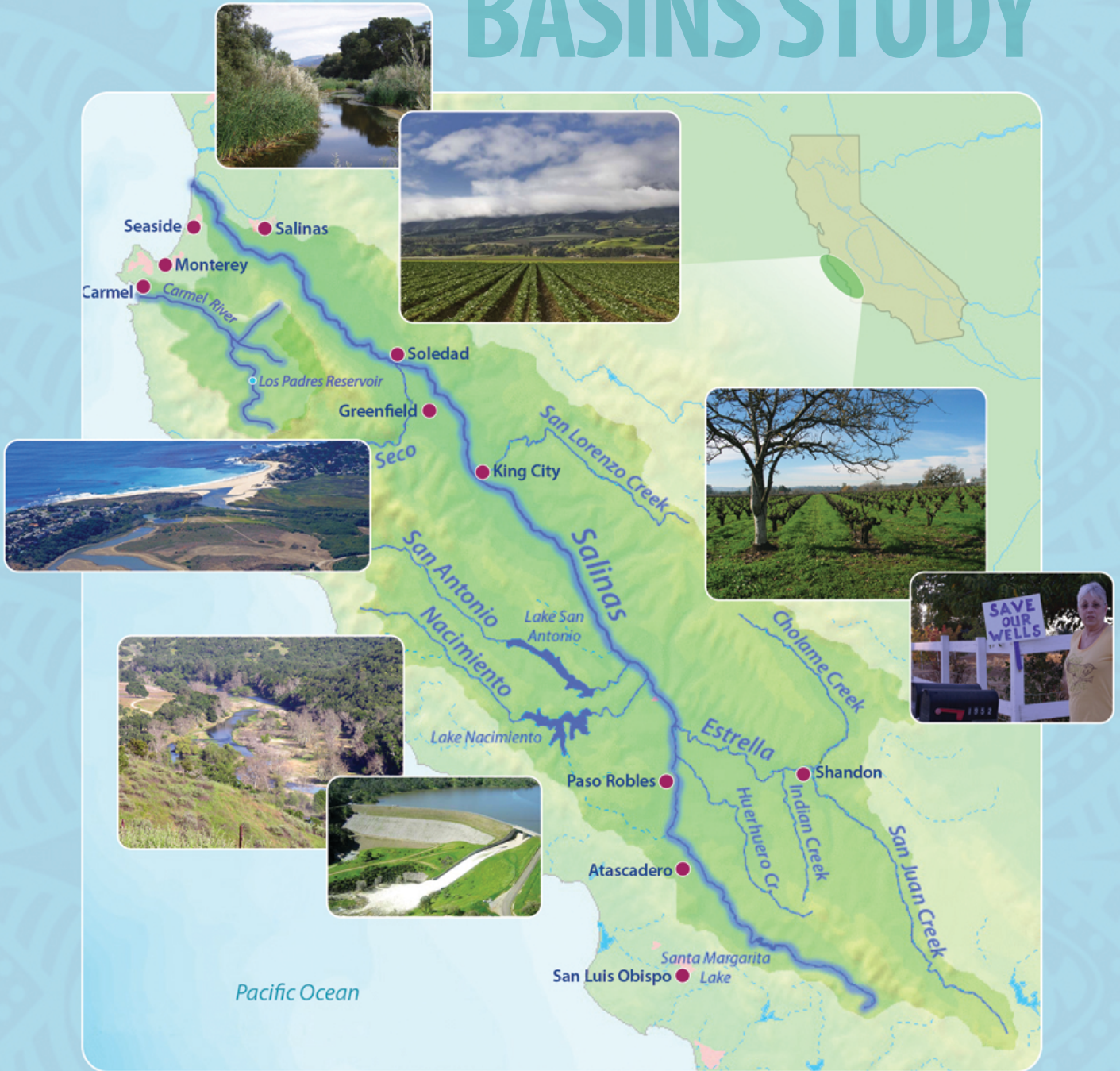


Proposal | April 2015

U.S. Department of the Interior | Bureau of Reclamation

SALINAS and CARMEL RIVER BASINS STUDY



Section A

PROJECT INFORMATION

1. TITLE: SALINAS AND CARMEL RIVER BASINS STUDY

A collaborative study to evaluate future water supply and demand imbalances in a changing climate and to develop potential adaptation strategies to meet future demands.

Within the Salinas and Carmel River basins an imbalance in the water supply and demand is being exacerbated by the extended drought, competing demands, and climate change. The goal of the study is to understand, anticipate, and adapt to these effects and to identify adaptive management strategies that will yield sustainable surface water and groundwater supplies capable of meeting the needs of agriculture, municipal users, the environment, an expanding population, and recreation.

2. LOCATION OF STUDY AREA AND BOUNDARIES OF THE BASIN

The study boundaries encompass the Salinas and Carmel River Basins, as shown on Figure 1, providing an opportunity to improve collaboration between partners, collectively plan for changing conditions, and cooperatively identify regional water supply opportunities in both basins.

Basin Statistics

- Area: 4,500 square miles
- Population: 370,000
- Annual tourist: 9,000,000
- Agricultural acres: 250,000
- Annual water use: 600,000 acre-feet
- Annual Economic Output: \$11,000,000,000

The Salinas River is the largest river on California’s Central Coast, originating in the center of San Luis Obispo County flowing 170 miles north and northwest to the Monterey Bay National Marine Sanctuary (MBNMS), about 80 miles south of San Francisco. The Carmel River lies adjacent to the Salinas River Basin and both are affected by the same weather patterns. The two rivers are separated by the Monterey Peninsula and the Sierra de Salinas, with the Salinas River out-letting to the MBNMS northerly of the Peninsula and the Carmel River out letting to the MBNMS southerly of the Peninsula at Carmel Bay, about 16 miles south of the Salinas River mouth.

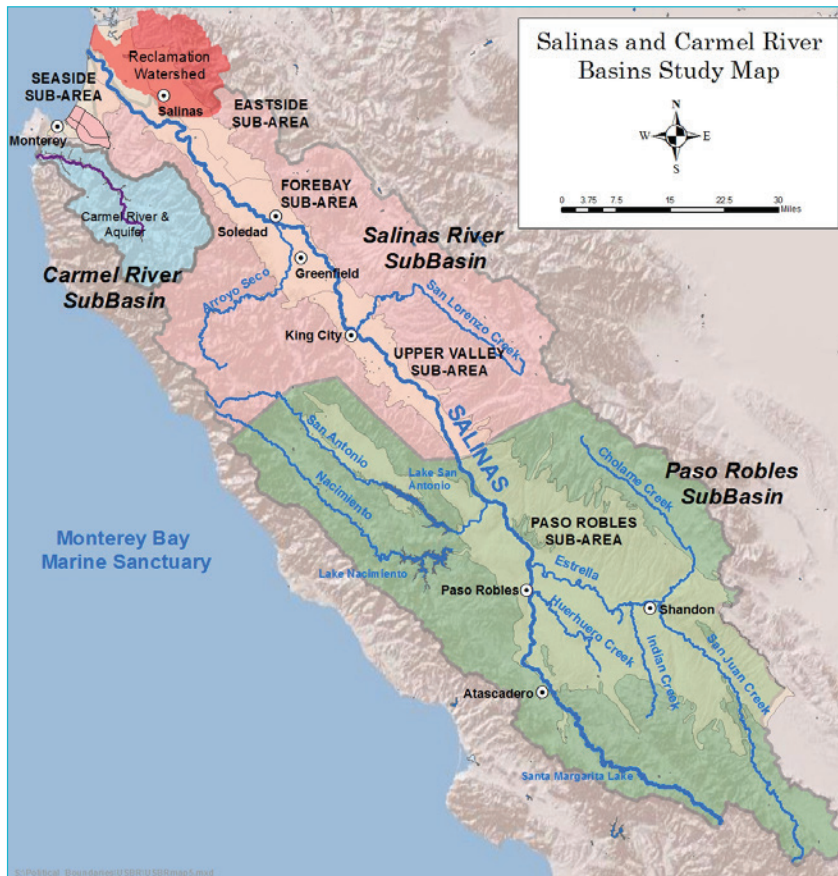


Figure 1. Map of Study Area.

The Salinas River originates in the La Panza Range and drains 4,160 square miles, from Santa Margarita Lake at 2,400 feet to the Ocean. It is fed by flows from Lake Nacimiento, Lake San Antonio, and the Arroyo Seco River. Dams at the three man-made reservoirs provide flood protection and are operated to provide approximately 288,000 acre feet per year (AFY) for municipal water supplies, agricultural irrigation, recreation, groundwater recharge, and drought protection. The capacity of the hydro plant at Nacimiento Dam is 4.3 Mw-hours per year. The Salinas River’s groundwater resources are used extensively to meet the water supply needs throughout the Salinas Valley.

The 255 square-mile Carmel River Basin (CRB) watershed begins in the Santa Lucia Mountains at 5,000 feet and merges with seven major stream tributaries along a 36-mile course before discharging to the Ocean. The Monterey Peninsula watersheds, which total about 85

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square miles and the adjacent Seaside Groundwater Sub-Basin (SGB), drain directly to the ocean. The CRB and SGB are operated conjunctively to provide water to the Monterey Peninsula for municipal, commercial, and industrial use.

The MBNMS was designated in 1992 as a federally protected marine area and is one of the nation's largest marine sanctuaries, larger than Yellowstone National Park and deeper than the Grand Canyon, and supports pristine beaches, jewel-like tide pools, lush kelp forests, steep canyons and an offshore sea-mount teeming with life.

One small valley [Salinas Valley] in California has become the center of vegetable production in the United States, with some remarkable production statistics:

- artichokes - 99%
- broccoli - 92%
- processing tomatoes - 94%
- celery - 94%
- garlic - 86%
- cauliflower - 83%
- head lettuce - 76%,
- carrots - 67%
- asparagus - 58%

grown and distributed throughout North America and the world.

In addition to the agricultural resources, these basins support important natural resources. National Forest lands occupy a large portion of the upper watersheds who's runoff flows into the MBNMS and support the largest sustainable west coast run south of San Francisco of Oncorhynchus mykiss, a salmonid species commonly referred to as South-Central California Coast (SCCC) steelhead trout, a federally and state listed threatened and endangered species. Numerous on-going activities are currently focused on providing for reliable water supplies, while improving the ability of SCCC steelhead trout to recover.

Together, these two river basins include some of the world's most fertile agricultural lands and are internationally known for their natural beauty; ecological diversity; multi-national cultural history; and recreation opportunities such as fishing, auto racing, and golfing. The area is oftentimes referred to as the "Salad Bowl of the World" or "America's Salad Bowl" because of the variety of crops grown. Approximately one-third of the state's annual strawberry yield is grown in the area. Wine grapes are so important and distinctive that there are three designated "American Viticultural Area" domains within the area. With a total value of over \$1.9 billion, by itself Monterey County is the fourth highest agricultural producing county in California. Combined with the agricultural production of San Luis Obispo County, the area under this proposed basin study is one of the most important areas in California and the western United States.

3. TOTAL STUDY COST

The Basin Study is estimated to cost \$2.1 million and Basin Study non-federal partners are contributing over 50%.

A significant amount of recent and on-going work, funded by the non-federal partners, will contribute to the "in-kind services" cost share and is presented in Appendix A. The partners are committed to participate and collaborate with Reclamation on data and technical needs, stakeholder engagement, developing an integrated watershed model, and using the unified tool to determine the projected impacts of climate change to water supplies and demands in the Salinas and Carmel Basins, as well as assisting in evaluating how proposed adaptation strategies will perform across a range of future climate conditions. The estimated cost share is shown in Table 1, although not all local contributions are shown.

Table 1 – Basin Study Major Tasks And Cost-Share

Task	Partners Share ¹	Federal Share ²	Estimated Cost
Task 1 – Pre-Study Efforts (Plan of Study/MOA) ³	\$100,000	\$25,000	\$125,000
Task 2 – Model Development/Integration/Calibration/Validation and GCM Modeling	\$250,000	\$550,000	\$800,000
Task 3 – Current Water Supply/Demand Assessment	\$100,000	\$50,000	\$150,000
Task 4 – Future Water Supply/Demand Assessment	\$150,000	\$100,000	\$250,000
Task 5 – Identify Supply/Demand Imbalance	\$30,000	\$30,000	\$60,000
Task 6 – Develop Adaptation Strategies	\$200,000	\$70,000	\$270,000
Task 7 – Trade-off Analysis of Alternatives	\$150,000	\$50,000	\$200,000
Task 8 – Draft Report, Findings and Recommendations	\$50,000	\$25,000	\$75,000
Task 9 – Final Report	\$25,000	\$15,000	\$40,000
Task 10 – Stakeholder Outreach/Project Team Meetings	\$100,000	\$35,000	\$135,000
Proposed Carmel and Salinas Basins Study TOTAL	\$1,155,000	\$950,000	\$2,105,000

1. MCWRA, MRWPCA, MPWMD, SLOC; includes costs since May 2014

2. USBR, USGS

3. Specific modeling approach to be defined in Plan of Study

4. BASIN STUDY PARTNERS

The Basin Study partners, which include all four of the decision making agencies in both basins, are committed to working with Reclamation to define the current regional conditions, supporting the estimation of future conditions, and identifying and implementing strategies for adapting to and managing these changes.

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6. SUPPORTING STAKEHOLDERS

There is an existing network of stakeholders in both basins that are actively involved in regional water management planning. The Basin Study partners are committed to continued involvement of this wide range of stakeholders who represent diverse interests the study area.

There are three current IRWM plans that cover the study area: the San Luis Obispo County Plan, the Greater Monterey County Plan and the Monterey Peninsula, Carmel Bay and Southern Monterey Bay Plan. These IRWM Plan efforts include significant participation from virtually every level and aspect of water resource management. It is expected as the Plan of Study is developed, several more partners and stakeholders will participate in the Basin Study process. The cost-share partners will use and expand the existing stakeholder network and framework to solicit input during the Basin Plan Study. Section C5 presents in further detail many of the stakeholder groups supportive of this effort. Included in Appendix B are Letters of Support from some of these groups.

