

Models Supporting the:

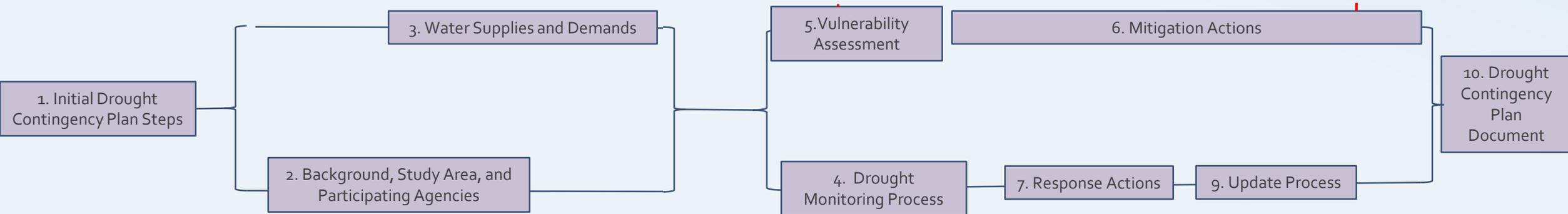
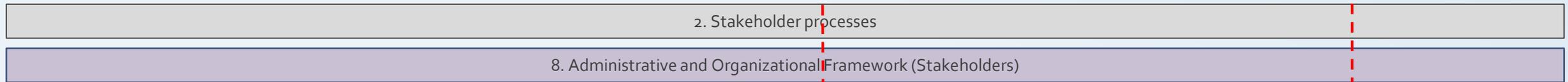
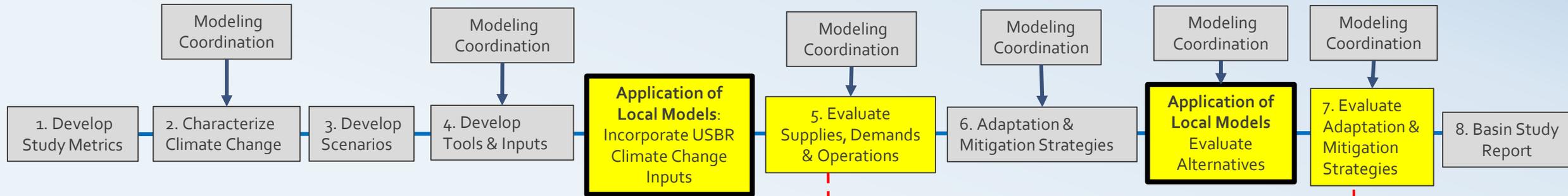
- **Salinas and Carmel River Basins Study**
- **North Monterey County Drought Contingency Plan**

Integration of local models into the DCP & Basin Study

- Early discussions lead to the decision not to create a new single model covering all the basins
 - Decided to apply existing or currently developing models
 - Develop a climate change model for the study area
 - Incorporate climate change model results into local models
- Key roles of local models :
 - Determine the future conditions and needs based on new climate input
 - Evaluate performance of potential mitigation projects to address needs
- Model applications
 - Integrated into the plans of study for both DCP & the Basin Study
 - Coordination and scheduling of analyses will be critical path items for completion of the two studies

Role of Local Models in the Studies

Salinas and Carmel Rivers Basins Study



North Monterey County Drought Contingency Plan

The Basin Study area will be modeled as four sub-areas:

- Salinas Valley Groundwater Basin (SVB)
- Paso Robles Groundwater Basin (PRB)
- Carmel River Basin (CRB)
- Seaside Groundwater Basin (SGB)

