change to existing high quality waters will not result in water quality less than water quality objectives?
- Will the policy require discharges to existing high quality waters to meet waste discharge requirements which will result in best practicable treatment or control necessary to assure (a) that pollution or nuisance will not occur and (b) that the highest water quality consistent with maximum benefit to the people of the state will be maintained?

To complete the Antidegradation Analysis, the individual policies, strategies and guidance contained within the Preferred Alternative were examined and elements of the policies which would affect water quality in the short-term or long-term were evaluated. In addition, the No Project Alternative was evaluated to provide a comparative assessment to the Preferred Alternative and for consistency with antidegradation policies. In this evaluation, "short-term" is defined as the period prior to implementation of long-term salt or nitrate management actions (on the order of two or more decades). "Long-term" is defined as the period after implementation of salt and nitrate actions to address the SNMP's management goals (on the order of 20 to 50 years).

In the absence of information to support a quantitative analysis, the findings presented herein are presented as qualitative assessments. In this qualitative evaluation, current water quality conditions in the Central Valley (as provided in Attachment C-3 and summarized in SNMP Section 3.4) provide a frame of reference for the evaluation of consistency with antidegradation policies. It should be noted that the consideration of water quality conditions existing in 1968 should be used in project specific evaluations performed in the implementation of the SNMP and associated policies where ambient data is available to enable such an assessment. The qualitative assessments described below fall into several common categories, all of which would be consistent with antidegradation policies, which are described below:

- A policy element will itself require performance of an antidegradation analysis to support proposed changes in high quality waters, ensuring consistency with antidegradation policies prior to approval of an action to be implemented in accordance with the SNMP.
- A policy element will support/yield no change in high quality waters.
- A policy element will allow a short-term change in high quality waters while actions are taken that improve beneficial use protection and provide long-term water quality improvement or other benefits.

- A policy element will allow a short term change of in high quality waters in a localized area while creating water quality improvements or other benefits in a larger area.

Section 6 of the Antidegradation Analysis (Attachment C-3) provides the findings of the required analyses completed on the recommended SNMP policies, strategies and guidance. Findings considered both the state and federal antidegradation policies. All recommended SNMP polices, strategies and guidance are subject to the state antidegradation policy; only recommendations applicable to surface waters are subject to the federal antidegradation policy, i.e., the Salinity Management Strategy, Revisions to the Salinity Variance Program Policy, and Guidance to Implement Secondary Maximum Contaminant Levels.

For the state antidegradation analysis, the analysis of each policy, strategy or guidance focused on addressing the following elements as related to the SNMP's Preferred Alternative and, where applicable, other options identified for inclusion in the analysis:

- Defining the Process by which the Central Valley Water Board will ensure that any change to high quality waters will not unreasonably affect present and anticipated beneficial uses of such water or result in water quality less than water quality objectives following adoption of the SNMP's recommendations (and any other proposed options).
- Defining the Process by which the Central Valley Water Board will ensure that discharges to existing high quality waters will be regulated under waste discharge requirements that will result in best practicable treatment or control necessary to ensure (a) that pollution or nuisance will not occur and (b) that the highest water quality consistent with maximum benefit to the people of the state will be maintained.
- Defining the Process by which the Central Valley Water Board will ensure that any degradation to high quality waters is consistent with the "maximum benefit to the people of the state" following adoption of the SNMP's recommendations (and any other proposed options).

Where evaluation of the federal antidegradation policy was required, the analysis of each policy, strategy or guidance focused on addressing the following elements as related to the SNMP's Preferred Alternative and, where applicable, other options identified for inclusion in the analysis:

- Defining the Process by which the Central Valley Water Board will ensure that existing instream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected following adoption of the SNMP's recommendations (and any other proposed options).
- Defining the Process by which the Central Valley Water Board will ensure that, where the quality of the waters exceeds levels necessary to support the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located.

- Defining the Process by which the Central Valley Water Board will ensure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and all cost-effective and reasonable best management practices for nonpoint source control.

Section 6 of the Antidegradation Report provides the findings for each recommended SNMP policy, strategy or guidance (see SNMP Attachment C-3).

6.7.3 Analysis of No Project Alternative

Under the No Project Alternative, the recommended changes encapsulated in the SNMP would not be incorporated in amendments to the Basin Plans. For the No Project Alternative, the regulation of waste discharges in the Central Valley would not change and would proceed as under the current regulatory framework for surface water and groundwater, respectively. Section 6.4.1 above describes potential consequences of the No Project Alternative to dischargers. With regards to antidegradation, the current NPDES and WDR program, and the selection of the No Project alternative, are consistent with antidegradation policies.

6.7.4 Limitation to the Antidegradation Analysis

The antidegradation analysis is for the programmatic level commensurate with the development of the SED (see SNMP Attachment C-1) for the Preferred Alternative. There was no ability at the current time to evaluate any particular project that may occur as a result of implementing the elements of the SNMPs recommended strategies, policies, and guidance. However, antidegradation analyses will be performed on specific projects and discharge conditions, when appropriate.