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Section B

STUDY ABSTRACT

Performing a comprehensive study to evaluate regional supplies and demands within the context of the anticipated effects of global climate change is essential for this environmentally, economically, and culturally significant study area.

The Salinas and Carmel Rivers Basin Study provides opportunities to improve inter-agency collaboration and develop integrated strategies for securing regional sustainable water supplies that benefit agricultural, urban, and environmental water demands. Strategies for adapting to climate change, including changing precipitation patterns, runoff, and sea level rise must be developed and integrated into the watershed management of the Salinas and Carmel River Basins. The Basin Study will, therefore, provide a scientific and collaborative basis for the development and implementation of current and future planning decisions that will yield management and land use decisions for sustainable water supplies. This Study provides opportunities to develop solutions and strategies to fill gaps in supply and demand planning, reduce risks to property and infrastructure associated with climate change, and improve sustainability of aquifers and rivers in order to provide adequate water supplies for the benefit of all users well into the future.

Water years 2012-14 stand as California's driest three consecutive years for precipitation. This occurred in a period of record warmth, with new climate records set in 2014 for statewide average temperatures. At the time this proposal was prepared, in April 2015, the drought continues. The local participating agencies of the Salinas and Carmel Rivers Basin Study proposal (MCWRA, MPWMD, MRWPCA, SLOCPWD), who are responsible for stewardship of local natural resources, have an urgency to collaborate with Reclamation. A Basin Study would augment ongoing efforts by the participating local agencies and provide unprecedented opportunities for Federal, State and local agencies to collaborate and advance models of the Salinas and Carmel Rivers Basin Study via inter-agency work. The basins and sub-basins included in this proposal are currently experiencing insufficient water supplies and are projected to have insufficient water supplies in the future, as well as are facing legal and regulatory restrictions on water use. Finding replacement water supplies is vital for this region to be in

compliance with legal mandates, cope with climate change, and improve environmental conditions.

Substantial development within the 100-year floodplain of rivers in this Basin Study has placed billions of dollars of urban and agricultural property at risk during large flood events. In addition, climate change could impact fire risk in the National Forest lands that provide most of the runoff within the basins and are already subject to high fuel loads. Water resource management in the study area is divided among multiple layers of local, regional, State, and Federal agencies, as well as for-profit entities such as private utilities.

As further described in this joint effort proposal, the Basin Study partners are actively engaged in pursuing sustainable practices in accordance of with the requirements of the State's Groundwater Sustainability Act (SGMA). Together, the partners are developing plans for sustainable groundwater management in the basins. The partners have implemented changes in conjunctive use programs to improve steelhead recovery and we participate in one another's operating and public outreach committees. The partners are dedicated to pursuing and evaluating the challenges of water resource management so that together, along with decision makers, they will collectively ensure future generations are provided with the tools to adapt to available water supplies and demand in proactive and responsible measures.

Basin Study Objectives

1. Improved regional collaboration in the development of an integrated modeling tool.
2. Identify Risks and Potential Impacts of climate change on future water resources (supply & demand).
3. Develop solutions and adaptation strategies to fill the gaps in supply/ demand.



Recent picture by stakeholder in Paso Robles Basin shows that the Salinas River is dry due to the current drought.

Section C

PROPOSAL CONTENT

C1. THE EXTENT AND CONSEQUENCES OF EXISTING OR ANTICIPATED IMBALANCES IN WATER SUPPLY AND DEMAND

Historical water supply and demand imbalances have resulted in sinking groundwater levels, seawater intrusion, impaired water supplies and regulatory actions. These imbalances will be further exacerbated by climate change.

Due to low annual rainfall along California's beautiful Central Coast, the Salinas and Carmel River Basins have faced water supply and management challenges for over half a century. Lacking imported water supplies and facilities, this region is limited to the use of in-basin supplies. Therefore, droughts like our current drought facing all of California are especially difficult for this area. The consequences of the historical imbalances between supply and demand have resulted in sinking groundwater levels, seawater intrusion, impaired water supplies, regulatory actions in the form of a Cease and Desist order (CDO) on pumping, adjudication, and requirements for minimum in-stream fish flows. These historical imbalances and consequences will only be further exacerbated by climate change effects, with a very real possibility of longer and more severe drought periods followed by periods of extreme precipitation events that could cause severe damage to property owners and critical habitats alike. Consequently, all groundwater basins within the study area are designated as high and medium priority by the State, and are subject to compliance with the Sustainable Groundwater Management Act (SGMA).

Although the three IRWM plans address water supplies and demand as well as climate change, and numerous individual studies on subareas of the basins have been conducted, a Basin-wide comprehensive study of the potential effects of climate change on water supplies, demands and imbalances within the Salinas and Carmel River Basins has not yet been performed. This study provides the opportunity and the means to develop comprehensive and coordinated adaptive strategies to address climate change risk to the basins' water supplies. Consistency in analysis and management of adjacent watersheds and groundwater basins is a requirement of SGMA.

Total Study Area Supplies and Demands

The Basin Study area is comprised of four sub-basins: Salinas Valley Basin (SVB), CRB, SGB, and the Paso Robles Groundwater Basin (PRGB). All four of these basins are in a current state of imbalance between supply and demand as demonstrated by seawater intrusion and groundwater level declines. While many studies and projects were conducted to find solutions to these issues, a projected imbalance remains that will be exacerbated by climate change. Table 3 summarizes the current and projected future supply and demand imbalances for each sub-basin. It is anticipated that imbalances in the demands will be re-evaluated as a part of the Basin Study, in light of climate, population and other changes.

Paso Robles Groundwater Basin

The current water demand for the PRGB is largely estimated, as the only metered water users are within water purveyor boundaries. In 2014, an integrated watershed/basin model was utilized to estimate historical demands within the PRGB on an average annual basis for the period of 1980 through 2011, as well as the perennial yield. Three water purveyors within the subbasin have contracts for 6,250 AFY of Lake Nacimiento water; however, only about 2,500 AFY has been put in place within the last few years, as the remaining treatment infrastructure is in the process of being constructed.

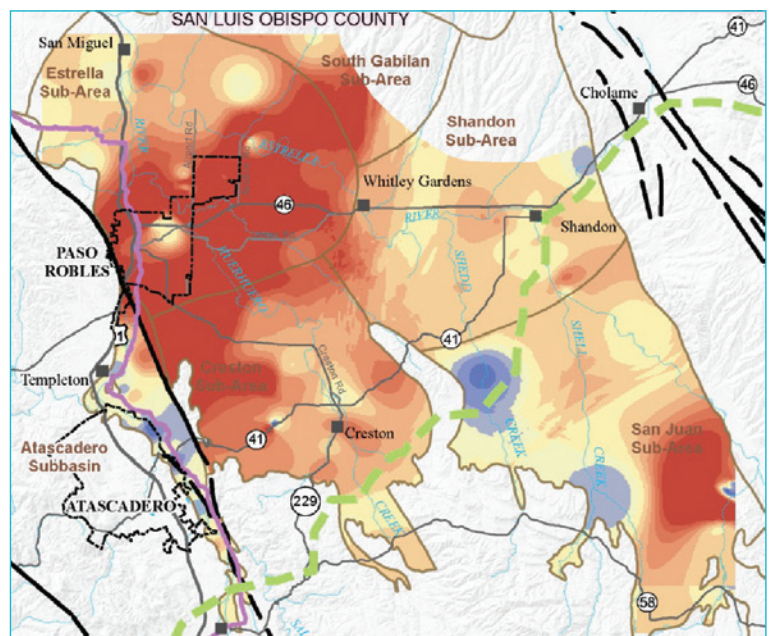


Figure 2 - Paso Robles groundwater basin change in water levels 1997 through 2013 (darkest red = >70 foot decline).

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Table 3 – Summary of Basin Area Supply, Demand and Unmet Demands

Basin Area	User	Supply (acre-feet)	Demand (acre-feet)	Unmet Demands (acre-feet)
PRGB (Current)	Agriculture ¹	89,600 ⁴	76,000	3,600 ⁵
	M&I ¹		17,200	
	Environmental ²	74,090	41,010	No unmet demands
	Recreation ³	Min pool: 2000 AF	Reached 1 time in 30 yrs	est. 3% of the time
PRGB (2040)	Agriculture ¹	89,600 ⁴	91,072	17,344 ⁵
	M&I ¹		6,250 ⁶	
	Environmental ²	74,090	41,010	No unmet demands are projected
	Recreation ³	Min pool: 2000 AF	Reached 1 time in 30 yrs	est. 3% of the time
CRB and SGB (Future)	Agriculture ¹	Included in M&I	Included in M&I	
	M&I ¹	9,000 ⁷	20,000 ⁸	11,000
	Environmental ²	Minimum instream flow and adjudication requirements are in effect.		
CRB and SGB (Current)	Agriculture ¹	Included in M&I	Included in M&I	unknown
	M&I ¹	10,000 (legal) ⁷	15,500 ⁹	5,500
	Environmental ²	Basins are overappropriated and subject to cutbacks.		
SVB Current	Agriculture	446,000 ¹⁰	418,000 ¹¹	17,000 ¹¹
	M&I		45,000 ¹¹	
	Environmental	The need for allocations is mentioned but not quantified.		
SVB (Future)	Agriculture	429,000 ¹⁰	358,000 ¹¹	14,000 ¹¹
	M&I		85,000 ¹¹	
	Environmental	The need for allocations is mentioned but not quantified		

1. 1980-2011 Average Annual Basis; Geoscience, 2014

2. Master Water Report, Carollo, 2009

3. Salinas Reservoir

4. Paso Robles Groundwater Basin estimated perennial yield; Geoscience, 2014

5. Unmet Demands for the purposes of the Paso Robles Sub Area means the extent to which demands exceed the perennial yield of the PRGB and Nacimiento water contract allocations on an average annual basis, which results in sustained basin drawdown.

6. Nacimiento Water Contracts = 6,250 AFY

7. Existing riparian, appropriative, and percolating rights determined by SWRCB, SGB Adjudication, and annual well reports

8. Cal-Am estimate, CPUC Application A12-04-019 plus 2014 Monterey Peninsula IRWM Plan Update

9. From Annual MPWMD well production reports

10. Demand - Unmet Demands

11. Greater Monterey IRWMP

Due to the imbalance in water demand and supply within the PRGB, groundwater levels have been declining over the past 30 years. Declining groundwater levels have led to the need for deeper wells across the basin. Some water users located along the edge of the basin have lost access to the groundwater and are now drilling into fractured rock formations. Figure 2 illustrates the results of the basins declining groundwater elevations.

The existing physical impacts have resulted in multiple conflicts and actions, and the formation of various stakeholder groups. Most recently, a two-year urgency ordinance was adopted by the San Luis Obispo County Board of Supervisors requiring new development and irrigated agriculture to offset new demands on the PRGB by a ratio of 1 to 1; formation of a Water District is being pursued; and several landowners within the PRGB have filed litigation for a quiet title action. Continuing declines in groundwater levels in the PRGB is anticipated to lead to the need for residential landowners

to lower wells where possible, or vacate the area. Declining groundwater levels may also result in the loss of smaller agricultural operations unable to afford coping with recurring drought, or energy and treatment costs associated with pumping water from lower levels.

Carmel River and Seaside Groundwater

More than 105,000 people reside in the MPWMD service area, which is dependent for water supplies from two sources: runoff from the Carmel River Basin (CRB) and groundwater from the Seaside Groundwater Basin (SGB). The CRB currently supplies about 70% of domestic supply for the Monterey Peninsula; however, in 2009, the State Water Resources Control Board (SWRCB) issued a CDO to the local water provider, California American Water (Cal-Am). The CDO requires Cal-Am to find replacement supplies for two-thirds of the annual diversions from the CRB by January 1, 2017. The Monterey Peninsula will be unable to comply with the CDO by this date and a time extension from the

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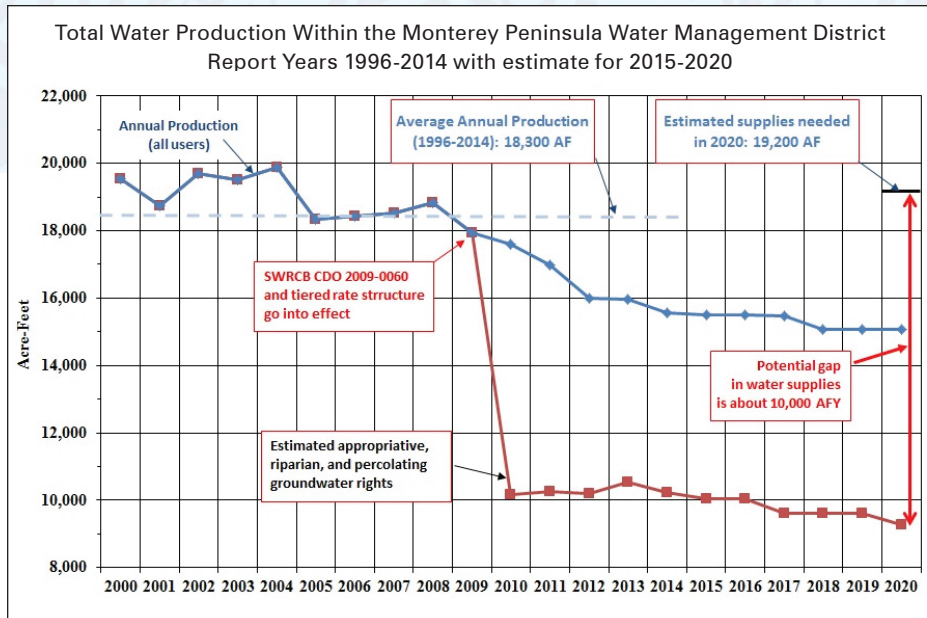


Figure 3. Current water demands shown exceed legal rights to supplies. Recently added new supply is subject to meeting in-stream flow requirements.

