**Attachment A**
**Technical Projects Supporting Central Valley-wide**
**Salt and Nitrate Management Plan**

## Conceptual Model Development

**Salt and Nitrate Sources Pilot Implementation Study -** The *Salt and Nitrate Sources Pilot Implementation Study* ("Pilot Study) was the precursor to what is now described as the development of a Conceptual Model for the Central Valley. The primary objective of the Pilot Study was to develop a methodology and provide guidance for development of the Salt/Nutrient Management Plan for the Central Valley. Specifically, the project developed and documented methods to fairly and equitably quantify salt and nitrate sources. These methods were then pilot tested in selected Central Valley areas to evaluate their appropriateness for region-wide application. Following completion of the Pilot Study, CV-SALTS developed *A Framework for Salt/Nitrate Source Identification* Studies based on the findings from the Pilot Study.
Status: Project was completed in February 2010.

**Initial Conceptual Model (ICM) -** Development of the ICM is the first phase of a planned three-phased effort to develop the technical and regulatory basis for adoption of a Salt/Nutrient Management Plan (SNMP) for the Central Valley. The purpose of this phase is to develop a conceptual level (or 30,000-foot level) analysis of water balance and associated salt and nutrient (nitrate) conditions in the Central Valley. This effort will rely on the establishment of Initial Analysis Zones (IAZs) to complete water quantity and quality analyses within smaller areas within the valley and detailed analyses in two selected subareas of the Central Valley. The IAZs provide the foundation for the eventual establishment of salt/nutrient management zones in the Basin Plan. The outcome of the ICM project will be an assessment of salt/nitrate conditions in the Central Valley, including identification of hotspots and long term trends for salt and nitrate concentrations. Subsequent phases will refine the findings from the ICM and develop the SNMP which includes preparation of a salt/nitrate program of implementation and completion of regulatory analyses to support adoption of the SNMP into the Basin Plan.
Status: Project was initiated in September 2012 and completed in December 2013.

**Phase 2 Conceptual Model -** Development of the Conceptual Model to support preparation of the Salt/Nitrate Management Plan (SNMP) was initiated under CV-SALTS' Initial Conceptual Model (ICM) Project (completed in January 2014). This project builds off the findings of the ICM to begin development of a draft SNMP for the Central Valley. Scope of work elements include targeted refinements to the project database, development of salt and nitrate data analysis methods to support regulatory decisions, implementation of an archetype or pilot analysis to evaluate salt and/or nitrate management options at a management zone scale, and preparation of the first drafts of the technical elements of the SNMP.
Status: Project was initiated in April 2014; completion expected in spring of 2016.

**Phase 3 Conceptual Model -** Development of the Conceptual Model to support preparation of the Salt/Nitrate Management Plan (SNMP) was initiated under CV-SALTS' Initial Conceptual Model (ICM) Project (to be completed in October 2013) and refined under the CV-SALTS' Phase 2 Conceptual Model project. This project will build off the work completed under Phase 2

and focus on completion of regulatory-related analyses (antidegradation and economics) and preparation of documentation to support adoption of the SNMP into the Basin Plan.
Status: Project is planned for initiation and completion in 2016.

**Updated Groundwater Quality Analysis for the Central Valley** – CV-SALTS has initiated a project to update the groundwater quality analysis originally conducted as part of the ICM. The project deliverables include (a) high resolution ambient groundwater quality maps (nitrate and TDS) for the Central Valley for three defined zones: upper, lower, and production zones; and (b) high resolution assimilative capacity maps (nitrate and TDS) for the Central Valley (upper, lower, and production zones). The deliverables will be incorporated into the technical sections of the developing SNMP.
Status: Project initiated in December 2015 and scheduled for completion in March 2016.

