

expected load reduction from each project, and a projection of when the reduced salt loading will begin to occur.

### **Task 3.2 – Establishment of Appropriate Numeric Salt Management Targets**

The Contractor will develop information leading to the establishment of numeric salt management targets to protect the AGR and other existing beneficial uses in surface waters and groundwaters of the Central Valley Region. The establishment of these numeric targets is intended to provide an appropriate technical basis for interpreting or translating existing Basin Plan narrative water quality objectives in a manner that accounts for local and regional differences in sensitivity to salt. To support this effort, this task will include an evaluation of the current state of knowledge regarding the sensitivity of uses other than AGR to salinity,

In performing this task, the Contractor will work with agricultural and other local stakeholders in different areas of the region to address the balance between setting targets that protect salt sensitive crops and other beneficial uses and setting targets that compromise the ability to obtain agricultural water supplies and/or comply with limitations on the discharge of agricultural return flows. In addition to the CV-SALTS Executive Committee, the Contractor will also work with agricultural and other stakeholders to establish numeric AGR targets that can be applied during extended dry periods when special salt management and irrigation practices are needed to maintain agricultural irrigation water supplies. A factor to be considered in this effort is the evolving nature of crop sensitivity to salts given the ongoing research and development in this area within the agricultural community and the need to promote and encourage the use of recycled water and conservation. A review of other existing uses and meetings with key representatives of all economic sectors, especially those concerned with salinity impacts on operation and maintenance of their facilities, will also occur to ensure proposed targets also are protective of other uses.

CV-SALTS has developed a fundamental approach to the development of AGR numeric targets in surface waters through CV-SALTS (2014b, 2014c). This methodology was used in the development of water quality objectives for EC in the Lower San Joaquin River (LSJR), which were adopted in a Basin Plan amendment approved by the Central Valley Water Board on June 9, 2017 (Resolution R5-2017-0062), The State Water Board and USEPA approved the amendment on January 9, 2018 (Resolution No. 2018-0002) and December 17, 2018, respectively.

The approved approach started with an evaluation of the most sensitive beneficial use(s) in the project area with regards to salinity. Subsequently, the approach developed baseline information regarding (a) existing cropping patterns in the study area and (b) agricultural water supply information. That information was used to identify important salt sensitive crops and to assign numeric salinity targets to those water bodies used as irrigation supply to those crops. The salinity targets were developed with available modeling tools that took into account the crop, cropping pattern, root-zone hydrology (i.e. balance among rainfall, irrigation, crop consumptive use, and leaching fraction), and salinity of irrigation supply, and

which produced soil salinity and crop yield impact outputs. That information was combined with stakeholder input to select appropriate AGR numeric targets, which were then adopted as water quality objectives through a process that considered existing and projected future salinity conditions in the LSJR using modeling tools and historical water quality information.

Under the P&O Study, the Contractor will use an approach that is similar to the above-described methods in several selected study areas, chosen with input from CV-SALTS Executive Committee and stakeholders, to provide both a proof of concept (archetype) and also representative information that will be used in a process to establish AGR and other target values for surface waters and groundwater in the entire Central Valley Region. Using the information from the archetype studies, the Contractor will develop and apply a process/method for determining AGR target values for normal and drought/extended dry period conditions for the Central Valley Region to protect salt sensitive crops.

To accomplish these outcomes, the Contractor will perform the following tasks. At the option of the Executive Committee, the Contractor may also be asked to provide services to use target values determined under these tasks to support adoption of either narrative or numeric water quality objectives to protect AGR or other existing beneficial uses in specific areas through a Basin Plan amendment.

#### **Task 3.2.1 - Protection of Salt Sensitive Beneficial Uses**

CV-SALTS previously conducted literature reviews to evaluate the effects of salinity on various beneficial uses (AGR stock watering: CV-SALTS 2013c; aquatic life: CV-SALTS 2014d; AGR crop irrigation: CV-SALTS 2016c; and MUN protection: CV-SALTS 2016d). In addition, the effects of salinity on aquatic life were further evaluated as part of the adoption of salinity objectives on the LSJR (Mouth of Merced River to Vernalis) through the LSJR Basin Plan Amendment (Central Valley Water Board 2017b, 2017c).