SWRCB is being sought. The SGB is at the northwest corner of the Salinas Valley, adjacent to Monterey Bay. Historical and persistent low groundwater elevations caused by pumping led to basin adjudication in 2006 and an amended court decision in 2007 that created the Seaside Basin Watermaster and ordered a ramp down in production from about 5,600 AFY to the Natural Safe Yield of 3,000 AFY by 2021. No seawater intrusion is occurring presently, but water levels are lower than those required to protect against seawater intrusion. Recharge into the basin aquifers will be beneficial for protection against seawater intrusion.

Both basins are being pumped in excess of legal rights to do so, which places the community at risk of heavy fines or severe rationing of up to 50%. Figure 3 shows that the estimated replacement need for the Monterey Peninsula is approximately 10,000 AFY. The MRWPCA's Pure Water Monterey Groundwater Replenishment (GWR) Project would provide 3,500 AFY of highly treated recycled wastewater to the SGB and Cal-Am's proposed desalination plant on the coast south of the Salinas River would provide the balance of the replacement supplies. Both projects are currently under environmental review, with completion anticipated by 2020.

Habitat for steelhead in the CRB has been degraded and annual returns of adult steelhead have fallen below 10% of the estimated potential for the run. WY 2014 and 2015 show the lowest fish densities ever recorded. Usable surface storage in the CRB is small (1,400 AF) and shrinking due to

high sediment loads. Runoff from the basin averages about 75,000 AFY, but with wide swings in flow both annually and seasonally. During most years the lower 6 to 7 miles of the Carmel River are dewatered by July by diversion for domestic supply. With no flood control reservoirs in the CRB and more than 1,600 properties in the Carmel Valley are located in the 100-year floodplain, about 90% of the Federal Emergency Management Agency (FEMA) 10-year repeat claims in Monterey County come from Carmel River flooding. In addition, properties and infrastructure around the mouth of the river are clearly at risk from any rise in sea level.

Salinas Valley Sub-Basin

Groundwater is the source for almost all of the water demands in the Salinas Valley. In the northern coastal areas of the SVB, most groundwater extraction occurs from two ground-water sources which are the 180-foot, and 400-foot aquifers. An ongoing imbalance between the rate of groundwater withdrawal and recharge has resulted in overdraft conditions in this basin that have allowed seawater from Monterey Bay to intrude inland into both of these aquifers as shown in Figure 4. By 2011, seawater was estimated to affect as much as 28,142 acres overlying the 180-foot aquifer in the northern Salinas Valley and 12,575 acres overlying the 400-foot aquifer. As a result, urban and agricultural supply wells have been abandoned or destroyed in some locations. To halt further groundwater degradation and prevent seawater from moving further inland, aquifer pumping and recharge rates must be brought into balance.

In 1992, MRWPCA and the MCWRA formed a partnership to build two projects: a water recycling facility at the Regional Treatment Plant (Salinas Valley Reclamation Plant) and a distribution system consisting of 45 miles of pipeline and 22 supplemental wells called the Castroville Seawater Intrusion Project (CSIP). The objective of these projects focused on advancement of seawater intrusion prevention by supplying recycled water in lieu of groundwater for irrigation to nearly 12,000 acres of farmland in the northern Salinas Valley. The \$75 million projects were completed in 1997 and highly treated wastewater is currently used for irrigation. Yet supply and demand imbalances remain an issue.

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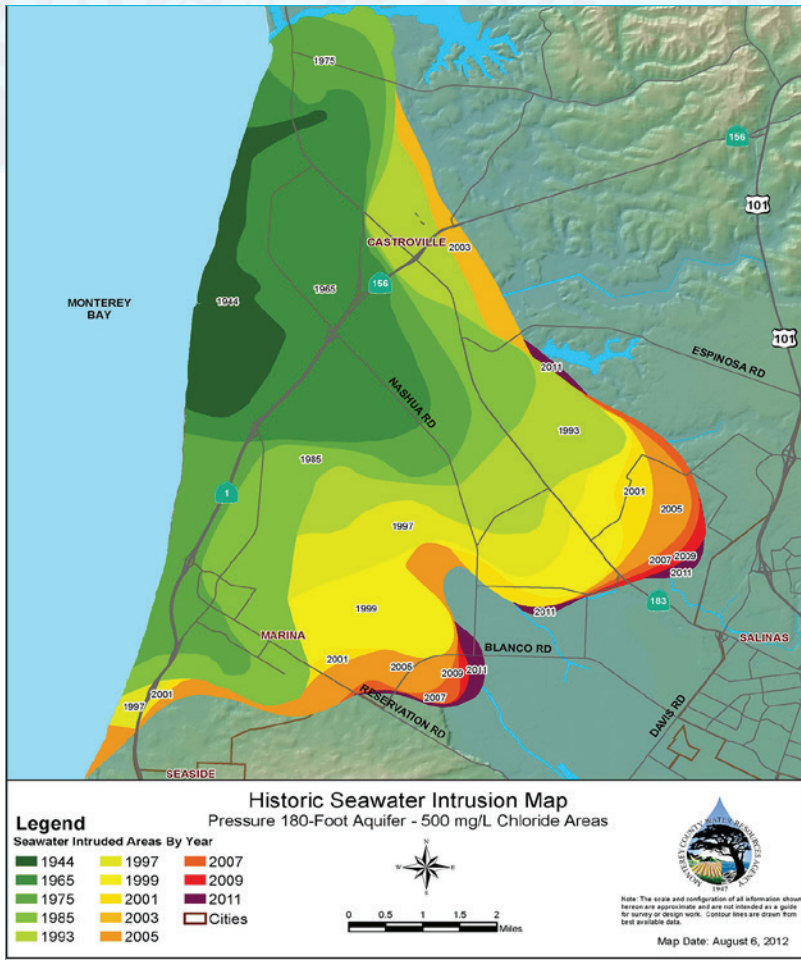


Figure 4. Historical Seawater Intrusion in Salinas Valley.

C2. DEMONSTRATE THE ABILITY TO ADDRESS THE ELEMENTS OF THE BASIN STUDY WITHIN THE STUDY TIMELINE

Based upon the extent of prior studies, the current resource commitments by Federal and non-Federal partners, and compliance timelines under the SGMA, we can conduct a basin study by June 2018.

a) Projections of water supply and demand, including risk related to water supply relating to climate change

The Basins' existing and projected water supplies and demands are well understood, and there exists multiple tools and models that can be used to evaluate the projections of water supply and demand under variable conditions, including water supply risks related to climate change.

During the course of the Salinas and Carmel Rivers Basin Study, it is anticipated that Reclamation will develop climate change scenarios representing potential variations seen for: 1) precipitation patterns that can result in a change in timing and quantity of runoff; 2) change in groundwater recharge

and discharge; and 3) increased temperatures leading to increased evaporation/evapotranspiration and increased water demand (e.g., higher temperatures requiring increased agricultural irrigation). It is also anticipated that most of these climate change scenario conditions will be applicable over the entire study area; however, where local variations are required, additional evaluation will be conducted to determine local impacts. For example, sea level rise scenarios will be important to consider for the coastal portions of this study area, but not applicable to the upper Salinas River or Carmel River Basin areas.

While multiple tools exist to evaluate future supply and demand under climate change scenarios, the Salinas and Carmel Rivers Basins' region could benefit from Reclamation's technical support to better determine the interaction between basin subareas and to define how changes in one sub-basin can affect other sub-basins. With Reclamation's oversight and regional collaboration, the predictive tools and models can be integrated to evaluate each scenario on a basin wide basis. The tools and model will be also be modified during the Basin Study to update temperature and precipitation assumptions as identified by Reclamation's climate change scenarios. Additional details on some of the available models and tools

that will be used during this study are discussed below for each sub-basin.

Paso Robles Sub-Basin

San Luis Obispo County's Resource Management System (RMS) provides a mechanism for ensuring a balance between land development and the water resources necessary to sustain such development. When a water resource deficiency becomes apparent, a Resource Capacity Study (RCS) is conducted to determine when water demands will equal the dependable supply of the resource, or whether they have already, and identify water and land use management strategies to address deficiencies. A RCS for the PRGB was completed in 2011. The RCS provides an analysis of future water demands utilizing eight scenarios for water use factor assumptions. In 2014, the integrated watershed/groundwater basin computer model (Figure 5) was used to quantify future demands and simulate the PRGB response to those demands. The future demands include a "no growth" scenario and a "growth" scenario and repeated past hydrology (e.g. no climate change). The watershed and groundwater model incorporate precipitation estimates, surface runoff, infiltration, percolation, subsurface inflow and outflow, pumping estimates and change in groundwater storage.

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A previous climate change vulnerability analysis suggest the PRGB may see more severe (but not more frequent) rainfall events, leading to quick pulses of runoff. Currently, there is insufficient infrastructure to harness that momentary surplus of water, and poor land use practices prevent much of the rain from infiltrating into the ground. Water supply shortages, which are already a serious problem, are expected to worsen. Climatic conditions are expected to be drier, with longer, hotter summers. Potential increases in the number of fires and severe storms could exacerbate already high rates of sediment runoff, which would affect the capacity of the Salinas Reservoir (impacting water supply) and Salinas River (exacerbating flooding, minimizing/altering ecosystem habitat, including but not limited to the steelhead trout). The findings of this past study will be updated based on the results of this Basin Study.

Carmel River and Seaside Groundwater Basin Models

In 2014 MPWMD worked with the USGS to develop the conceptual model for a linked surface-groundwater flow model for the Carmel Basin using the GSFLOW model, which will have a daily time step (PRMS and MODFLOW are components). The model accommodates changing climate parameters and is expected to be calibrated in 2015 using several long-term records. In 2016 MPWMD expects to complete an Instream Flow Incremental Method (IFIM) study for portions of the Carmel River. Both 1D and 2D hydraulic models will be used to evaluate the effects of stream diversions on steelhead habitat suitability and instream flow needs. Data collection for model development was halted in Spring 2015 due to low fish densities. In the SGB, a peer-reviewed numerical groundwater flow model based on MODFLOW was devel-

oped using extensive well-log and production data to model long-term changes to four water-bearing geologic layers. The model can predict potential impacts to the groundwater basin from management actions, such as new supplemental water supply projects that include injection and extraction of various source waters, including basin rainfall, desalinated water, excess flows diverted from the Carmel River Basin and injected into the SGB, and highly treated recycled water proposed for injection into the SGB (i.e., for indirect potable reuse). The two basin models are powerful tools for evaluating how changing climate affects future water supply and can reveal the efficacy of adaptation strategies and how demands could impact the supply availability and use.

MPWMD proposes to work with the USGS and the Desert Research Institute to model future CRB flows. Along with estimation of demands, adaptation strategies to adapt to climate change will be evaluated. MPWMD would guide model development with USGS performing peer review. For the SGB, climate change analysis results would be incorporated into the basin model to assess the effects on groundwater resources from future climate patterns, future demand, water supply alternatives, and proposed project operations. Results from the two models would be merged to describe what the effects would be to the water resources and people of the Monterey Peninsula.

Salinas Valley Sub-Basin

The MCWRA has collected ground water extraction data from well operators in the Salinas Basin since the 1992-1993 reporting year. Information received from the 300-plus well operators is compiled by the Ground Water Extraction Management System (GEMS) portion of the Water Resources Agency Information Management System (WRAIMS), a relational database maintained by the MCWRA. The intent of the ground water reporting program is to provide documentation of the reported amount of ground water that is extracted each year.

MCWRA has measured groundwater levels within the Salinas Basin since the 1940s to monitor the health of the basin, as well as to evaluate the effectiveness of releases from Lake Nacimiento and Lake San Antonio reservoirs for groundwater recharge. Each year, weighed averages of groundwater level data from the fall data collection program are compiled by hydrologic subarea to track long-term trends. For reference, the graph in Figure 6 highlights the initiation of years of major water supply projects in the Salinas Valley and the impacts of these major water supply projects on groundwater level trends.

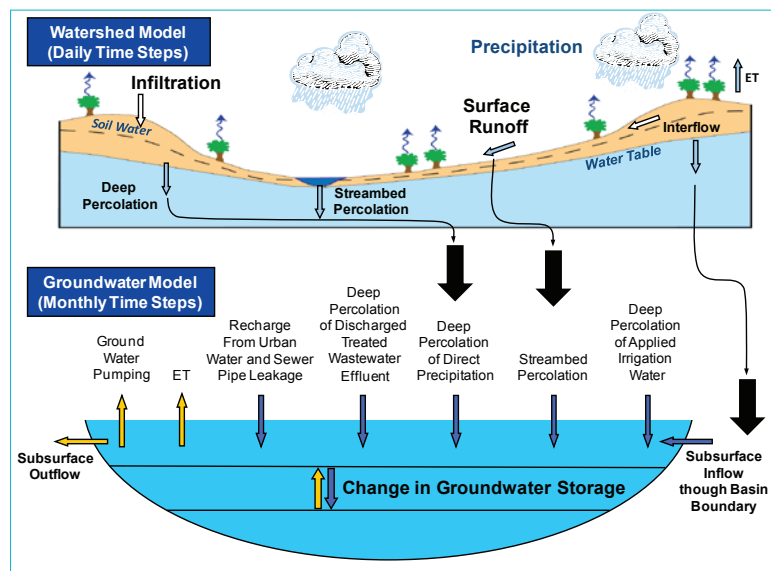


Figure 5. Conceptual Diagram of the Paso Robles Groundwater/Watershed Model.

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b) How water and power infrastructure/operations will perform in the face of changing realities

The existing tools and models that are currently used to assess supply and demand imbalances will also be useful in evaluating how water infrastructure operations will perform in the future.

To meet the requirements of the SECURE Water Act, the Basin Study will consider the extent of changes in water supply that could impact the following activities: water deliveries, hydroelectric power generation, recreation, fish and wildlife habitat, endangered species, water quality, ecologic resiliency, and flood control. The hydraulic and watershed models will be useful in evaluating how changes in quantity and timing of precipitation events or reservoir releases may potentially cause impacts to habitat and protected species. It is anticipated that Reclamation and other Federal resource agencies, including NOAA, will participate to determine potential impacts to endangered species.