North Monterey County Water

Total Water Management

Evaluating Options for a Reliable Water Future

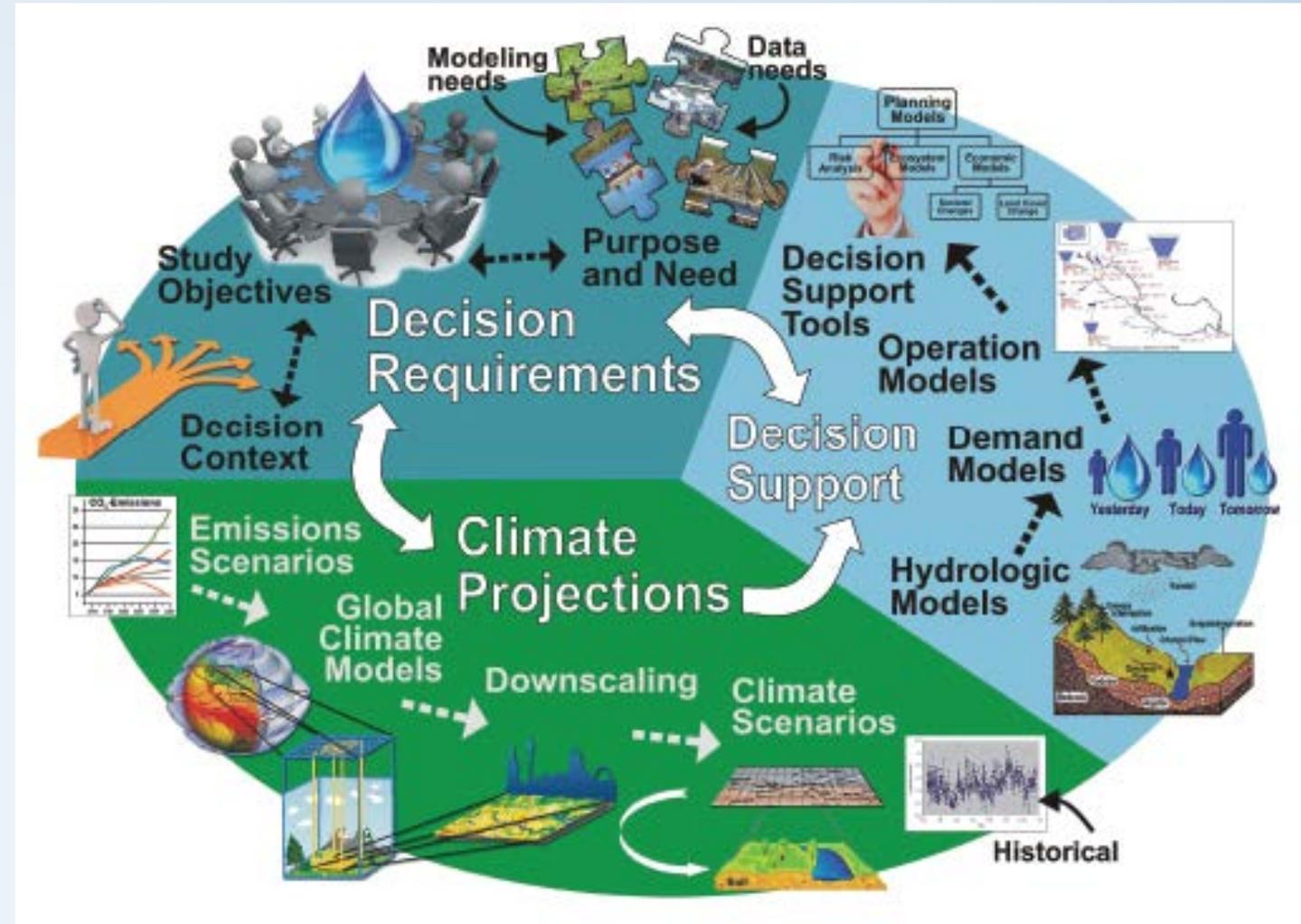
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Overview of Models

Climate Projections & Scenarios

- Reclamation Project Manager: Ian Ferguson
- USGS Project Manager: Randy Hanson
- Climate projection team: Includes staff from Reclamation's Technical Service Center and USGS California Water Science Center.



Local Models Addressed

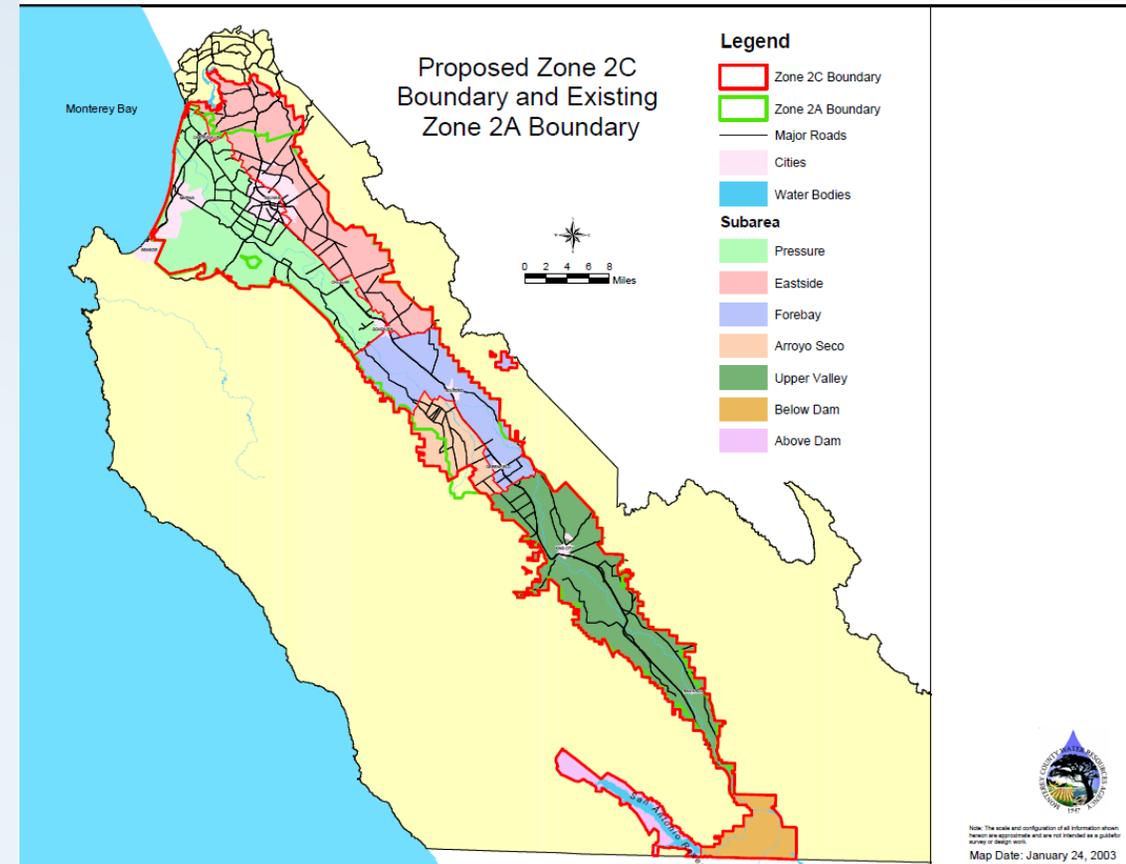
- Salinas Valley Groundwater Basin (SVB)
- Paso Robles Groundwater Basin (PRB)
- Carmel River Basin (CRB)
- Seaside Groundwater Basin (SGB)
- Monterey Peninsula Watershed (MPW)
 - Covers the area between the SVB and CRB sub-area model domains.
 - This small area will be modeled by USGS (Randy Hanson's team) by extending the BCM and/or HSPF watershed models developed for SVB.