## Data Development Projects

**GIS Services - Phase 1 Beneficial Use & Objectives Study (BUOS)** - CV-SALTS began data gathering and Geographic Information System (GIS) development efforts through the implementation of the Phase 1 BUOS. This project included three tasks: (a) Identification of existing and potential beneficial uses in the Central Valley which included development of GIS mapping layers showing beneficial use categories assigned to surface water and groundwaters; (b) compilation of data for use in the development of the beneficial use map layers; and (c) completion of a literature review of criteria related to salt and nutrients and protection of various beneficial uses.
Status: Project was completed in September 2010.

**GIS Services – Phase 2 - C**V-SALTS continues to develop a Geographic Information System (GIS) to organize information pertaining to the beneficial uses, water quality objectives, water use infrastructure, and water quality of surface water and groundwater in the Central Valley. Development of this GIS supports ongoing efforts to develop a Salt/Nutrient Management Plan (SNMP) for the Central Valley by providing a centralized geodatabase for all matters pertaining to the development and implementation of the SNMP. This project builds off the CV-SALTS Phase 1 Beneficial Use Objectives Study (BUOS), which established baseline GIS-related data to support CV-SALTS. Phase 2 will update the existing geodatabase to incorporate the 2012 National Hydrography Dataset and incorporate new water infrastructure-related data, e.g., municipal surface water intakes, locations of wastewater facility discharges to surface water, agricultural water intakes, and groundwater wells.
Status: Project initiated in September 2012 and completed October 2013.

**GIS Services – Agricultural Zone Mapping -** CV-SALTS implemented a GIS project to develop map layers of agricultural-related data to support development and implementation of water quality objectives to protect waters used for agricultural irrigation. Data layers incorporated into the CV-SALTS geodatabase included agricultural-related jurisdictional boundaries, soil characteristics, irrigation supply sources, water quality, historic and current cropping patterns, as well as other relevant data. These data layers were used to identify potential Crop Sensitivity Zones (CSZs) based on similar hydrologic and hydrogeologic conditions, cropping patterns, management practices, and other factors related to crop sensitivity to salinity. T his project was originally planned to occur in two phases. Phase 1 was authorized in 2013, but Phase 2 authorization was deferred, pending the findings of the Phase 1 work. Phase 1 deliverables included (a) developing agricultural-related data and preparing appropriate GIS map layers; (b) identifying up to 25 CSZs for the Central Valley; and (c)

conducting a workshop with the agricultural community to discuss project findings. The need for a second phase for this project has not yet been determined by CV-SALTS.
Status: Phase 1 project was implemented February 2013 and was completed in April 2014.

## Beneficial Use Designation Studies

**Tulare Lake Bed MUN Archetype -** As part of its effort to develop a Salt/Nutrient Management Plan (SNMP) for the Central Valley, CV-SALTS is evaluating appropriate designations and level of protection for waterbodies currently designated with the MUN beneficial use, taking into account the requirements of the California Sources of Drinking Water Policy (SDWP) (Resolution 88-63) and other environmental characteristics. Through this activity, a portion of the Tulare Lake Bed groundwater basin has been identified as an area that appears to meet the exemption criteria set forth in the SDWP. In portions of this same area the AGR use also may not be applicable. Accordingly, CV-SALTS initiated technical studies and basin planning activities in collaboration with the Tulare Lake Drainage District to develop the required documentation to support de-designation of MUN and AGR from a portion of groundwater body underlying the Tulare Lake Bed. The expected final outcome is a Basin Plan Amendment. In addition, the project deliverables will support development of the Central Valley SNMP by providing an archetype or template for other studies designed to evaluate the applicability of beneficial uses on a groundwater body.
Status: Project initiated in September 2012; completion expected in 2016.