MCWRA operates two reservoirs (Lake Nacimiento and Lake San Antonio) which release water into tributaries of the Salinas River. Monterey County Parks Department operates year round recreation activities on both reservoirs and both have established minimum releases to maintain fisheries habitats downstream. As discussed in the previous section, MCWRA has tools to evaluate the effectiveness of reservoir releases based on past experience. This will be useful for evaluating how the reservoirs can be operated under future condition to address changing conditions for a wide variety of objectives due to climate change. It will also be beneficial to identify how potential structural changes or modifications in how and where water is stored will assist with development of adaptations to the anticipated effects of climate change. Both reservoirs currently play a crucial role in water supply and flood control in the Salinas River and that role will likely increase under climate change scenarios. Lake Nacimiento Dam has a hydropower generation facility that is operated with a license from the Federal Energy Regulatory Commission (FERC), and the impacts of power production will be considered for any changes anticipated in water releases.

c) Development of appropriate adaptation and mitigation strategies to meet future demands

The Basin Study will identify the extent to which existing water management systems in the region are adaptable to climate change impacts and the steps or new infrastructure are needed to make those systems more robust for a changing water reality.

Over the past several decades, numerous water management strategies have been proposed to strengthen current water supplies to meet future demands: water conservation, municipal wastewater recycling, storm water reclamation, indirect potable reuse of recycled water supplies, aquifer storage and recovery, and seawater desalination. Many of these types of projects have been implemented, such as the Monterey County Water Recycling Projects, which deliver recycled water from MRWPCA to agricultural users to address seawater intrusion, and the Salinas Valley Water Project, which diverts Salinas River water to agricultural users. An examination of the expansion potential of existing projects could bring new irrigation water supplies to additional farmland and further reduce groundwater pumping in the seawater intruded areas.

The past and ongoing studies of additional water supply and management strategies will be important to consider during the development of the Basin Study. For example, San Luis Obispo County has recently hired a consultant to prepare a Water Supply Options Study for the PRGB. The scope includes evaluating supplemental supplies brought to the PRGB, utilizing additional Lake Nacimiento water in this basin, and identifying opportunities for water exchanges. It also includes evaluating the potential to utilize water avail-

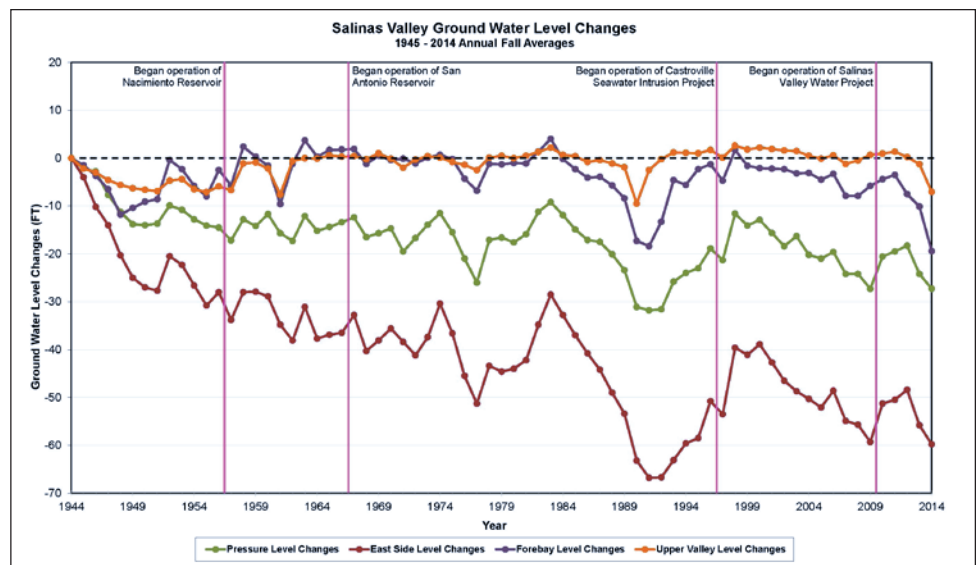


Figure 6. Historical Groundwater Levels in Salinas Valley.

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able per the County's 25,000 AFY contract for State Water. However, given reliability concerns and future uncertainties due to climate change, the County and Basin stakeholders are looking to optimize the use of local water supplies to stabilize the Basin's groundwater levels. The results of this evaluation, and alternative strategies to address the needs of the PRGB is of interest to Reclamation because of the Cooperative Operation Agreement (COA) with the State related to shared facilities with the Central Valley Project.

The Salinas and Carmel Rivers Basin Study will complement the Water Supply Options Study by also evaluating storm water diversion opportunities, such as utilizing the Salinas River and its tributaries in the PRGB as additional sources of supply. Likely, this would require use of the groundwater and watershed model to evaluate runoff under different scenarios to determine if there are opportunities to capture flows during wet years or extreme events. San Luis Obispo County is also using the basin computer model to investigate the best location to put water in the PRGB, the impacts of agricultural pumping on the residential wells, as well as storm water capturing and storage opportunities.

Other potential strategies that would be considered as part of this Basin Study is reoperation or expansion of the existing reservoirs (Lake Nacimiento, Lake San Antonio and the Salinas Dams) to better meet the needs of the basins now and into the future, as well as identifying additional water storage facilities needs would reduce the effects of drought conditions. A recent study of the CRB in connection with evaluating the fate of an ageing main stem reservoir shows there is adequate runoff for an off-main stem reservoir with an option for pumped storage to generate peaking hydro-power.

It is proposed that as part of the Basin Study, regular workshops will be held with stakeholders, the Basin Study partners and the Reclamation to collaborate and exchange ideas on new strategies that could have multiple benefits to the region.

d) Trade-off analysis of strategies identified

This Basin Study will build upon the work already completed to screen, evaluate, and facilitate a trade-off analysis of identified strategies, including the synthesis of new actions based on better integration.

The regional IRWM Plans from both Counties provide a ready framework for the critical review and trade-off analysis of adaptation strategies. The vetting process in the IRWM Plans is designed to identify the programs and projects that best meet stakeholder needs while meeting numerous environmental and societal objectives. Working in a more comprehensive manner, the IRWM Plans and new Basin Study stakeholders will consolidate the identification of proposed and in-progress water resources management projects. In addition to the IRWM Plans, each cost-share partner has been or is currently involved in projects and studies that require evaluation of the trade-offs of various alternatives. For example, the Water Supply Options Study being conducted for the PRGB is designed to consider the trade-offs associated with alternative water supply options. The GWR project is evaluating numerous combinations of source waters (agricultural return flows, storm water, agricultural process wastewater, etc.) for recycling and indirect potable reuse.

Upon completion of the Basin Study climate change analysis, the Basin Study partners and Reclamation will identify adaptation strategies through multiple workshops. Drawing upon collective experiences, the group will facilitate a trade-off analysis of identified strategies, including the synthesis of new actions based on a better integration. Criteria for comparing alternatives will be jointly determined during the Pre-Study Efforts (Task 1). Criteria are likely to include cost, environmental impact, risk, and stakeholder acceptance. It is anticipated that Reclamation will solicit the help of NOAA and other federal agencies to determine the impacts and trade-offs related to aquatic resources in the study area, due to the presence of endangered and threatened species.



Lake Nacimiento is the Only Reservoir with a Hydropower Facility in the Study Area.

Stakeholder outreach will be conducted as part of this Basin Study within the context of existing stakeholder groups and the IRWM Plans. Vetting the potential adaptation strategies with stakeholders will be an important step in identifying the potential acceptance of a proposed action. This important feedback loop will inform both the Reclamation and the cost-share partners as to those strategies that appear to be the most robust, perform well across the longest timeframe, and are the most cost effective.

C3. THE EXTENT TO WHICH FEDERAL INVOLVEMENT IS NEEDED AND THE STRENGTH OF ANY NEXUS BETWEEN THE BASIN STUDY AND RECLAMATION PROJECT OR ACTIVITY

Reclamation and its SecureWATER Basin Study Program provides a unique opportunity to assist the four water management agencies in the Salinas and Carmel Basins in the development of a comprehensive assessment of potential climate change impacts to water supplies and demands in these basins. There is currently no other local, state or federal agency which has the authority and capability to Partner with these four agencies in the development of strategies and actions which respond to projected imbalances between supplies and demands across both of these basins. An important nexus for Reclamation's involvement in the proposed Salinas and Carmel Basins Study is found under the State and Federal Coordinating Operating Agreement (COA). Since San Luis Obispo County has an annual allocation of 25,000 acre-feet of water from the State Water Project (SWP), the COA provides that delivered water may be supplied by either by the State Water Project or by Reclamation's Central Valley Project (CVP).

As evidenced in this proposal, extensive modeling and planning efforts have been undertaken independently in each of the three subbasins. The local agencies are now seeking Federal assistance in 1) integrating the individual system models into one linked model to provide a comprehensive system assessment tool with consistent data at the boundaries, and to consider impacts of climate change, and 2) leading and facilitating the evaluation of climate adaptation strategies that work best to meet all needs in the study area.

Federal expertise in hydrology, engineering, modeling, and climate analysis and the Basin Study results will provide the analysis and oversight needed to facilitate the identification of consistent, complementary management activities in all three subbasins. Table 4 lists the Basin Plan elements and partner contributions. With Reclamation as the lead agency, it is anticipated that participation by other federal agencies result in a more complete and robust Basin Study.

The Salinas and Carmel River Basins generate over nine million visitors and \$11 billion to the state and local economy, annually. The Salinas River Basin provides agricultural products that are distributed throughout the United States and as key exports to foreign trading partners. As agriculture is the backbone of the region's economy, water is its lifeblood. A

federal interest therefore exists in ensuring that a major link in our nation's food supply and commerce remains viable and sustainable in the face of anticipated climate change impacts. However, this extremely productive area has also produced an imbalance of water supply for both the environmental and consumptive uses. Participation by federal partners will help the basins address complex issues by developing collaborative and comprehensive management approaches to water supply imbalances made worse by a changing climate. Federal resource agency participation will also be critical to address the habitat issues related to threatened and endangered species in the river basins.

There are numerous Federal facilities and agencies that provide important functions that are impacted by climate change within the study area that would benefit from participation as outlined in Table 5. The strongest nexus between Reclamation and the Basin Study is the fact that the Paso Robles Sub Basin is considering using water available under San Luis Obispo County's State Water Project (SWP) Contract to stabilize levels. The Central Valley Project (CVP) and SWP are jointly operated under a coordinated operating agreement (COA). The COA provides that either SWP or CVP water may be used for deliveries. Under the COA, any deliveries to the Paso Robles Sub Basin by the SWP is essentially the same as a delivery made by Reclamation's CVP (see Appendix D). This Basin Study is an opportunity to identify adaptation strategies to mitigate the impacts of climate change that also reduce the need for SWP and CVP water.

One such option involves optimizing and/or expanding the Salinas Reservoir Dam which is owned by the Army Corp of Engineers and is operated by San Luis Obispo County. The dam can currently store up to 23,843 acre-feet (AF). The original design of the dam included spillway gates that would have increased capacity to an estimated 45,000 AF, and an increase in safe annual yield of 1,650 AFY (see Appendix D). However, due to the expense of the modifications necessary and absence of a regional approach to consider this option, this adaptation strategy has not been pursued. Also, inflow may not be stored in the Salinas Reservoir unless there is a live stream in the Salinas River between the dam and the confluence on the Nacimiento River. Reclamation's overview capabilities and authorities, as well as its expertise in climate change analysis, will be important for helping to analyze the viability and benefit of this adaptation strategy and potentially move it forward.

FEDERAL NEXUS
The annual allocation of water from the State Water Project provides a nexus due to the COA stating that CVP water may be delivered.

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Table 4. Basin Study Elements and Partner Contributions

Study Elements	Local Partners	Federal Partners
1. Modify projections of future supply and demand to include the impacts of climate change in a consistent manner across the study area and ensure consistent data is used at the boundaries of each sub basin.	Provide projections of future supply and demand Provide data and local studies regarding climate change risks and impacts on water supplies Provide data regarding sub basin boundary conditions Provide computer models	Use local data (e.g. Monterey County climate change impacts analysis methodology to be used for the Zone 2C model) and Federal data and techniques (e.g. West-Wide Climate Risk Assessments methods/process) to perform and/or enhance climate change risk assessments and studies across the study area Update supply and demand projections as needed to ensure consistency across the sub basins.
2. Analyze how the study area's existing water and power operations and infrastructure will perform in response to the projections of future water supplies and demands	Provide results of computer modeling and input data for runs that analyzed the impacts of changes of water supply on a variety of demands, along with demand change projections, if performed	Modify existing models and tools to integrate results from Objective #1 and to analyze or reanalyze the water and power operations and infrastructure performance projections as needed
3. Develop adaptation and mitigation strategies to improve operations and infrastructure to supply adequate water in the future	Provide information on the strategies under consideration in each area	Evaluate the effectiveness of the identified strategies using the results from Objective #2 and/or conducting additional modeling, and facilitate the development of any additional mitigation strategies
4. Perform trade-off analysis of the options identified and findings	Provide previous trade-off analyses and participate in trade-off analysis refinement	Perform/refine trade-off analyses to compare the potential costs and benefits of the adaptation strategies and develop findings

C4. EXISTING DATA AND MODELS, AND STUDY PARTNER FUTURE SUPPLY AND DEMAND ASSESSMENT ABILITIES

The Basin Study partners own and use extensive data sets, spreadsheet tools and models for water supply and demand projections that will also be used for this Basin Study.

Development of Integrated Hydrologic Models for the Salinas and Carmel River Basins

The Basin Study partners have collected data and studied the basins for many decades. The breadth and extent of the data available is too numerous to list here. Appendix F includes a summary of data and other relevant sources of information available to support the Basin Study. The SGMA requires consistent data (including groundwater elevation data, groundwater extraction date, surface water supply, total water use, change in groundwater storage, water budgets, sustainable yield) to be used in hydrogeologic analysis. The Basin Study partners are seeking Federal participation to ensure the models are consistently utilized, particularly at watershed and basin model boundaries, prior to using the models to analyze the effect of various water supply and demand projections and assessing the benefits and performance of various adaptation strategies. Table 6 summarizes the computer models and studies relevant to the proposed Basin Study and summarizes

their relationship to the proposal. These are the models the Basin Study partners are seeking to leverage as part of this Basin Study.