The Salinas Valley Integrated Hydrologic Model (SVIHM)

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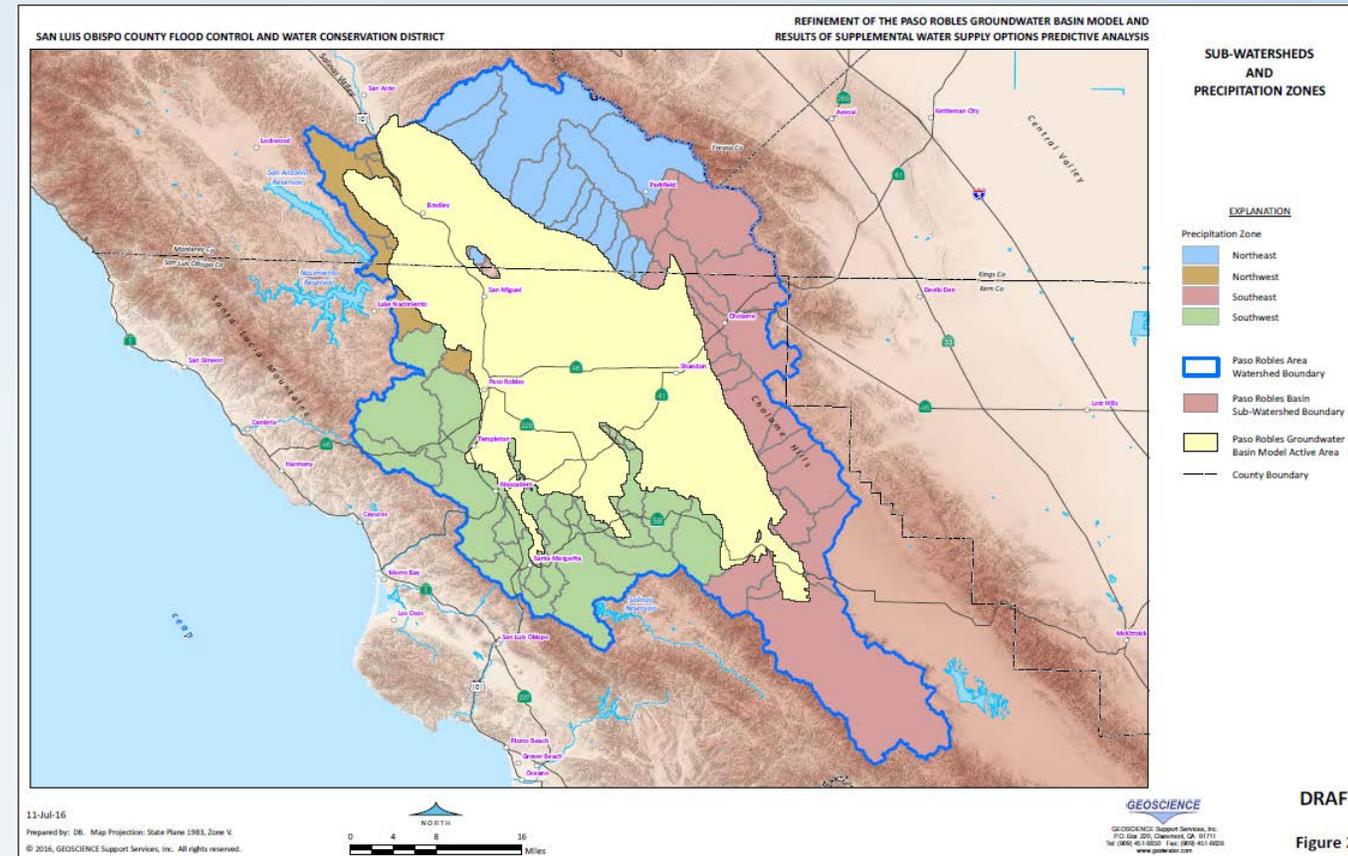
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- MCWRA/Monterey County Project Manager: Howard Franklin
- USGS Project Manager: Randy Hanson
- SVGB model development model team: Includes staff from MCWRA and USGS USGS staff includes Randy Hanson, Scott Boyce, Wes Henson, Joe Hevesi, Don Sweetkind, Lorrie Flint, Alan Flint, Andre Ritchie, and Amy Galanter



Paso Robles Groundwater Model:

- PRGB Model Project Managers: Scott Duffield and Courtney Howard
- This model is already completed and calibrated and has been used to run supply options
- PRGB model team: For water Smart Project the USGS will probably be running this model and performing analysis