These previous beneficial use evaluations provide baseline information for consideration when (a) evaluating the most sensitive beneficial use; and (b) establishing appropriate salt management targets under Task 3.2. Under this task, the Contractor will review the above referenced reports that evaluated the effects of salinity on AGR, MUN and aquatic life beneficial uses and update the previously compiled technical information and recommendations, as needed. In addition, the Contractor will evaluate the effects of salinity on the Industrial Service Supply [IND] and Industrial Process Supply [PRO] beneficial uses which, per the Basin Plans, are presumptively applied to all groundwaters. The findings from this task will be documented in a Technical Memorandum.

Deliverable: Draft and final technical memorandum that provides the findings from the literature review of potential impacts of salinity on beneficial uses.

### **Task 3.2.2 – Identify Archetype Study Areas**

Identify candidate archetype study areas in coordination with the CV-SALTS Executive Committee and stakeholders using best available information on existing agricultural land use (cropping patterns) in the Central Valley Region. Recommended archetype study areas will be presented to the Executive Committee and stakeholders for approval before initiating subsequent tasks. Considerations in selecting archetype areas should include, but are not limited to, evaluation of what is likely to be the most sensitive beneficial use in the archetype area, the willingness of stakeholders to engage in the effort and the characteristics of the archetype area which support extrapolation of findings to other areas of the Central Valley. Characteristics to be considered in selecting archetype areas include, but are not limited to, areas which are: arid, primarily irrigated with groundwater, have different sensitive crop types than almonds, cover areas outside the valley floor, are representative of large areas within the Central Valley (not necessarily just for agriculture but other economic sectors as well), etc.

Deliverable: Draft and final technical memorandum identifying candidate archetype study areas and selected archetype study areas, respectively.

### **Task 3.2.3 – Identify Salt Sensitive Crops in Selected Study Areas**

Using best available cropping information, rank crop acreage and determine common salt sensitive crops in selected study areas. The Contractor will work with agricultural stakeholders to identify the best available information regarding sensitivity of common crops to salts, with attention to innovations in the development of crops with an increased ability to tolerate salinity.

### **Task 3.2.4 – Identify Irrigation Supply Sources and Sources Serving Other Beneficial Uses**

Identify irrigation supply sources (surface waters and groundwater) to common salt sensitive crops grown within the study areas (as determined in Task 3.2.3) and identify sources of water serving other beneficial uses within the study areas. As part of the evaluation of irrigation supply sources to salt sensitive crops, the Contractor will characterize and, to the extent possible, quantify salinity of agricultural supply waters during normal and dry years.

### **Task 3.2.5 – Determine Relationship Between Salinity and Crop Yields.**

The Contractor will use best available modeling tools to determine relationships between irrigation supply salinity and crop yields for the salt sensitive crops identified in Task 3.2.3. Models that account for different irrigation methods should be considered.

### **Task 3.2.6 – Evaluate Salt Management Scenarios**

Using the existing baseline water quality information for waters used as agricultural supply in the archetype study areas developed in Task 3.2.4, the Contractor will identify and implement best available modeling tools to evaluate the effectiveness of management scenarios in improving water quality. The Contractor will coordinate with stakeholders,

including GSAs, to determine a wide range of management scenarios that could be employed to impact the existing water quality baseline and use the selected modeling tools to identify a range of attainable future water quality conditions.