The three major objectives of the model effort in support of the proposed Basin Study would be:

1. To evaluate and utilize existing hydrologic models developed for the Salinas and Carmel Basins and to leverage the investments made previously by the Partner agencies in these models.
2. To develop a comprehensive Salinas and Carmel basin hydrologic assessment tool (covering both the upper and lower Salinas basins) that uses data from the existing sub-basin models including the Paso Basin and the Carmel Valley models and others as appropriate.
3. To apply the most recent CMIP5 Global Climate Models (GCMs) which are appropriately downscaled to assess climate change impacts to supplies and demands across both of these basins.

The Salinas and Carmel River Basins are currently experiencing an imbalance in water supply and demand. These adjacent river basins have very different hydrologic systems as well as supply and demand issues. However, both the Salinas and Carmel basins have common issues relating to adequate supplies, resources and habitat management. Interbasin transfers of treated water is also occurring from the Carmel Basin to the Seaside groundwater basin. The overarching

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Table 5 – Federal Partners and How They Benefit from the Basin Study

Federal Agency Active in Study Area	Relationship and Benefit to Study Area	Benefit of Performing Basin Study to the Federal Agency
US Bureau of Reclamation (Reclamation)	<ul style="list-style-type: none"> • Central Valley Project (CVP) <ul style="list-style-type: none"> – Paso Robles Sub Basin is considering using water available under San Luis Obispo County’s State Water Project (SWP) Contract to stabilize levels – The CVP and SWP are jointly operated under a coordinated operating agreement (COA). The COA provides that either SWP or CVP water may be used for deliveries. Under the COA, any deliveries to San Luis Obispo County by the SWP is essentially the same as a delivery made by Reclamation’s CVP. • Provided funding for the Castroville Seawater Intrusion Project 	<ul style="list-style-type: none"> • Reclamation’s SecureWATER basin study program is uniquely capable of bringing together San Luis Obispo and Monterey Counties - which encompass the Salinas River Basin and also incorporates the two special districts that provide water management and treatment in the Carmel River Basin on the Monterey Peninsula. The Reclamation’s Basin Study program will provide the avenue to collaboratively involve the four non-Federal Partner agencies with Reclamation in order to investigate potential climate impacts to supplies and demands in these two river basins, which has never occurred before. • Identification of a range of adaptation strategies to mitigate the impacts of climate change, which may reduce the need for SWP and CVP water. • Identification of additional strategies to mitigate sea-water intrusion in light of climate change impacts.
US Geological Survey (USGS)	<ul style="list-style-type: none"> • Groundwater Ambient Monitoring and Assessment (GAMA) Program Priority Basin water quality testing • Future project to complete California’s 4th Climate Change Assessment • Monterey County MOU 	<ul style="list-style-type: none"> • Opportunity to integrate water quality findings from the GAMA program into adaptation strategy analysis • Potential for CAWSC staff to develop a number of climate future scenarios for the Salinas and Carmel basins, and support CAWSC’s efforts associated with California’s 4th Climate Change Assessment.
US Army Corps of Engineers (COE)	<ul style="list-style-type: none"> • Owns Salinas Dam and inspects levees on the Salinas River • Issue 404 permits for projects 	<ul style="list-style-type: none"> • Re-evaluation of hydrologic conditions and Dam operations in light of climate change impacts • Identification of optimization and/or modification opportunities to meet multiple needs for study area
NOAA -National Marine Fisheries Service -Monterey Bay	<ul style="list-style-type: none"> • Responsible for federally threatened South Central California Coast Steelhead trout designated critical habitat • Primary administrator of the MBNMS 	<ul style="list-style-type: none"> • Opportunity to integrate species and MBNMS needs into supply and demand assessments and mitigation strategies
US Fish and Wildlife Service (USFWS)	<ul style="list-style-type: none"> • Salinas River National Wildlife Refuge • Responsible for numerous federally threatened species 	<ul style="list-style-type: none"> • Opportunity to integrate species needs into supply and demand assessments and mitigation strategies.
Federal Military Installations	<ul style="list-style-type: none"> • Army Reserve Garrison Fort Hunter Liggett, largest installation in the Army Reserve with 165,000 acres • US Army Defense Language Institute & Navy Post Graduate School 	<ul style="list-style-type: none"> • Opportunity to integrate military installation water supply and demand needs into assessments and mitigation strategies analysis.
Bureau of Land Management (BLM)	<ul style="list-style-type: none"> • Manages more than 15,000 acres of Fort Ord and National Monument • Will manage approximately 1,000 acres in the Carmel River 	<ul style="list-style-type: none"> • Opportunity to integrate BLM water supply and demand needs, and resource protection into assessments and mitigation strategies analysis.
U.S. Forest Service (USFS)	<ul style="list-style-type: none"> • Maintains Los Padres National Forest (large portions of upper watersheds) 	<ul style="list-style-type: none"> • July, 2013 MOU between Reclamation and NFS establishing collaborative framework for watershed management to enhance water supplies and adapt to climate change.
U.S. Coast Guard Station - Monterey Bay	<ul style="list-style-type: none"> • Maritime law enforcement and search/rescue along the California coast. • Work jointly with other agencies in governing the MBNMS 	<ul style="list-style-type: none"> • Relationship to the proposed basin study includes climate change induced extreme weather events, flooding and search and rescue.

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Table 6 – Sources of Existing Models and Studies To Be Used

Basins	Existing Models/Studies	How the model and studies can be/have been used
CRB/SGB	2006 Carmel River Flood Insurance Study and HEC-RAS 2014 CRB GSFLOW (PRMS linked to MODLFLOW) – to be developed in 2015/16 2014 Canyon Del Rey HEC-HMS & HEC-RAS Seaside Groundwater Basin Model	Predict flood elevations/areas of inundation along Carmel River Simulate Carmel River flow, reservoir storage, aquifer storage, diversions, water system operations Predict flood magnitudes, elevations, and areas of inundation Simulate groundwater flow and contours with variable inputs/outputs to basin
PRGB	1991 Salinas Reservoir Expansion Feasibility Study 2012 Groundwater Management Plan 2014 Integrated Watershed/Groundwater Basin Computer Model (HSPF/Modflow) and 2015 Supply Options Study http://www.slocountywater.org/site/Water%20Resources/Water%20Forum/	Established PRGB sustainability objectives Identified management strategies Used the model to assess impacts to groundwater supply by: <ul style="list-style-type: none"> • Repeating the 1980 – 2011 hydrology and reservoir operation information for the simulation period 2012 – 2040 • Applying “no-growth” and “growth” future demand pumping estimates to establish baselines for strategy comparison and compare to basin level stability objectives • Identified and tested management strategies with the model and compared the degree of benefit and trade offs
SVB	Integrated Groundwater Surface Water Model. Calibrated Baseline model (scheduled for completion early 2016) Groundwater elevation contours Pressure 180 ft and Eastside shallow aquifers 1994-2013 Groundwater elevation contours Pressure 400 ft and Eastside deep aquifers 1994-2013	Basin Sustainability: <ul style="list-style-type: none"> • Evaluate seawater intrusion on annual basis thru 2030/build-out • Evaluate groundwater level elevations on annual basis thru 2030/build-out • Evaluate total water demand on annual basis thru 2030/build-out • Assess climate change effects and combined effects of groundwater pumping and rising sea level on the location of the freshwater-seawater interface over time and develop projections of changes in seawater intrusion volume.

purpose of combining both of these river basins into a singular basins study is to identify promising adaptation strategies which may potentially benefit both river basins. To address both local surface and groundwater management issues, the Partner agencies have developed multiple separate models in the Salinas and Carmel Valleys.

The proposed model framework for the basin study would include enhancing these models by ensuring consistency, particularly at basin boundaries, and for purposes of climate change impact analyses. Incorporated in these simulations will be the magnitude and frequency of known or anticipated water shortages and all natural and anthropogenic supply components. The shortages will be quantitatively analyzed and evaluated based on the magnitude and timing of shortages. Since the Basin Study will address water supply and the related effects of potential climate change on future water supply, it is essential to have models that can simulate all the known and anticipated supply and demands for all types of water uses (agricultural, municipal and industrial, environmental needs, and recreation). In addition, the nature of imbalances will include an analysis of quantity and quality of

water supplies. In particular, the effects from sea-water intrusion will be simulated and evaluated from growing demand and sea-level rise related to climate change. The potential consequences for not addressing imbalances in supply and demand will be shown through tables, graphs, and other figures. Also additional sources of water that are currently not captured or reused will be identified.

Specifically, for the upper/lower Salinas Valley, the simulations will include connections to San Antonio, Nacimiento and Salinas Reservoirs. A review of the existing models will include providing input on the code selection used to develop the models. For example, MF-OWHM rev 2 is ideally suited as it will include the new Reservoir linkage Process (SWOPS) that simulates the reservoir inflows, outflows, charges and credits and demand driven releases of agriculture. This approach has already been successfully used by the USBR and USGS for the Lower Rio Grande project EIS that also included climate change analysis. Specifically incorporating these reservoirs will allow an analysis of how this existing infrastructure and operations will perform in the face of changing water drivers, such as population increases, more

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water-intensive agriculture, and climate change. Another GSFLOW based model of the Carmel River Valley may be constructed as this is a separate watershed and better suited to simulation with a combined PRMS-MODFLOW model like GSFLOW where there is less agriculture and a more dynamic interplay between rainfall runoff, streamflow and natural vegetation. However, the combination and linkage of these models will allow the development of appropriate adaptation and mitigation strategies to meet future water demands to be applied and analyzed. Furthermore, using these models trade-off analysis of the strategies identified and proposed alternatives in terms of their relative cost, environmental impact, risk (probability of not accomplishing the desired/expected outcome), stakeholder response, or other attributes common to the alternatives can be done.

The four non-Federal partners and Reclamation, which comprise the Study Team for the Salinas and Carmel Basins Study, are proposing that Reclamation's Technical Services Center (TSC) be the lead agency for development of the Basin Study's assessment-level hydrologic model. Preliminary discussions with TSC staff have indicated that the USGS's Water Science Center, located in Sacramento, may be engaged by the TSC in integrating the existing hydrologic models in the Salinas and Carmel Basins and to provide the technical expertise and recommended approaches to climate change downscaling and analysis.

Several options for the modeling approach used are anticipated to be developed as part of the Plan of Study. This includes possibly having the TSC assist with further development of the SWOPS pack package which will be publicly released as a joint product by the USGS as part of the second release of MODFLOW-OWHM (One Water Hydrologic Model) in 2016. The SWOPS process is linked to the streamflow routing and Farm Process within MF-OWHM and allows the simulation of charges, credits, carry over, changes in reservoir storage, inflows and outflows, delivery efficiencies, and calls linked to agricultural and other demands on a monthly basis.

The potential collaboration of USGS and Reclamation's TSC would enhance the information developed and credibility in the Salinas and Carmel Basin Study relating to climate downscaling, bias corrections, and analysis in coastal regions which require new and more refined methods than are currently being used by USBR. A potential collaboration with USGS brings expertise in several numerical codes as well as climate simulations specifically downscaled at a detailed resolution for the California coast. The USGS has completed other linked climate change studies for the Central Valley and has a concurrent study in the adjacent Pajaro Valley that will also

involve this same analysis. Alignment with this work would allow integration and consistency throughout the study area.

C5. THE LEVEL OF STAKEHOLDER INTEREST IN AND SUPPORT FOR THE BASIN STUDY

Due to the significant existing impacts of water demands outpacing supply in this study area, there is widespread stakeholder support for finding solutions to this imbalance.

Stakeholder participation on water related projects and studies have been extensive in the Salinas and Carmel River Basins. Water issues in general can always generate significant discussion and diverse opinions on the best approach to be implemented. However, while a healthy discussion is expected among stakeholders, there are no known opponents to this Basin Study; and in fact, the Basin Study partners expect there to be wide spread support for further efforts to develop more sustainable water supplies for the region. Letters of Support for the Basin Study are included in Appendix A and summarized in Table 7. The stakeholder groups in these basins are well defined and will be engaged during this study using existing processes and groups.

Paso Robles Groundwater Sub-Basin

The SLOCPWD serves as staff to the San Luis Obispo County Flood Control and Water Conservation District (District), and is the cost share partner for the Salinas and Carmel Rivers Basin Study. The District funds work efforts for PRGB water resource planning efforts carried out by the SLOCPWD via its Flood Control budgets. The SLOCPWD has led or participated in the development of the County's IRWM Plan, the Nacimiento Water Project, the Paso Robles Groundwater Basin Model and Management Plan, and the County-wide Master Water Report. All these efforts included stakeholder participation. Most recently, the District is funding a Water Supply Options Feasibility Study for the PRGB, which will provide some of the mitigation strategies to be evaluated in the Basin Study and include stakeholder outreach.

The District has a Paso Robles Groundwater Basin Advisory Committee, and the Feasibility Study and Basin Study will be developed in coordination with this Committee. In May of 2013, the Committee identified water supply options to benefit the Basin, including the Salinas River watershed, as a top solution to investigate. The Committee meets monthly on the third Thursday and all members of the public are invited to attend. The SLOCPWD will also host town hall meetings in the evenings approximately every three to four months. All materials will be posted on the SLOCPWD's website and many events will be recorded.