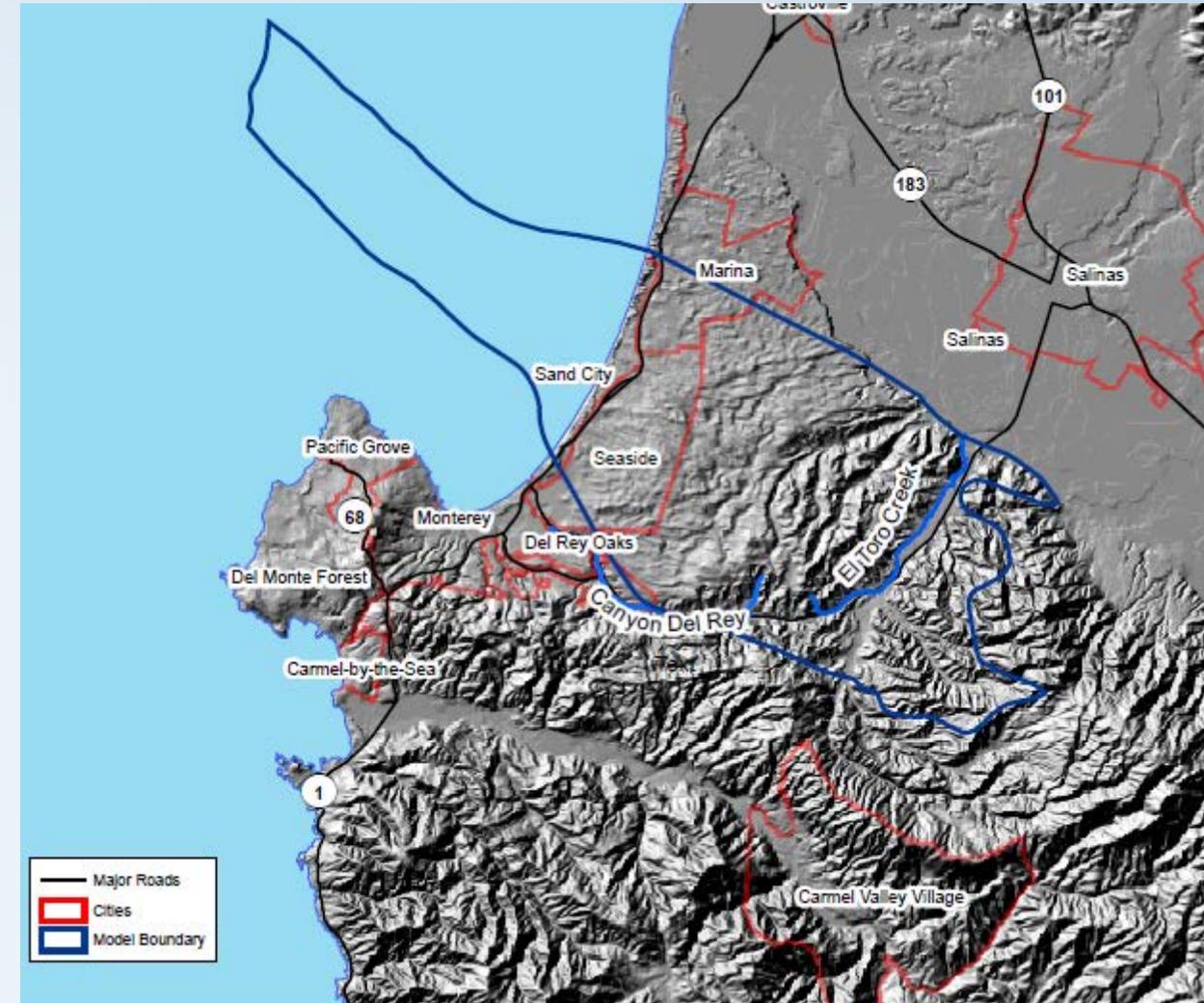
Carmel River Basin Hydrological Model:

- MPWMD Project Manager: Thomas Christensen
- CRB model development team: Jon Lear (MPWMD), Rich Niswonger (USGS), Michael Hutnak (Right On Q, Inc.), Justin Huntington (Huntington Hydrologic).
- MPWMD to carry out scenario runs and provide output for use in Water Smart Project.
- MPWMD may contract with USGS to expand the model



Seaside Groundwater Basin Model:

- MPWMD Project Manager: Jon Lear
- This model is already complete
- Additional updates and changes may be needed to use it for the Water Smart Project
- USGS likely to run model and perform analysis



North Monterey County Water

Total Water Management

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Discussion of Federal and Local Agency Roles in Basin Study

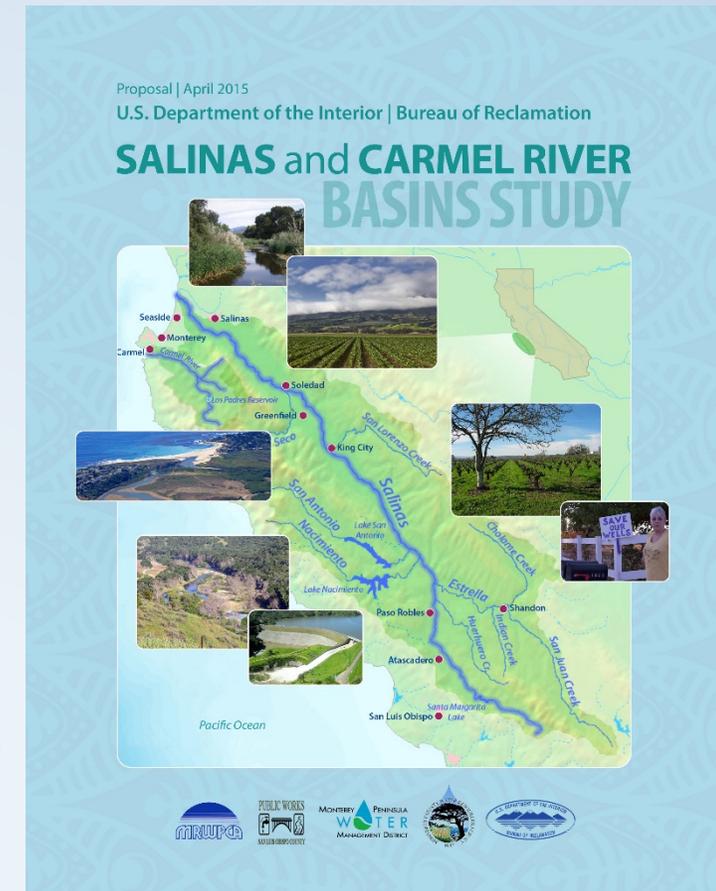
Approach to models and relative responsibilities