**MUN Beneficial Use in Agriculturally Dominated Water Bodies Archetype -** By way of the Sources of Drinking Water Policy (Resolution 88-63), the Central Valley Regional Water Quality Control Board Basin Plans (Basin Plans) designate MUN beneficial use to all surface and groundwater bodies unless they are specifically listed in a Basin Plan as water bodies that are not designated with MUN. Recent court findings have confirmed that to utilize exceptions identified in Resolution 88-63, for constructed and modified natural channels used to transport agricultural drainage, a basin plan amendment is required. The CV-SALTS initiative has identified the need to evaluate the appropriate designation and level of protection of MUN beneficial uses in constructed agricultural drains as well as other agriculturally dominated water bodies. This project has two phases: (1) Phase 1 evaluated the appropriateness of the MUN beneficial use designation in four case study areas - the agriculturally dominated receiving waters of four Publically Owned Treatment Works (POTWs - Cities of Willows, Colusa, Biggs and Live Oak). The outcome was an approved Basin Plan amendment to remove MUN from the receiving waters of each POTW; (2) Under Phase 2, the Board is developing amendments to the Basin Plans that would specify a process whereby the Board could evaluate and de-designate or refine (where appropriate) the MUN beneficial use in certain agriculturally-dominated waterbodies. Status: Project initiated in the latter part of 2011; Phase 1 completed in 2015; Phase 2 planned for completion in 2016.

## Water Quality Objectives Review

**Aquatic Life Study -** CV-SALTS implemented a study to identify potential water quality criteria that could be used to establish salinity-related water quality objectives to protect aquatic life in Central Valley surface waters. This study researched the following information sources to fulfill the project purpose: (a) recent literature reviews conducted by selected states to establish water quality criteria for salinity-related constituents; (b) peer-reviewed published literature; (c) data and methodologies developed by federal agencies, including U.S. Environmental Protection and Department of Interior; (d) recommendations developed by selected international agencies; and (e) any information developed by other California agencies. The final report provided technical recommendations for adoption of salinity-related water quality objectives to protect aquatic life. Status: Project initiated in December 2012; completed in January 2014.

**Stock Watering Study -** CV-SALTS implemented this study to identify water quality criteria that may be used to establish salinity and nitrate-related water quality objectives to protect stock watering supplies in the Central Valley. This study was completed through the completion of research on the following information sources: (a) water quality objectives established in other regions of California or in other selected states; (b) review of U.S. Environmental Protection Agency recommendations; (c) university extension publications and specialists; (d) published peer-reviewed literature; and (e) selected international agencies. The final report provides recommendations for protection of stock watering sources which will be used to support development of a Salt/Nutrient Management Plan for the Central Valley.
Status: Project was initiated in January 2012; completed May 2013.

**Salinity-related Effects on Agricultural Irrigation Uses -** CV-SALTS completed research to define what constitutes reasonable protection of existing and probable future use of water for agricultural irrigation. This research focused on the preparation of a summary of the current state of knowledge regarding the effects of elevated salinity concentrations on crop yields, wetland plants and vegetation commonly used for landscaping. In addition, the research effort reviewed water quality objectives established in other California regions, federal recommendations developed by the U.S. Environmental Protection Agency, water quality standards adopted by other states to protect water used for irrigation, and guidelines established by selected international entities. The resulting White Paper provides a summary of the key findings along with supporting data and references to support development of a Salt/Nutrient Management Plan for the Central Valley and ensure that waters used for agricultural irrigation are appropriately protected. Status: Project was initiated in June 2012. A draft White Paper was submitted in July; a Final Draft White Paper was submitted in August 2012. A final document will be prepared as part of SNMP development.

**Salinity Effects on MUN-related Uses of Water -** CV-SALTS completed research to define what constitutes reasonable protection of existing and probable future MUN (Municipal and Domestic Supply) uses. This research focused on the preparation of a summary of the current state of knowledge regarding the effects of elevated salinity concentrations on drinking water supply, including human health concerns, and other domestic uses of water, including impacts of salinity on residential, commercial and industrial water-using devices. In addition, the research effort reviewed water quality objectives established in other California regions, federal recommendations developed by the U.S. Environmental Protection Agency, MUN-related water quality standards adopted by other states, and guidelines established by selected international entities. The resulting White Paper provides a summary of the key findings along with

supporting data and references. CV-SALTS is using the findings of the White Paper to support development of a Salt/Nutrient Management Plan for the Central Valley and ensure that MUN-related uses of water are appropriately protected. Status: Project was initiated June 2012; draft White Paper was submitted in July 2012; Final Draft White Paper was submitted in August 2012; A final White Paper will be prepared as part of SNMP development.