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Table 7 – List of Stakeholders Providing Letters of Support

Federal Government	State Government	Local Government	Local Stakeholders
U.S. Senator Barbara Boxer ¹	California Congresswoman Lois Capps ¹	County of San Luis Obispo, Board of Supervisors Debbie Arnold (Chair)	Paso Robles Agricultural Alliance for Groundwater Solutions (PRAAGS) Jerry Reaugh, Chairman
U.S. Dept of Commerce NOAA - NBNMS Paul Michel (Superintendent)	CA State Senator 17th District William Monning		Paso Robles Groundwater Basin Overliers for Water Equity (Pro Water Equity-PWE) Sue Luft, President
U.S. Department of Interior, USGS Eric Reichard (Director)	California Assemblyman Katcho Achadjian		Carmel Valley Association Patricia Walton, President
			Legislative Analyst of the San Luis Obispo County Farm Bureau Joy Fitzhugh

1. Letter to be sent directly to Reclamation

Salinas Valley Sub-Basin

MRWPCA has multiregional responsibility for wastewater treatment throughout the Salinas Valley, Carmel River, and Seaside Basins. MRWPCA was established in 1979 under a Joint Powers Authority (JPA) agreement between the City of Monterey, the City of Pacific Grove and the Seaside County Sanitation District. MRWPCA operates the regional wastewater treatment plant, including the Salinas Valley Reclamation Plant water recycling facility (collectively known as the Regional Treatment Plant), a non-potable water distribution system known as the Castroville Seawater Intrusion Project, sewage collection pipelines, and 25 wastewater pump stations. The MRWPCA mission is to meet the wastewater and reclamation needs of its member agencies while protecting the environment.

MCWRA’s mission is to manage, protect, and enhance the quantity and quality of water and provide specified flood control services for present and future generations of Monterey County. MCWRA’s nine member board include representatives appointed by each Board of Supervisor member from the five districts within the County. The remaining members are appointed from the Monterey County Farm Bureau, the Mayor select committee, the Grower-Shipper Association of Central California and the Board of Supervisors’ as Agricultural Advisory Committee.

The proposed Basin study will compliment current stakeholder efforts already scheduled to take place. Climate change is a large consideration for studies that are in process, and that will be in process in the near future. Currently Monterey County is working on a new Salinas Valley Basin model, of which effects of climate change will need to be evaluated and/or modeled. The Water Resources Agency is evaluating constructing a tunnel to connect two reservoirs to

increase the effectiveness of these structures, and that process will involve modeling climate change effects.

Also, the state has recently passed legislation called SGMA. SGMA requires that all basins plan to achieve sustainability by 2042. These efforts are just beginning, and there are required milestones that will need to be met. Again, climate change will be a major factor in keeping the basins to be studied sustainable, and there will be a great deal of stakeholder input into this process.

Carmel River Basin and Seaside Groundwater Basin

The MPWMD is a special district created by the California State legislature in 1977 to promote or provide for long term sustainable water supply and to manage and protect the water resources of the Monterey Peninsula for the benefit of the community and the environment. MPWMD is currently working with other local special districts, water purveyors, City governments, and other groups to fund water supply solutions. The MPWMD Board is comprised of five elected officials, one member appointed by a Mayor’s group and one member appointed by the Monterey County Board of Supervisors. There are numerous opportunities for the public within the MPWMD organization to take part in water management issues. The MPRWA portfolio includes desalination, groundwater replenishment, aquifer storage and recovery, and recycled water.

Other regional stakeholders include local water purveyors (Cal-Am, Marina Coast Water District, City of Seaside, City of Salinas, California Water Service Company), recycled water purveyors (Carmel Area Wastewater District/Pebble Beach Community Services District), as well as governmental agencies such as Fort Ord Reuse Authority.

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C6. THE EXTENT TO WHICH THE PROPOSED STUDY WILL EMPLOY AN INTEGRATED WATERSHED PLANNING APPROACH.

This Basin Study will identify relationships between sub-basins and identify climate adaptation strategies that result in water resources management strategies representing the most economically feasible, environmentally preferable and technically sustainable solutions to meet the future water resource management needs for the entire region, consistent with the integrated watershed approach already being implemented by the agencies in their IRWMPs.

The Basin Study partners are all key participants in California's IRWM Plan Program. Each is leading and/or participating in numerous water resources planning and implementation projects that have and will continue to shape water resource management through the use of an integrated watershed planning and management approach. Perhaps more importantly, their ongoing participation and familiarity with the IRWM Plan process means their regulating boards are accomplished with the use and procedures of the integrated planning process, their stakeholders are accustomed to participating in this process, and their service area residents are familiar with the process and its results. The Basin Study partners are also collaborating with each other by being stakeholders in each other's IRWM Plan efforts and participating in committees that have regional impacts. The associated IRWM Plans cover the following study areas: 1) the San Luis Obispo County Plan; 2) the Greater Monterey County Plan; 3) the Monterey Peninsula Carmel Bay, and Southern Monterey Bay Plan.

Pursuant to California's requirements, these IRWM Plans must address estimates of current and future water supply and demand, and the water management strategies of water supply reliability, water quality protection and improvement, groundwater management, ecosystem restoration, environmental and habitat protection and improvement, flood management, recreation and public access, storm water capture and management, water conservation, water recycling, and wetlands enhancement and creation on a regional basin. It is therefore the plan of the Basin Study partners to use these existing integrated watershed planning and management stakeholder network and framework to guide and develop the Salinas and Carmel Rivers Basin Plan Study.

The IRWM Plans establish "working groups". Members are expected to participate in all aspects of the IRWM Planning process. During Plan development, members attend monthly meetings, participate on subcommittees to develop various

elements of the Plan, identify regional issues and conflicts, determine goals and objectives, and develop the process for ranking projects. As part of the Basin Plan Study, a Plan will be developed to identify how stakeholders will be engaged during the study, coordinated with the ongoing IRWM Plan outreach.

The goal of this Basin Study is to identify the most economically feasible, environmentally preferable and technically sustainable solutions to meet the future water resource management needs for all Salinas and Carmel River stakeholders. Building on the IRWM Plans' collaborative approaches will lead to identifying climate adaptation strategies that have the most benefits for the region and improved cooperative and integrated opportunities for more effective operation of existing systems and developing new projects. Water management strategies identified in the IRWM Plans will likely need to be refined given the results of the Basin Study's climate change-based analysis of supplies, demands, issues, and opportunities within the study area.

The image shows three overlapping covers of Integrated Regional Water Management Plans (IRWMPs). The top cover is for the Monterey Peninsula, Carmel Bay, and South Monterey Bay. The middle cover is for the San Luis Region. The bottom cover is for San Luis Obispo County and features a circular diagram of the IRWM Plan.

Monterey Peninsula, Carmel Bay, and South Monterey Bay Integrated Regional Water Management Plan

Stakeholders	
California American Water	Monterey Bay Citizen Watershed Monitoring Network
California Coastal Commission	Monterey County Service Area 50
California Coastal Conservancy	Monterey Peninsula Regional Park District
California Department of Fish and Game	NDA Fisheries
California State University Monterey Bay	Pebble Beach Community Service District
California State Water Resources Control Board	
Carmel Area Watershed District	
Carmel River Watershed Association	
Carmel River Watershed Conservancy	
Carmel Unified School District	
Carmel Valley Association	
City of Carmel-by-the-Sea	
City of Del Rey Oaks	
City of Pacific Grove	
City of Sand City	
City of Seaside	
Monterey Bay National Marine Sanctuary	

San Luis Region Integrated Regional Water Management Plan

A Strategic Plan for Sustainable Water Resources to Meet Human and Environmental Needs in San Luis Obispo County

Adopted December 2005
Amended July 2007

Regional Agency: San Luis Obispo County
Flood Control and Water Conservation District

San Luis Obispo County IRWM Plan

Water Supply: Conserve, Reuse, Recycle
Water Efficiency: Protect & Improve
Wetlands: Preserve & Restore
Ecosystem: Monitor & Recharge
Groundwater: Capture & Infiltrate
Flooded: Flooded

Water Management Group

Big Sur Land Trust
State University Monterey Bay
Water Services Company
Community Services District
City of Salinas
City of Solvang
Wildland Ecotone Research Institute
Wild Justice Coalition for Water
Yuba Creek Watershed Council
Yuba Coast Water District
Big National Marine Sanctuary
Agricultural Commissioner's Office
County Water Resources Agency
Local Water Pollution Control Agency
Wildlife Marine Laboratory
National District of Monterey County
Watershed Assistance Corporation
Watershed Cooperative, Inc.

April 2013

The three existing IRWMP efforts set the stage for successful outreach and integration.

STUDY OUTLINE AND SCHEDULE

Table 8 – Study Outline and Schedule

Schedule assumes a June 2015 Notice of Selection

Task	Partners Share ¹	Federal Share ²	Estimated Cost	Proposed Schedule ⁴
<p>Task 1 – Pre-Study Efforts</p> <p>Summary: Scope out the study and agree to tasks, schedule, budget and roles/responsibilities for achieving study objectives in order to execute a Memorandum of Agreement (MOA) and develop a Plan of Study</p> <p>1.a: Hold kick off meetings with study partners to establish:</p> <ul style="list-style-type: none"> • Goals and objectives • Needs and challenges, and data gaps to be filled • Stakeholder outreach plan and regional coordination framework • Use of existing models • Climate change framework and scenarios to be applied • Decision criteria and basin balance objectives • Details of the technical sufficiency review <p>1.b: Prepare a detailed Plan of Study (POS) that outlines study goals objectives, management plan (including tasks, schedule and budget and study tasks for conducting the basin study and modeling approach).</p> <p>1.c: Develop and execute MOA between project partners</p> <p>Deliverable: MOA and Plan of Study</p>	\$100,000	\$25,000	\$125,000	6/2015 to 9/2015
<p>Task 2 – Model Development Integration/Calibration/Validation and GCM Modeling³</p> <p>Summary: Develop a comprehensive Salinas basin hydrologic model (covering both the upper and lower Salinas basins), integrate the model with the Paso Robles Groundwater Subbasin (Paso Basin) model, and assist with the completion of the Carmel Valley and Seaside Basin hydrologic model to ensure consistency as appropriate. Develop a detailed comprehensive downscaling of Global Climate Models (GCMs) in order to assess climate change impacts to supplies and demands across the basin, and apply and analyze selected GCMs to the Salinas, Paso Basin and Carmel Valley and Seaside Basin hydrologic models.</p> <p>2.a: Data collection from various local sources</p> <p>2.b: Determine model basis for model performance including common parameters, inputs for models and overall water balance</p> <p>2.c: Federal technical sufficiency review models</p> <p>2.d: Develop model integration approach for entire basin system</p> <p>2.e: Refine and recalibrate model and conduct model simulations</p> <p>2.f: Provide downscaled GCMs</p> <p>2.g: Identify climate scenarios to evaluate (precipitation, sea level rise, temperature, others) and evaluate impacts through use of downscaled Global Climate Models.</p> <p>2.h: Consider risk and reliability evaluation of dams and river channels, especially where requiring consultation with Federal agencies over impacts to T&E species or from increased flood risks.</p> <p>Deliverable: Technical Memorandum</p>	\$250,000	\$550,000	\$800,000	10/2015 to 2/2017
<p>Task 3 – Current Water Supply and Demand Assessment</p> <p>Summary: Refine previous existing water supply and demand assessments to include considerations of variability due to climate change and to account for any demands not previously covered. Assessment to include quantification/identification of supply and demands.</p> <p>3.a: Federal technical sufficiency review</p> <p>3.b: Update water demand assessments as needed</p> <p>Deliverable: Technical Memorandum</p>	\$100,000	\$50,000	\$150,000	10/15 to 4/2016

EXHIBIT 15-B

Task	Partners Share ¹	Federal Share ²	Estimated Cost	Proposed Schedule ⁴
<p>Task 4 – Future Water Supply and Demand Assessment</p> <p>Summary: Develop future water supply and demand assessments to include considerations of variability due to climate change and to account for any supplies not previously covered. Assessment to include change in timing and quantity of runoff, groundwater recharge/dischage and reservoir operations and potential for increased demands due to increases in temperature and evaporation.</p> <p>4.a: Federal technical sufficiency review of previous existing and future water supply and demand assessments</p> <p>4.b: Develop water supply and demand assessments as needed</p> <p>4.c: Summarize in a Future Supply and Demand Assessment TM</p> <p>Deliverable: Technical Memorandum</p>	\$150,000	\$100,000	\$250,000	2/2017 to 5/2017
<p>Task 5 – Identify Supply and Demand Imbalances</p> <p>Summary: Identify imbalances between existing and future water supply and demands under climate change scenarios on a regionwide basis.</p> <p>Deliverable: Technical Memorandum</p>	\$30,000	\$30,000	\$60,000	4/2017 to 6/2017
<p>Task 6 – Develop Adaptation Strategies</p> <p>Summary: Identify Adaptation Strategies to address imbalances and risks. Alternatives will be developed to sufficient level of detail to be able to use the model to evaluate effectiveness of proposed strategies, assess rough cost and potential environmental impacts.</p> <p>6.a: Review previously identified opportunities</p> <p>6.b: Identify any additional opportunities to address</p> <p>6.c: Summarize the opportunities to evaluate in the trade off analysis in a TM</p> <p>Deliverable: Technical Memorandum</p>	\$200,000	\$70,000	\$270,000	6/2017 to 9/2017
<p>Task 7 – Trade-off Analysis of Strategies</p> <p>Summary: Compare alternatives identified for established metrics for each sub-basin and the system as a whole, including:</p> <ul style="list-style-type: none"> • Environmental impacts • Risk/Reliability • Costs • Stakeholder support • Institutional/Regulatory • Performance • Recreational • Power Generation <p>Deliverable: Technical Memorandum</p>	\$150,000	\$50,000	\$200,000	9/2017 to 12/2017
<p>Task 8 – Findings and Recommendations</p> <p>Prepare a draft report summarizing and prioritizing the findings and recommendations of the alternatives analysis, including technical details, and a QA/QC review. Conduct a Technical Sufficiency review (by the Reclamation or TSR panel) of the modeling and draft report.</p> <p>Deliverable: Draft Basin Study Report and Response to Technical Sufficiency Review Comments</p>	\$50,000	\$25,000	\$75,000	1/2018 to 5/2018
<p>Task 9 – Final Report</p> <p>A final report will be developed summarizing the findings of the Basin Study.</p> <p>Deliverable: Final Basin Study Report</p>	\$25,000	\$15,000	\$40,000	6/2018 to 9/2018
<p>Task 10 – Stakeholder Outreach and Involvement/Project Team Meeting</p> <p>Identify and work with key stakeholders throughout the Basin Study to solicit input on the study findings and proposed alternatives through stakeholder meetings, small group meetings and a project website.</p> <p>Deliverable: Project Communications Plan, Stakeholder Workshops Meeting Minutes</p>	\$100,000	\$35,000	\$135,000	Ongoing
Proposed Carmel and Salinas Basins Study TOTAL	\$1,155,000	\$950,000	\$2,105,000	