Reclamation and USGS have developed an approach & assumed responsibilities for performing analysis to support on the Basin Study and DCP

- Preliminary assumptions for discussion only
- Reconcile with Basin Study grant application
- Local agencies will need to work internally to confirm
- Decisions and confirmation of roles at a later meeting

Basins Study Proposal/Grant Application

- Originally submitted 2014, resubmitted in 2015 with significant input by USBR & USGS
- Major objectives: 1) improved regional collaboration, 2) ID risk of climate change, 3) develop strategies to fill gaps in supply.
- Partners bringing to the table:
 - Significant amount of past studies, data on supply/demand
 - Existing models and tools to use for evaluations
 - Well established stakeholder groups and processes (IRWM)
 - In kind contribution of past studies, models and staff time for regional collaboration and stakeholder outreach



What was in the 2015 Grant Application?

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, SLIC; includes costs since May 2014

2. USBR, USGS

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

- Partner Staff Resources = \$441,000 + 30,000 model runs for a total “new share” of \$471,000.
- Rest of partner share is in past or ongoing studies and modeling efforts.
- Partner share for Tasks 2, 3, 4, 5 and 6 largely based on past work (Total for tasks 2-6 = \$730,000)
- “Total Applicable Resources” = \$3,195,000

Appendix A

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)	• Protective Elevations to Control Sea Water Intrusion in the Salinas Valley, November 2013	\$120,000	• 2013 Groundwater Extraction Summary, September 2014	\$85,000
	• 2012 Groundwater Extraction Summary, September 2013	\$84,000	• Seawater Intrusion Maps 2014	\$90,000
	• State of the Salinas River Groundwater Basin Report, January 2015	\$103,000	• Integrated Groundwater Surface Water Model (to be completed early 2016)	\$671,000
	• Groundwater Level Contour Maps, 2013	\$90,000	• Basin Study Plan Match (Staff resources)	\$100,000
Monterey Peninsula Water Management District (MPWMD)	• SGB Salt and Nutrient Management Plan (2014)	\$60,000	• 2014 Update to IRWM Plan (2014)	\$156,000
	• Canyon Del Rey Drainage Plan Update (2014)	\$250,000	• CRB Surface-Groundwater Model (GSFLOW) (2014)	\$125,000
	• Los Padres Dam and Reservoir Acquisition: Long-Term Strategic and Short-Term Tactical Plan (2014)	\$146,000	• Los Padres Dam Long-Term Plan Project (2015-16-17)	\$500,000
			• Complete Instream Flow Incremental Method Study (IFIM) Study, 2017	up to \$250,000
			• Carmel River Basin Surface-Groundwater Model (GSFLOW) (2015)	\$50,000
			• Basin Study Plan Match (Staff resources)	\$45,000
Monterey Regional Water Pollution Control Agency (MRWPCA)	• Pure Water Monterey Groundwater Replenishment Project (GWR) studies: - WaterSMART Feasibility Study - SGB Modeling - Indirect Potable Reuse - Agricultural Reuse - Seaside Basin Groundwater Flow Model	\$1,960,000	• Basin Study Plan Match (Staff resources)	\$120,000
San Luis Obispo County Public Works Department (SLOCPWD)	• Groundwater/Watershed Model Update and Mitigation Strategies Analysis, pre-April 2014	\$357,000	• Groundwater/Watershed Model Update and Mitigation Strategies Analysis, post-April 30, 2014	\$129,000
			• Water Supply Options Study	\$657,000
			• Basin Study Plan Match (Staff resources) - Model Runs	\$176,000 \$30,000
Total	• Past Studies (not included in cost share)	\$3,070,000	• Applicable Studies/Staff Resources	\$3,195,000

Grant Application Cost by Task

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

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/discharge 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	

Reclamation Initial Allocation of Roles and Responsibilities

- Discussion of tasks
 - Brief overview to initiate the discussion
 - Not intending to make final decisions today
 - Each agency will need to review and discuss internally
 - Follow-up meetings/webmeetings as needed to resolve
- Task breakdown in the POS
 - Differs somewhat from the task breakdown in the original proposal
 - The revised task breakdown provides for better definition of technical tasks/sub-tasks and corresponding roles/responsibilities

Task from Basin Study Plan of Study

Tasks

1. Develop Study Metrics
2. Characterize Climate Change and SLR
3. Develop Study Scenarios
4. Develop Modeling Tools and Inputs
5. Evaluate Supplies, Demands and Operations
6. Develop Mitigation/Adaptation Strategies
7. Evaluate Mitigation/Adaptation Strategies
8. Final Study Report and Executive Summary