## Implementation Planning

**The Economic Impacts of Central Valley Salinity** - The purpose of this study was to measure the economic impacts of increasing salinity in the Central Valley out to the year 2030. To conduct the analysis, the project team assumed that there would be no change in current salt management policies; as such, the findings from the analysis represented the economic impacts associated with taking no action. The study was conducted on an aggregate valley-wide basis that averaged salinity effects and costs. Based on estimates of increasing levels of salinity under existing conditions, the study estimated the direct economic effects on industry, residential, food processing, confined animal operations, and irrigated agricultural production in the Central Valley using different physical and economic models.
Status: Project was completed in 2009.

**Strategic Salt Accumulation Land and Transport Study (SSALTS) -** CV-SALTS is implementing a study to identify the range of viable Central Valley alternatives for salt disposal (taking into account regulatory, institutional, economic, and technological issues) to provide input for consideration during development of the Salt/Nutrient Management Plan (SNMP) for the Central Valley. Potential alternatives for salt disposal range from expanded use of existing salt disposal areas, establishment of new salt disposal areas within the Central Valley, export or transport of salt out of the Central Valley, or some combination of the above. The findings from this study will provide input to policymakers regarding where opportunities exist to dispose of salt over the long term in a sustainable manner. In addition, the findings will provide important input to the development of the SNMP under Phases 2 and 3 of Conceptual Model, and provide information to support development of the Basin Plan Amendment to adopt a Central Valley SNMP. Status: Project was initiated in December 2012. Phase 1, which focused on an evaluation of current salt disposal practices at selected study areas, was completed in December 2013. Phase 2, which concentrates on the development of potential future salt disposal/treatment alternatives for the Central Valley, was completed in September 2014. Phase 3 is evaluating the potential salt disposal/treatment alternatives identified in Phase 2 to develop implementation measures and a phased implementation strategy for inclusion in the SNMP. Status: A draft Phase 3 report was completed in spring 2015; the Phase 3 report will be finalized in coordination with the CV-SALTS Nitrate Implementation Measures Study in spring 2016.

**Surveillance & Monitoring Program** - The purpose of this project is to develop a Surveillance & Monitoring Program (SAMP) that will allow for statistically-defensible ambient water quality determinations and completion of trend analyses. The SAMP, which will be incorporated into the Central Valley Salt and Nitrate Management Plan, is being designed to fulfill the monitoring requirements of the planned Basin Plan amendments that will be adopted to support implementation of the SNMP.
Status: Project was initiated in March 2015 and is planned for completion in spring 2016.

**Nitrate Implementation Measures Study (NIMS) -** CV-SALTS is implementing a study to evaluate nitrate contamination in the groundwater basins of the Central Valley and develop appropriate implementation measures to mitigate this contamination using a phased approach that includes providing safe drinking water, reducing or eliminating impacts to drinking water sources and implementing managed restoration activities where needed to restore beneficial uses in groundwater. The implementation measures, which will be incorporated into the SNMP, will be phased and a prioritization methodology will be used to rank groundwater basins in order of priority – where risk reduction from nitrate in groundwater is optimized to facilitate use of the limited resources available. Findings from NIMS will be evaluated along with SSALTS findings to develop a coordinated salt and nitrate management program for incorporation into the SNMP.
Status: This project is planned for completion in spring 2016.

**CEQA Substitute Environmental Document (SED)** - CV-SALTS will prepare the SED and CEQA Checklist to support the SNMP and expected subsequent Basin Plan amendments. This project will be closely coordinated with the antidegradation and economic analyses to be developed to support the SNMP (see Phase 3 Conceptual Model). First step in all three projects is the establishment of a project description for analysis and identification of baseline conditions to be used as the basis for regulatory analyses. Once these elements are established, environmental and economic analyses will be completed.
Status: Project is planned for initiation and completion in 2016.