1. MCWRA, MRWPCA, MPWMD, SLOC; includes related costs since May 2014

2. USBR, USGS

3. Specific modeling approach to be defined in Plan of Study

4. Schedule to be confirmed as part of Pre-Study efforts.

SUMMARY OF REGIONAL STUDIES AND PARTNER COST SHARE

Table A1 – Summary of Basin Study Partners Cost Share

A. Agency	Relevant Past Studies and Costs Prior to April, 2014		Proposed In-Kind Services Match	
Monterey County Water Resources Agency (MCWRA)	<ul style="list-style-type: none"> • Protective Elevations to Control Sea Water Intrusion in the Salinas Valley, November 2013 • 2012 Groundwater Extraction Summary, September 2013 • State of the Salinas River Groundwater Basin Report, January 2015 • Groundwater Level Contour Maps, 2013 	<p align="right">\$120,000</p> <p align="right">\$84,000</p> <p align="right">\$103,000</p> <p align="right">\$90,000</p>	<ul style="list-style-type: none"> • 2013 Groundwater Extraction Summary, September 2014 • Seawater Intrusion Maps 2014 • Integrated Groundwater Surface Water Model (to be completed early 2016) • Basin Study Plan Match (Staff resources) 	<p align="right">\$85,000</p> <p align="right">\$90,000</p> <p align="right">\$671,000</p> <p align="right">\$100,000</p>
Monterey Peninsula Water Management District (MPWMD)	<ul style="list-style-type: none"> • SGB Salt and Nutrient Management Plan (2014) • Canyon Del Rey Drainage Plan Update (2014) • Los Padres Dam and Reservoir Acquisition: Long-Term Strategic and Short-Term Tactical Plan (2014) 	<p align="right">\$60,000</p> <p align="right">\$250,000</p> <p align="right">\$146,000</p>	<ul style="list-style-type: none"> • 2014 Update to IRWM Plan (2014) • CRB Surface-Groundwater Model (GSFLOW) (2014) • Los Padres Dam Long-Term Plan Project (2015-16-17) • Complete Instream Flow Incremental Method Study (IFIM) Study, 2017 • Carmel River Basin Surface-Groundwater Model (GSFLOW) (2015) • Basin Study Plan Match (Staff resources) 	<p align="right">\$156,000</p> <p align="right">\$125,000</p> <p align="right">\$500,000</p> <p align="right">up to \$250,000</p> <p align="right">\$50,000</p> <p align="right">\$45,000</p>
Monterey Regional Water Pollution Control Agency (MRWPCA)	<ul style="list-style-type: none"> • Pure Water Monterey Groundwater Replenishment Project (GWR) studies: <ul style="list-style-type: none"> - WaterSMART Feasibility Study - SGB Modeling - Indirect Potable Reuse - Agricultural Reuse - Seaside Basin Groundwater Flow Model 	<p align="right">\$1,960,000</p>	<ul style="list-style-type: none"> • Basin Study Plan Match (Staff resources) 	<p align="right">\$120,000</p>
San Luis Obispo County Public Works Department (SLOCPWD)	<ul style="list-style-type: none"> • Groundwater/Watershed Model Update and Mitigation Strategies Analysis, pre-April 2014 	<p align="right">\$357,000</p>	<ul style="list-style-type: none"> • Groundwater/Watershed Model Update and Mitigation Strategies Analysis, post-April 30, 2014 • Water Supply Options Study • Basin Study Plan Match (Staff resources) - Model Runs 	<p align="right">\$129,000</p> <p align="right">\$657,000</p> <p align="right">\$176,000</p> <p align="right">\$30,000</p>
Total	<ul style="list-style-type: none"> • Past Studies (not included in cost share) 	<p align="right">\$3,070,000</p>	<ul style="list-style-type: none"> • Applicable Studies/Staff Resources 	<p align="right">\$3,195,000</p>

Appendix B

LETTERS OF SUPPORT

EXHIBIT 15-B



United States Department of the Interior

U.S. GEOLOGICAL SURVEY
California Water Science Center
6000 J Street, Placer Hall
Sacramento, CA 95819

February 26, 2015

Mr. David Murillo, Regional Director
Bureau of Reclamation, DOI
Mid-Pacific Regional Office, Attn: MP-700
2800 Cottage Way
Sacramento, CA 95825

Dear Mr. Murillo,

This letter of interest is to express the USGS California Water Science Center's (CAWSC) desire to participate with the Bureau of Reclamation (Reclamation) and local partner agencies on the proposed Salinas and Carmel River Basins Study. As discussed at the February 20th meeting between our respective staff, CAWSC has a number of scientific projects and programs underway that could support the proposed basin study. The following paragraphs describe this ongoing work and possible future scientific study in the groundwater and climate change areas with potential benefit to the proposed basin study.

Groundwater Analyses:

In partnership with the California Water Resources Control Board, the USGS periodically assesses the groundwater quality in the Monterey Bay and Salinas Valley groundwater basins pursuant to the Groundwater Ambient Monitoring and Assessment (GAMA) Program's Priority Basin Project. This project focuses on drinking water quality. A number of reports have been published. The latest report, published in 2013 (web link: <http://pubs.usgs.gov/fs/2011/3089/>), concluded that nitrate is the constituent that most frequently exists at high concentrations in the primary aquifers.

It is our understanding from the Salinas-Carmel Basin Study Proposal submitted in 2014 that work is underway to develop a linked surface-groundwater model for the Carmel Basin using the USGS GSFLOW model. In addition, Brown and Caldwell consultants are working with the County of Monterey Resource Management Agency (with oversight by the Monterey County Water Resources Agency) on a comprehensive water resource assessment of Zone 2C of the Salinas River Groundwater Basin. Part of this assessment will be the development of an integrated hydrologic model. The CAWSC has developed and applied integrated surface-groundwater models for many coastal basins in California. Subject to funding availability, CAWSC staff are available to perform or assist with surface-groundwater modeling to assess impacts to groundwater supply under various land-use and climate change future scenarios and or code development or enhancement to better simulate the features of these systems (including reservoir operations). We could also assist with assessing potential seawater intrusion including computer simulations and geophysical mapping.

EXHIBIT 15-B

Climate Change Modeling:

The CAWSC has ongoing projects that assess the impact of climate change, population growth and land use change on future hydrology throughout the state. In order to evaluate the impact of climate change on hydrology, a number of future climate scenarios are developed from global climate models, such as CMIP5 (Coupled Model Intercomparison Project Phase 5), and then downscaled to 270-m resolution. This resolution allows for detailed modeling at the watershed level. An anticipated future product for California's 4th Climate Change Assessment is the spatial downscaling of daily projections that have been statistically downscaled to preserve extremes using the LOCA methodology. Subject to funding availability, CAWSC staff could develop hydrology associated with a number of climate future scenarios for the Salinas and Carmel basins.

The science support the CAWSC can provide to the Salinas and Carmel Basins Study could help Reclamation and its local partners quantitatively consider the impact of climate change and socio-economic factors on surface and groundwater resources and on water demands. We look forward to potentially working with Reclamation and the local partner agencies on this basin study to quantitatively assess the risks associated with climate change, population growth and land use changes on the eight Secure Water Act resource categories—water delivery, hydropower, recreation, flood control management, fish and wildlife habitat, endangered species, water quality and flow- and water-dependent ecological resiliency.

Sincerely,

A handwritten signature in blue ink, appearing to read "Eric Reichard".

Eric Reichard,
Director, USGS California Water Science Center

STATE CAPITOL
P.O. BOX 942849
SACRAMENTO, CA 94249-0035
(916) 319-2035
FAX (916) 319-2135

DISTRICT OFFICE
1150 OSOS STREET SUITE 207
SAN LUIS OBISPO, CA 93401
(805) 549-3381
FAX (805) 549-3400

EXHIBIT 15-B
Assembly
California Legislature



KATCHO ACHADJIAN
ASSEMBLYMEMBER, THIRTY-FIFTH DISTRICT

COMMITTEES
VICE CHAIR: TRANSPORTATION
BANKING AND FINANCE
GOVERNMENTAL ORGANIZATION
UTILITIES AND COMMERCE

JOINT COMMITTEES
FAIRS, ALLOCATION AND
CLASSIFICATION
FISHERIES AND AQUACULTURES
LEGISLATIVE AUDIT

April 27, 2015

Attn: David Murillo, Regional Director
U.S. Department of the Interior, Bureau of Reclamation
Mid-Pacific Regional Office, Federal Office Building
2800 Cottage Way
Sacramento, CA 95825-1898

**Subject: Monterey County Water Resources Agency & San Luis Obispo County Joint Proposal for USBR
WaterSMART Salinas and Carmel River Basins Study**

Dear Sir:

Thank you for the opportunity to submit a letter of support on behalf of the joint proposal for a U.S. Department of the Interior Bureau of Reclamation (USBR) 2015 WaterSMART Basin Study for the Salinas and Carmel River Basins, with the Paso Robles Groundwater Basin as a sub-basin. This letter comes at a critical time when the "perfect storm" of drought, long-term groundwater level declines and water demand increases have elevated the need of rural residents and agricultural users who depend on these Basins.

Most areas within these basins have recently felt the direct and indirect impacts of changing environmental conditions on water supplies, hydropower, fish and wildlife habitats, water quality and implementing flood control policies. Your agency's assistance in understanding and quantifying the Salinas and Carmel River Basins over the long-term, including climate change considerations, would greatly contribute to and enhance our efforts of evaluating the feasibility of stabilizing the basins and mitigating flood hazards. The proposal is also submitted by the Monterey Peninsula Water Management District and the Monterey Regional Water Pollution Control Agency and will include areas within the service boundaries of each agency.

The Basin Study would assist the non-federal partners in collaborating with the Bureau to analyze the potential impacts of climate change to water supplies and demands; identify a broad spectrum of adaption strategies; identify funding opportunities for future projects; facilitate communication and collaboration between partner agencies and the Bureau of Reclamation, and utilize other basin study reports or documents to directly benefit the "in-kind" contributions of the partner agencies.

I am certain you will find the scope of work outlined in the WaterSMART Basin Study Proposal for the Salinas and Carmel River Basins are consistent with the USBR's goals associated with ensuring the people of California have access to clean, safe and reliable drinking water now and into the future. A Basin Study from the USBR will assist all who utilize the Salinas and Carmel River Basins in both Monterey and San Luis Obispo Counties.

Sincerely,

A handwritten signature in blue ink, appearing to read "K. Achadjian".

Khatchik H. "Katcho" Achadjian
35th Assembly District

EXHIBIT 15-B



April 28, 2015

Attn: David Murillo, Regional Director
U.S. Department of the Interior, Bureau of Reclamation
Mid-Pacific Regional Office, Federal Office Building
2800 Cottage Way
Sacramento, CA 95825-1898

Re: **Monterey County Water Resources Agency & San Luis Obispo County Joint Proposal for USBR WaterSMART Salinas and Carmel River Basins Study**

Dear Sir:

PRAAGS is a local organization of rural residents, farmers, ranchers and landowners pursuing the creation of a local water district covering the Paso Robles Groundwater Basin. We feel that local folks with interest in the health of a declining groundwater basin are in the best position to manage our water resource. The relationship between groundwater and surface water resources are closely tied together.

We encourage and support the joint proposal for a U.S. Department of the Interior Bureau of Reclamation (USBR) 2014 WaterSMART Basin Study for the Salinas and Carmel River Basins, with the Paso Robles Groundwater Basin as a sub-basin.

As with many areas in the State of California, the Paso Robles Groundwater Basin is in decline and our efforts to properly manage the basin can only be enhanced by your efforts to help analyze potential impacts of changing weather patterns, study of supply and demands on our water resources, and develop strategies for stabilizing our basin. Collaboration and funding are also key components for success.

Again, we encourage your efforts and look forward to your assistance in managing our important water resources.

Regards,

Jerry Reaugh
Viticulturist
Chairman PRAAGS
Paso Robles Agricultural Alliance for
Groundwater Solutions

PRO Water Equity, Inc.

Paso Robles Groundwater Basin Overliers for Water Equity

www.prowaterequity.org
info.prowaterequity@gmail.com
www.facebook.com/ProWaterEquity
P.O. Box 255, Templeton, CA 93465

April 18, 2015

Attn: David Murillo, Regional Director
U.S. Department of the Interior, Bureau of Reclamation
Mid-Pacific Regional Office, Federal Office Building
2800 Cottage Way
Sacramento, CA 95825-1898

Subject: Monterey County Water Resources Agency & San Luis Obispo County Joint Proposal for USBR WaterSMART Salinas and Carmel River Basins Study

Dear Sir:

In a letter dated February 13, 2014, PRO Water Equity indicated our support of the joint proposal for a U.S. Department of the Interior Bureau of Reclamation (USBR) 2014 WaterSMART Basin Study for the Salinas and Carmel River Basins, with the Paso Robles Groundwater Basin as a sub-basin. We are hereby reiterating our support for this proposal.

We are continuing through a critical time when the “perfect storm” of drought, long-term groundwater level declines and water demand increases have elevated the needs of rural residents and agricultural users who depend on these basins.

Most areas within these basins have recently felt the direct and indirect impacts of changing environmental conditions on water supplies, hydropower, fish and wildlife habitats, water quality and implementing flood control policies. Your agency’s assistance in understanding and quantifying the Salinas and Carmel River Basins over the long-term, including climate change considerations, would greatly contribute to and enhance our efforts to evaluate the feasibility of stabilizing the basins and mitigating flood hazards. The proposal is also submitted by the Monterey Peninsula Water Management District and the Monterey Regional Water Pollution Control Agency and will include areas within the service boundaries of each agency.