See handout of tasks to follow slides

Task 1 Develop Study Metrics

Task	Reclamation	USGS	MPWMD	MCWRA	SLOCPWD	MRWPCA
1. Develop Study Metrics						
1(a) Develop Climate Metrics	• Co-lead	• Co-lead	• Support / Review	• Support / Review	• Support / Review	• TBD??
1(b) Develop Supply Metrics	• Coordinate / Support	• Limited Support / Review	• Co-lead (MP, CRB)	• Co-lead (SVB)	• Co-lead (PRB)	• TBD??
1(c) Develop Demand Metrics	• Coordinate / Support	• Limited Support / Review	• Co-lead (MP, CRB)	• Co-lead (SVB)	• Co-lead (PRB)	• TBD??
1(d) Develop Operations Metrics	• Coordinate / Support	• Limited Support / Review	• Co-lead (MP, CRB)	• Co-lead (SVB)	• Co-lead (PRB)	• TBD??
1(e) Task 1 Tech Memo	• Lead	• Review	• Review	• Review	• Review	• Review

Legend

Green: Task/subtask funded by partner (partner cost share)

Blue Task/Subtask by Reclamation (Federal costs share)

Brown: Not applicable (No cost)

Task 2. Characterize Climate Change and SLR

Task	Reclamation	USGS	MPWMD	MCWRA	SLOCPWD	MRWPCA
2(a) Compile Climate Data – Observed Climate	• Lead	• Limited support (provide available data)	• Provide available data			
2(b) Compile Climate – Global Projections	• Lead	• Review	• N/A	• N/A	• N/A	• N/A
2(c) Compile Climate – Downscaled Proj.	• Lead	• Review	• N/A	• N/A	• N/A	• N/A
2(d) Characterize Current Climate	• Lead	• Review	• N/A	• N/A	• N/A	• N/A
2(e) Characterize Climate Trends – Observed	• Lead	• Support / Review	• N/A	• N/A	• N/A	• N/A
2(f) Characterize Climate Trends – Projected	• Lead	• Support / Review	• N/A	• N/A	• N/A	• N/A
2(g) Compile Sea Level Data – Observed Climate	• Lead	• Review	• N/A	• N/A	• N/A	• N/A
2(h) Compile Sea Level – Global Projections	• Lead	• Limited support (identify data/method options)	• N/A	• N/A	• N/A	• N/A
2(i) Compile Sea Level – Downscaled Proj.	• Lead	• Limited support (identify data/method options)	• N/A	• N/A	• N/A	• N/A
2(j) Characterize Current Sea Level	• Lead	• Review	• N/A	• N/A	• N/A	• N/A
2(k) Characterize Sea Level Trends – Observed	• Lead	• Support / Review	• N/A	• N/A	• N/A	• N/A
2(l) Characterize Sea Level Trends – Projected	• Lead	• Support / Review	• N/A	• N/A	• N/A	• N/A
2(m) Task 2 Tech Memo	• Lead	• Review	• Review	• Review	• Review	• Review

Task 3 Develop Study Scenarios

Task	Reclamation	USGS	MPWMD	MCWRA	SLOCPWD	MRWPCA
3(a) Develop Climate Scenarios	<ul style="list-style-type: none"> • Lead 	<ul style="list-style-type: none"> • Review 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A
3(b) Develop Sea Level Scenarios	<ul style="list-style-type: none"> • Lead 	<ul style="list-style-type: none"> • Review 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A 	<ul style="list-style-type: none"> • N/A
3(c) Develop Socioeconomic Scenarios	<ul style="list-style-type: none"> • Coordinate 	<ul style="list-style-type: none"> • Review 	<ul style="list-style-type: none"> • Co-lead (MP, CRB) 	<ul style="list-style-type: none"> • Co-lead (SVB) 	<ul style="list-style-type: none"> • Co-lead (PRB) 	<ul style="list-style-type: none"> • TBD??
3(d) Task 3 Tech Memo	<ul style="list-style-type: none"> • Lead – outline/template • Lead – climate • Lead – sea level • Review – socio/econ 	<ul style="list-style-type: none"> • Review 	<ul style="list-style-type: none"> • Review – climate • Review – sea level • Co-lead – socio/econ (MP, CRB) 	<ul style="list-style-type: none"> • Review – climate • Review – sea level • Co-lead – socio/econ (SVB) 	<ul style="list-style-type: none"> • Review – climate • Review – sea level • Co-lead – socio/econ (PRB) 	<ul style="list-style-type: none"> • Review – climate • Review – sea level • Review – socio/econ