6.8 Summary

Based on the findings of the environmental review and economic analysis completed for the SNMP, the SNMP recommends the implementation of the Preferred Alternative. This recommendation is based on the following key findings:

- Where dischargers would be able to comply with existing regulatory thresholds, implementation of the No Project Alternative would lessen some of the potentially significant impacts in areas of groundwater basins/subbasins where salt and nitrate levels are currently approaching or exceeding applicable water quality objectives. However, given the complexity and expense associated with implementing corrective actions, compliance would only be achieved over a number of years. Furthermore, widespread deployment of the advanced treatment technologies necessary to meet existing regulatory thresholds would result in extraordinary secondary impacts (additional greenhouse gas emissions from reverse osmosis treatment, the creation of new waste streams, etc.). Where dischargers are unable to implement treatment or control technologies to come into compliance with existing regulatory thresholds, dischargers would be forced to discontinue commercial activities. While the discontinuation of commercial activities, such as the fallowing of agricultural lands or the abandonment of livestock operations, might reduce current pollutant loading, it would not itself rectify groundwater impairments, as significant masses of nitrates and other salts currently exist in vadose zones throughout the Central Valley, and would continue to migrate to groundwater following the cessation of

economic activities. Furthermore, the extensive discontinuation of commercial activities would result in significant and widespread negative economic impacts. Water quality degradation is therefore inevitable under the No Projective Alternative both where dischargers have the technical and economic capacity to come into compliance with existing regulatory thresholds and where dischargers would be forced to discontinue commercial activities. Under both scenarios, the continued degradation would be considered a potentially significant impact. Lastly, while the No Project Alternative may somewhat lessen the potentially significant water quality impacts from salt and nitrate water quality degradation impacts identified for the Preferred Alternative, it is not expected to reduce these impacts to a less-than-significant level.

- Implementation of the No Project Alternative would not result in the long-term improvements in groundwater quality that are anticipated to occur under the Preferred Alternative. The Preferred Alternative includes three management goals, two of which would not be realized under the No Project Alternative. Specifically, the No Project Alternative does not (a) provide a pathway to providing safe drinking water to Central Valley residents, nor does it (b) establish a mechanism for the long-term restoration of groundwater basins/subbasins. Under the No Project Alternative, a greater number of vulnerable communities would likely continue to consume water of unacceptable quality, potentially resulting in extensive negative human health impacts. Under the Preferred Alternative, safe drinking water and the benefits of this effort will be realized within a reasonable time frame. Further, although the long-term goal to restore the Central Valley's groundwater basins/subbasins, where reasonable and feasible, will require many years to meet, the outcome will be a safe drinking water source for many generations. This long-term outcome would not be realized under the No Project Alternative.

- The expected cost of compliance under the No Project Alternative could not be estimated given the significant variability that exists in how dischargers may choose to comply with water quality objectives at first encountered groundwater. However, all known treatment technologies, such as the implementation of reverse osmosis treatment to reduce salinity from discharges, are extraordinarily expensive; where dischargers are able to comply with existing regulatory thresholds, compliance costs are expected to increase substantially. Where achieving compliance is determined not to be feasible, the outcome is expected to be increased land fallowing and loss of jobs as agricultural and dairy operations cease, and the economic effects would be devastating to many of the Central Valley's agricultural communities. Therefore, under the No Project Alternative, the cost of compliance will at best have mixed economic outcomes and will at worst have catastrophic local impacts. The No Project Alternative could result in a weaker economy in the Central Valley, which would reduce the resources available to manage salts and nitrates and reduce the resources that would be available to work to ensure safe and reliable drinking water for sensitive communities. In contrast, the Preferred Alternative seeks to ensure that resources are available to manage these critical constituents, and focuses efforts to help ensure safe drinking water for communities.

- The cost to implement the salt and nitrate management requirements under the Preferred Alternative could be substantial. Given this finding, the Preferred Alternative recommends

a hierarchical approach for implementation. Under this alternative, the initial primary focus is on nitrate management, in particular, to ensure that safe drinking water concerns are addressed. In contrast, salt management will be implemented in a phased manner over a number of years. Implementation of the nitrate management requirements is further prioritized under the Preferred Alternative so that groundwater basins/subbasins with the most significant water quality concerns are addressed first following adoption of Basin Plan amendments. Ultimately, under the Preferred Alternative, the proposed hierarchal, prioritized approach ensures that critical resources are allocated to the most significant Central Valley water quality concerns first. This approach allows resources to be focused initially on getting sensitive communities safe and reliable drinking water (consistent with State legislation and Water Board direction), while longer-term solutions are developed and implemented to reduce loading to groundwater and eventually reverse degradation. In contrast, the No Project Alternative would focus all resources to achieve compliance with objectives at the individual discharger level, without consideration of legacy contamination already in the groundwater that will continue with or without the discharges. The No Project Alternative would not allow prioritization of resources to ensure Central Valley sensitive communities are able to access a safe and reliable drinking water supply. Thus, the No Project Alternative does not meet the project goals.

- The Preferred Alternative proposes to alter the way in which the Central Valley Water Board will regulate discharges of salt and nitrates throughout the Central Valley. The environmental review therefore evaluated the means by which the Board's implementation of the Preferred Alternative through subsequent regulatory activities (i.e., issuance of WDRs) will nonetheless ensure compliance with federal and state antidegradation policies. The environmental analysis concludes that the proposed regulatory process has sufficient elements to ensure that the Board would not authorize discharges that would unreasonably degrade water quality or unreasonably affect present and anticipated beneficial uses, and that the Board's regulatory process would still ensure the maintenance of the highest water quality consistent with the maximum benefit to the people of the State.