The Basin Study would assist the non-federal partners in collaborating with the Bureau to:

- Analyze the potential impacts of climate change to water supplies and demands
- Identify a broad spectrum of adaptation strategies
- Identify funding opportunities for future projects
- Facilitate communication and collaboration between partner agencies and the Bureau of Reclamation
- Utilize other basin study reports or documents to directly benefit the “in-kind” contributions of the partner agencies

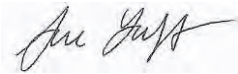
Mission Statement: To promote the health, safety, common good and general welfare of the community by advocating for the stabilization and sustainability of the Paso Robles groundwater basin for the benefit of all overliers.

EXHIBIT 15-B

Page 2

I am certain you will find the scope of work outlined in the WaterSMART Basin Study Proposal for the Salinas and Carmel River Basins is consistent with the USBR's goals associated with ensuring the people of California have access to clean, safe and reliable drinking water now and into the future. A Basin Study from the USBR will assist all who utilize the Salinas and Carmel River Basins in both Monterey and San Luis Obispo Counties.

Sincerely,

A handwritten signature in black ink, appearing to read "Sue Luft", is placed over a light gray rectangular background.

Sue Luft
President

California State Senate

STATE CAPITOL
SACRAMENTO, CA 95814
(916) 651-4017

SENATOR
BILL MONNING
SEVENTEENTH SENATE DISTRICT



April 27, 2015

David Murrillo, Regional Director
Mid-Pacific Regional Office
Bureau of Reclamation
United States Department of the Interior
Federal Office Building
2800 Cottage Way
Sacramento, CA 95825-1898

Dear Director Murrillo:

This letter is to express my support for the San Luis Obispo County Public Works Department and Monterey County Resources Agency's joint application for a United States Department of the Interior Bureau of Reclamation 2015 WaterSMART Basin Study for the Salinas and Carmel River Basins, with the Paso Robles Groundwater Basin as a sub-basin.

The water demands on the Salinas and Carmel River Basins, along with the Paso Robles Basin, have rapidly increased due to the growth in the use of water by rural residents and the agricultural industry. These water demands have created long-term groundwater declines that are being exacerbated by the drought in California.

A 2015 WaterSMART Basin Study would provide a better understanding of the direct and indirect impact of groundwater decline on hydropower, fish and wildlife habitats. Additionally, the Study will allow stakeholders to identify future water management strategies, as well as future projects that may be needed, and I ask that you give all due consideration to the San Luis Obispo County Public Works Department and Monterey County Resources Agency's joint application for a 2015 WaterSMART Basin Study.

Thank you for your time.

Sincerely,

A handwritten signature in black ink, appearing to read "William W. Monning".

WILLIAM W. MONNING
Senator, 17th District

WWM:kb

SENATE CAPITOL OFFICE
STATE CAPITOL, ROOM 4066
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MONTEREY DISTRICT OFFICE
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SAN LUIS OBISPO, CA 93401
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GILROY DISTRICT OFFICE
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SANTA CRUZ DISTRICT OFFICE
701 OCEAN STREET, SUITE 318-A
SANTA CRUZ, CA 95060
PHONE: (831) 425-0401

WEB: <http://sd17.senate.ca.gov/>

EXHIBIT B
Carmel Valley Association
P.O. Box 157, Carmel Valley, California 93924
www.carmelvalleyassociation.org



Board of Directors April 24, 2015

Priscilla Walton
President
Michelle H. Denning, Regional Planning Officer
U.S. Dept. of the Interior
Bureau of Reclamation
Rich Fox
Vice President
Mid-Pacific Regional Office
2800 Cottage Way
Sandy Schachter
Secretary
Sacramento, CA 95825-1898

Stephen Brabeck
Treasurer
Subject: Letter of Support for the Salinas and Carmel River Basins Study

Mibs McCarthy
President Emerita

Luana Conley

Frank Hennessy

Karin
Strasser Kauffman

Donna Kneeland

Marlene Martin

Margaret Robbins

Eric Sand

Tim Sanders

Dick Stott

Lisa Taylor

Dear Ms. Denning,

The Carmel Valley Association (CVA) has a deep and abiding concern for the capacity and health of the Carmel River and the valley groundwater basin that collectively make up the hydrologic Carmel Valley basin. On behalf of the CVA, I would like to express our support for the Salinas and Carmel River Basins Study proposal. It is our understanding that the intent of this study is to evaluate the effects of global climate change and future changes in population and land use on sustainable water supplies. This would include such factors as changing precipitation patterns, surface water runoff and basin recharge and sea level rise. Further, the basin study would develop appropriate adaptation strategies to close the gap between water supply and demand under the effects of climate change.

It is paramount that the Basin Study program reviews all of the water resources in each basin to help determine the availability of water and to develop a better understanding of the potential solutions for the long term sustainability of these resources.

As the California drought has strengthened its grip on the State, we are encouraged by the collaborative effort of the partner entities for submitting this proposal. These partner entities include: Monterey County Water Resource Agency, San Luis Obispo County Public Works, Monterey Peninsula Water Management District and the Monterey Regional Water Pollution Control Agency.

The Basin study partner agencies and other stakeholders that represent various interests in the respective service areas are keenly aware of the need to balance water supplies and demands for the environment, municipal, industrial, and agriculture uses. The deliverables from the Basin Study would have contributions from these entities and would assist in developing robust strategies for future considerations.

“To preserve, protect and defend the natural beauty, resources, and rural character of Carmel Valley”

EXHIBIT 15-B

We strongly encourage the Bureau of Reclamation to consider funding this important Basin Study project. Please contact our Water Committee Chair, Roger Dolan, at r2dolan@gmail.com and/or 831-622-9016 if you have any questions or comments about our support of this proposal.

Sincerely,

A handwritten signature in cursive script that reads "Priscilla Walton".

Priscilla Walton
President, Carmel Valley Association

cc: Larry Hampson
Monterey Peninsula Water Management District

EXHIBIT 15-B



SAN LUIS OBISPO COUNTY FARM BUREAU

4875 MORABITO PLACE ♦ SAN LUIS OBISPO, CA 93401

PHONE (805) 543-3654 ♦ FAX (805) 543-3697 ♦ www.slofarmbureau.org

April 28, 2015

David G. Murillo, Regional Director
U.S. Dept. of the Interior
Bureau of Reclamation
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, CA 95825-1898

Re: Support for the Salinas/Carmel River Basins Study

Dear Director Murillo:

San Luis Obispo County Farm Bureau is pleased to be able to join the many supporters of the WaterSMART collaborative Salinas and Carmel River Basins Study, which includes the Paso Robles Groundwater Basin as a sub-basin and is being proposed by the U.S. Bureau of Reclamation.

This is a critical time for all stakeholders, especially agriculture in light of the continuing historic drought and water declines in the Salinas Groundwater Basin, the Salinas and Carmel River Basins Study area as well as the whole of California. We support the need to consider the effects of the possible impacts of climate change on our watersheds. We look for the Basin Study to create a fuller understanding of the Basins' resources, as well as the effects of climate change on water supplies, water quality and habitat. It is our hope that the study to fill vital data gaps and look for potential long term management strategies that will create sustainability for all entities dependent on the Basins.

San Luis Obispo County Farm Bureau looks forward to participating as a stakeholder in the program and believe that the Basin Study will help all stakeholders to develop long term solutions to the many basin issues in both Monterey and San Luis Obispo Counties.

Sincerely,

A handwritten signature in black ink, appearing to read 'L. J. [unclear]', written in a cursive style.

Legislative Analyst

Mission Statement:

“To lead San Luis Obispo County in the protection, promotion and advocacy of agriculture for the benefit of our members and community.”



EXHIBIT 15-B

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL OCEAN SERVICE
Monterey Bay National Marine Sanctuary
99 Pacific Street, Bldg 455a
Monterey, CA 93940

April 28, 2015

Michelle H. Denning, Regional Planning Officer
U.S. Dept. of the Interior
Bureau of Reclamation
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, CA 95825-1898

Subject: Letter of Support for the Salinas and Carmel River Basins Study

Dear Ms. Denning,

On behalf of Monterey Bay National Marine Sanctuary, I would like to express our support for the Salinas and Carmel River Basins Study proposal. It is our understanding that the intent of this study is to evaluate the effects of global climate change and future changes in population and land use on sustainable water supplies. This would include such factors as changing precipitation patterns, surface water runoff and basin recharge and sea level rise. Further, the basin study would develop appropriate adaptation strategies to close the gap between water supply and demand under the effects of climate change.

It is paramount that the Basin Study program reviews all of the water resources in each basin to help determine the availability of water and to develop a better understanding of the potential solutions for the long term sustainability of these resources.

As the California drought has strengthened its grip on the State, we are encouraged by the collaborative effort of the partner entities for submitting this proposal. These partner entities include: Monterey County Water Resource Agency, San Luis Obispo County Public Works, Monterey Peninsula Water Management District and the Monterey Regional Water Pollution Control Agency.

The Basin study partner agencies and other stakeholders that represent various interests in the respective service areas are keenly aware of the need to balance water supplies and demands for the environment, municipal, industrial, and agriculture uses. The deliverables from the Basin Study would have contributions from these entities and would assist in developing robust strategies for future considerations.

We strongly encourage the Bureau of Reclamation to consider funding this important Basin Study project. Please contact Bridget Hoover at (831) 647-4217 you have any questions or comments regarding our support of this proposal.

Sincerely,

Paul Michel
Superintendent

SOURCES OF HISTORICAL DATA AND REPORTS

Sources of Historical Data and Reports

Basin Study Areas	Sources of Data/Reports
CRB/SGB	1983 Analysis of the Carmel Valley Alluvial Groundwater Basin 2002 Carmel River Basin Water Availability Analysis 2004 Physical and Hydrologic Assessment of the Carmel River Watershed 2005 Seaside Groundwater Basin Update 2006 Carmel River Flood Insurance Study Coastal Flooding Analysis 2008 Coastal Regional Sediment Management Plan in Southern Monterey Bay 2012 Evaluation of Erosion Mitigation Alternatives for Southern Monterey Bay 2013 Carmel River Lagoon and Scenic Road Protection Feasibility Report 2014 Los Padres Dam Long Term Plan 2014 Seaside Groundwater Basin Salt and Nutrient Management Plan 2014 Canyon Del Rey Drainage Plan Update
PRGB	2002 Basin Study 2005 Basin Model Report 2009 Master Water Report 2009 Projected Future Climatic and Ecological Conditions in San Luis Obispo County 2010 Integrated Climate Change Adaptation Planning in San Luis Obispo County 2011 Resource Capacity Study 2012 Groundwater Management Plan 2014 Computer Model Update Report 2014 Watershed Repository 2015 Supply Options Study Technical Memorandums
SVB	2001 Salinas Valley Water Project Draft/Final EIR/EIS 2007 Monterey County General Plan 2013 Greater Monterey County Integrated Regional Water Management Plan 2013 Protective Elevations to Control Sea Water Intrusion in the Salinas Valley 2015 Salinas River Groundwater Basin Investigation

Appendix D

STATE AND FEDERAL COORDINATED
OPERATING AGREEMENT

SALINAS RESERVOIR
EXPANSION PROJECT

EXHIBIT 15-B

State/Federal COA:

Coordinated Operations Agreement (COA)

Background

The Agreement between the United States of America and the State of California for Coordinated Operation of the Central Valley Project and the State Water Project was authorized by PL 99-546 in 1986. It superseded a 1960 agreement and annual coordination agreements that

had been implemented since the SWP came on-line. The COA is both an operations agreement and a water rights settlement. Its history extends back to Reclamation protests of SWP water rights applications around 1960. The purpose of the COA is to ensure that the CVP and the SWP

each obtains its share of water from the Delta and bears its share of obligations to protect the other beneficial uses of water in the Delta and Sacramento Valley. Coordinated operation by agreed-on criteria can increase the efficiency of both the CVP and the SWP.

The CVP and SWP (collectively, the projects) use a common water supply in California's Central Valley. The projects have built water conservation and water delivery facilities in the Central Valley to deliver water supplies to affected water rights holders as well as project contractors. The projects' water rights are conditioned by the SWRCB to protect the beneficial uses of water within each respective project and jointly for the protection of beneficial uses in the

Sacramento Valley and Sacramento-San Joaquin Delta Estuary. The COA memorializes these facts and objectives into an agreement for which the projects can use the water resources for project purposes and meet the common beneficial uses in the Sacramento Valley and Sacramento-San Joaquin Delta Estuary.

In summary, the COA defines the project facilities and their water supplies, it sets forth procedures for coordination of operations, it identifies formulas for sharing joint responsibilities for meeting Delta standards and other legal uses of water, it identifies how unstored flow will be

shared, it sets up a framework for exchange of water and services between the SWP and CVP, and, finally, it provides for periodic review every 5 years.

The CVP and SWP use the Sacramento River and the Delta as common conveyance facilities. Reservoir releases and Delta exports must be coordinated to ensure that each project achieves its share of benefit from shared water supplies and bears its share of joint obligations to protect beneficial uses.

EXHIBIT 15-B

alternative indicates that the available natural runoff into the reservoir is more than adequate to justify the full expansion project from a hydrologic standpoint. However, the intermediate expansion project may be more economical, depending on project costs.

The reason that the expansion project is so effective in providing additional water supply yield is indicated by the results in Table 6-2. Under existing conditions, the simulated operation of the CITY's two reservoirs in a coordinated fashion would result in average reservoir spill of about 12,430 AF/YR and net evaporation loss of about 2350 AF/YR. The other uses, including Whale Rock entitlements by State agencies and downstream release requirements for both reservoirs, are not altered by the expansion project. For the assumed proposed condition (maximum expansion), the average spill quantity is reduced to about 10,150 AF/YR while the net evaporation loss is increased to about 3110 AF/YR. The differences between the existing and proposed conditions reveal that reservoir spills are reduced by almost 2,300 AG/YR because of the additional storage capacity available to capture water during high flow periods. However, the net evaporation losses increase by about 760 AF/YR due to higher reservoir levels (i.e., greater surface area). Nevertheless, by capturing and later using a significant amount of water that would otherwise spill, the capability of the CITY's water supply system can be greatly enhanced by expansion of Salinas Reservoir.

newch6.rpt/ros