Task 4 Develop Modeling and Inputs - 1

Task	Reclamation	USGS	MPWMD	MCWRA	SLOCPWD	MRWPCA
4(a) Develop modeling tools	<ul style="list-style-type: none"> Coordinate / Support 	<ul style="list-style-type: none"> Co-lead (Under contract with study partners) 	<ul style="list-style-type: none"> Co-lead (MP, CRB) Develop modeling tools Calibrate / verify modeling tools 	<ul style="list-style-type: none"> Co-lead (SVB) Develop modeling tools Calibrate / verify modeling tools 	<ul style="list-style-type: none"> Co-lead (PRB) Develop modeling tools Calibrate / verify modeling tools 	<ul style="list-style-type: none"> TBD??
4(b) Develop model inputs – baseline	<ul style="list-style-type: none"> Coordinate / Support 	<ul style="list-style-type: none"> Co-lead (Under contract with study partners) 	<ul style="list-style-type: none"> Co-lead (MP, CRB) Develop baseline climate inputs (historical) Develop baseline socio/econ inputs (current) 	<ul style="list-style-type: none"> Co-lead (SVB) Develop baseline climate inputs (historical) Develop baseline socio/econ inputs (current) 	<ul style="list-style-type: none"> Co-lead (PRB) Develop baseline climate inputs (historical) Develop baseline socio/econ inputs (current) 	<ul style="list-style-type: none"> TBD??
4(c) Develop model inputs – future climate	<ul style="list-style-type: none"> Support – provide climate scenarios, collaborate on method to develop future climate inputs from scenarios 	<ul style="list-style-type: none"> Lead – develop future climate inputs (Under contract with study partners) 	<ul style="list-style-type: none"> Support (MP, CRB) (Provide data/methods used to develop baseline climate inputs) 	<ul style="list-style-type: none"> Support (SVB) (Provide data/methods used to develop baseline climate inputs) 	<ul style="list-style-type: none"> Support (PRB) (Provide data/methods used to develop baseline climate inputs) 	<ul style="list-style-type: none"> TBD??
4(d) Develop model inputs – future sea level	<ul style="list-style-type: none"> Support – provide sea level scenarios, collaborate on method to develop future climate inputs from scenarios 	<ul style="list-style-type: none"> Lead – develop future sea level inputs (Under contract with study partners) 	<ul style="list-style-type: none"> Support (MP, CRB) (Provide data/methods used to develop baseline sea level inputs) 	<ul style="list-style-type: none"> Support (SVB) (Provide data/methods used to develop baseline sea level inputs) 	<ul style="list-style-type: none"> Support (PRB) (Provide data/methods used to develop baseline sea level inputs) 	<ul style="list-style-type: none"> TBD??
4(e) Develop model inputs – future socio/econ	<ul style="list-style-type: none"> Coordinate / Support / Review 	<ul style="list-style-type: none"> Limited Support / Review 	<ul style="list-style-type: none"> Co-lead(MP, CRB) (Develop socio/econ inputs for future scenarios) 	<ul style="list-style-type: none"> Co-lead (SVB) (Develop socio/econ inputs for future scenarios) 	<ul style="list-style-type: none"> Co-lead (PRB) (Develop socio/econ inputs for future scenarios) 	<ul style="list-style-type: none"> TBD??
4(f) Task 4 Tech Memo	<ul style="list-style-type: none"> Lead – outline/template Review – model development Co-Lead – climate inputs Co-Lead – sea level inputs Review – socio/econ inputs 	<ul style="list-style-type: none"> Co-Lead – model development (MP, CRB, SVB) Co-Lead – climate inputs Co-Lead – sea level inputs Review – socio/econ inputs 	<ul style="list-style-type: none"> Review – climate inputs Review – sea level inputs Co-Lead – socio/econ inputs (MP, CRB) 	<ul style="list-style-type: none"> Review – climate inputs Review – sea level inputs Co-Lead – socio/econ inputs (SVB) 	<ul style="list-style-type: none"> Review – climate inputs Review – sea level inputs Lead – socio/econ inputs (PRB) 	<ul style="list-style-type: none"> Review – climate Review – sea level inputs Review – socio/econ

Task 5 Evaluate Supplies, Demands, and Operations

Task	Reclamation	USGS	MPWMD	MCWRA	SLOCPWD	MRWPCA
5(a) Simulate Baseline Conditions	<ul style="list-style-type: none"> Coordinate / Support 	<ul style="list-style-type: none"> Lead – carry out simulations of baseline conditions using models and inputs developed in Task 4 (Under contract with study partners) 	<ul style="list-style-type: none"> Support 	<ul style="list-style-type: none"> Support 	<ul style="list-style-type: none"> Support 	<ul style="list-style-type: none"> TBD??
5(b) Simulate Future Conditions	<ul style="list-style-type: none"> Coordinate / Support 	<ul style="list-style-type: none"> Lead – carry out simulations of future conditions under future climate, socioeconomic, and sea level scenarios using models and inputs developed in Task 4 (Under contract with study partners) 	<ul style="list-style-type: none"> Support 	<ul style="list-style-type: none"> Support 	<ul style="list-style-type: none"> Support 	<ul style="list-style-type: none"> TBD??
5(c) Compute study metrics	<ul style="list-style-type: none"> Lead Compute study metrics – historical (Study metrics computed from observations) Compute study metrics – baseline + scenarios (Study metrics computed from relevant model simulations carried out under Task 5(a-b)) 	<ul style="list-style-type: none"> Support – post-processed model results for baseline and future simulations Review 	<ul style="list-style-type: none"> Support – provide historical data to compute metrics Review 	<ul style="list-style-type: none"> Support – provide historical data to compute metrics Review 	<ul style="list-style-type: none"> Support – provide historical data to compute metrics Review 	<ul style="list-style-type: none"> TBD??
5(d) Evaluate/Characterize Historical Conditions	<ul style="list-style-type: none"> Lead Evaluate / characterize historical water supplies, demands, and operations based on study metrics 	<ul style="list-style-type: none"> Support – develop / review approach to evaluating / characterizing historical conditions Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> TBD??
5(e) Evaluate/Characterize Baseline Conditions (without adaptation/mitigation)	<ul style="list-style-type: none"> Lead Evaluate / characterize baseline water supplies, demands, and operations based on study metrics (metrics computed from Task 4 baseline simulations) 	<ul style="list-style-type: none"> Support – develop / review approach to evaluating / characterizing baseline conditions Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> TBD??
5(f) Evaluate/Characterize Future Conditions (without adaptation/mitigation)	<ul style="list-style-type: none"> Lead Evaluate / characterize future water supplies, demands, and operations based on study metrics (metrics computed from Task 4 scenario simulations) 	<ul style="list-style-type: none"> Support – develop / review approach to evaluating / characterizing future conditions Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> TBD??
5(g) Evaluate/Characterize Projected Change (without adaptation/mitigation)	<ul style="list-style-type: none"> Lead – Compare baseline vs. historical (transient vs. current socioecon / management) Lead – Compare future vs. baseline (effects of climate change) 	<ul style="list-style-type: none"> Support – develop / review comparison methods Review 	<ul style="list-style-type: none"> Review 	<ul style="list-style-type: none"> Review 	<ul style="list-style-type: none"> Review 	<ul style="list-style-type: none"> TBD??
5(h) Task 5 Tech Memo	<ul style="list-style-type: none"> Co-Lead – outline/template Co-Lead – historical conditions Co-Lead – baseline conditions Co-Lead – future conditions Co-Lead – projected change 	<ul style="list-style-type: none"> Co-lead – simulations / results 	<ul style="list-style-type: none"> Support – review / contribute to discussion and interpretation (CRB, MP) 	<ul style="list-style-type: none"> Support – review / contribute to discussion and interpretation (SVB) 	<ul style="list-style-type: none"> Support – review / contribute to discussion and interpretation (PRB) 	<ul style="list-style-type: none"> Review – all