### **Task 3.2.7 – Develop Range of Potential Target EC Values for Archetype Areas**

In coordination with local irrigators and other water users, using information from Tasks 3.2.3, 3.2.4 and 3.2.5, the Contractor will develop a range of potential target EC values for (a) normal water years; and (b) drought/extended dry period conditions. This step will include consideration of the existing quality of supply waters (from Task 3.2.4). Informed by the range of attainable water quality conditions developed in Task 3.2.6, the Contractor will work with stakeholders to select different target salinity values for (a) normal and (b) drought/extended dry years for the study areas. Appropriate averaging periods will be determined for the selected target values. Note that selected target values for drought/extended dry periods will be higher than the values determined for normal conditions to allow greater flexibility for water supply and salinity management.

Deliverables (Tasks 3.2.3 through 3.2.7): Draft and final technical memorandum for each archetype study area describing the methods, results and conclusions of the analysis performed to determine recommended target salinity values for each archetype area.

### **Task 3.2.8 – Develop Recommended Target Salinity Values for Other Areas of the Central Valley Region**

In coordination with CV-SALTS Executive Committee and stakeholders, develop a process using available cropping and water quality information and information and methodologies derived in the archetype studies to establish target salinity values for appropriate regional areas within the remainder of the Central Valley Region to protect AGR and other beneficial use of water. This process will use available information to address region-specific issues such as common crop identification, existing water quality, irrigation practices, water management practices, and projections for future water quality improvements. The Contractor will use the resulting process to establish default regional salinity targets throughout the Central Valley Region for normal and drought/extended dry period conditions. These default regional salinity targets will be used in subsequent planning tasks that are designed to establish long-term salt management strategies within defined planning areas (see Task 4).

Deliverable: Draft and final technical memorandum describing the process, results and conclusions from Task 3.2.8. The outcome will be regional salinity targets protective of the AGR use and other salt sensitive uses in the remainder of the Central Valley Region (i.e., areas not included in the archetype analyses completed under Tasks 3.2.3 through 3.2.7).

### **Task 3.2.9 – Develop Process to Refine Salinity Targets in Other Areas of the Central Valley**

Task 3.2.8 will result in default salinity management targets for all areas of the Central Valley Region. These default targets may be refined by local stakeholders within a defined area. To facilitate efforts to refine salt management targets, the Contractor will develop and document a process that allows for site-specific refinement of the regional salinity targets developed in Task 3.2.8, based on consideration of more refined regional data analyses, region-specific modeling outputs, and enhanced stakeholder engagement.

Deliverable: Draft and final technical memorandum describing the process for local stakeholders interested in site-specific refinement of regional salinity targets.

### **Task 3.2.10 - Support Adoption of Salinity Targets to Protect AGR in Basin Plans (optional)**

The Contractor will provide services to support adoption of the AGR targets into the Central Valley Region Basin Plans by the Central Valley Water Board through a Basin Plan amendment as a means of implementing narrative water quality objectives, or adoption of numeric water quality objectives to protect AGR uses. Support will include development of additional technical information for the staff report prepared by Central Valley Water Board staff, including additional use of modeling tools, preparation of environmental documents required by CEQA, as well as any required economic and antidegradation analyses.

Deliverables – Draft and final technical memorandum providing technical information to support the staff report for a Basin Plan amendment, including any necessary CEQA, economic and antidegradation analyses associated with adoption of water quality targets or objectives for AGR uses consistent with California Water Code Requirements.

### **Task 3.3 – Numerical Salt Management Tool Development**

In this task, the Contractor will be responsible for the development of a combined numerical surface water and groundwater model (or models) that tracks water supply and water demand, identifies sources of salinity, and models the movement of water and salts within the Central Valley Region and within the production zone of each hydrologic region. From a water balance perspective, the model(s) must address subsurface inflows and outflows, groundwater extraction, surface water interdependencies, stream discharge, groundwater recharge (stormwater/dry weather capture and recharge, imported water recharge, recycled water recharge, and streambed recharge), POTW and industrial discharges, deep percolation of precipitation, deep percolation of applied water (urban and agriculture), and consumptive use by crops.

The objectives of the numerical Salt Management Tool (SMT) include:

- Provide support for water managers and P&O Study stakeholders to effectively understand and manage groundwater basins and watersheds; hence, horizontal and