Task 6 Develop Mitigation/Adaptation Strategies

Task	Reclamation	USGS	MPWMD	MCWRA	SLOCPWD	MRWPCA
6(a) Define mitigation/adaptation objectives	<ul style="list-style-type: none"> Coordinate / Support (discuss/review imbalances) (discuss/review adaptation objectives) 	<ul style="list-style-type: none"> Support (discuss/review imbalances) (discuss/review adaptation objectives) 	<ul style="list-style-type: none"> Co-Lead Identify primary imbalances (MP, CRB) (From Task 5 results) (stakeholder outreach?) Define adaptation/mitigation objectives 	<ul style="list-style-type: none"> Co-Lead Identify primary imbalances (SVB) (From Task 5 results) (stakeholder outreach?) Define adaptation/mitigation objectives 	<ul style="list-style-type: none"> Co-Lead Identify primary imbalances (PRB) (From Task 5 results) (stakeholder outreach?) Define adaptation/mitigation objectives 	<ul style="list-style-type: none"> TBD??
6(b) Develop non-structural strategies (optional)	<ul style="list-style-type: none"> Coordinate / Support (discuss/review non-structural strategies) (help as needed to develop concepts in sufficient detail to simulate/evaluate alternatives) 	<ul style="list-style-type: none"> Support (discuss/review non-structural strategies) (discuss/review whether concepts are developed in sufficient detail to evaluate using sub-area models) 	<ul style="list-style-type: none"> Co-Lead Develop non-structural adaptation/mitigation concepts (MP, CRB) Develop alternatives in sufficient detail to simulate/evaluate (stakeholder outreach?) 	<ul style="list-style-type: none"> Co-Lead Develop non-structural adaptation/mitigation concepts (SVB) Develop alternatives in sufficient detail to simulate/evaluate (stakeholder outreach?) 	<ul style="list-style-type: none"> Co-Lead Develop non-structural adaptation/mitigation concepts (PRB) Develop alternatives in sufficient detail to simulate/evaluate (stakeholder outreach?) 	<ul style="list-style-type: none"> TBD??
6(c) Develop structural strategies (optional)	<ul style="list-style-type: none"> Coordinate / Support (discuss/review structural strategies) (help as needed to develop concepts in sufficient detail to simulate/evaluate alternatives) 	<ul style="list-style-type: none"> Support (discuss/review structural strategies) (discuss/review whether concepts are developed in sufficient detail to evaluate using sub-area models) 	<ul style="list-style-type: none"> Co-Lead Develop structural adaptation/mitigation concepts (MP, CRB) Develop alternatives in sufficient detail to simulate/evaluate (stakeholder outreach?) 	<ul style="list-style-type: none"> Co-Lead Develop structural adaptation/mitigation concepts (SVB) Develop alternatives in sufficient detail to simulate/evaluate (stakeholder outreach?) 	<ul style="list-style-type: none"> Co-Lead Develop structural adaptation/mitigation concepts (PRB) Develop alternatives in sufficient detail to simulate/evaluate (stakeholder outreach?) 	<ul style="list-style-type: none"> TBD??
6(f) Task 6 Tech Memo	<ul style="list-style-type: none"> Lead – outline/template Review – strategies (all sub-areas) 	<ul style="list-style-type: none"> Review 	<ul style="list-style-type: none"> Co-lead – contribute section(s) describing proposed strategies (MP, CRB) 	<ul style="list-style-type: none"> Co-lead – contribute section(s) describing proposed strategies (SVB) 	<ul style="list-style-type: none"> Co-lead – contribute section(s) describing proposed strategies (PRB) 	<ul style="list-style-type: none"> TBD??

Task 7 Evaluate Adaptation/Mitigation Strategies

Task	Reclamation	USGS	MPWMD	MCWRA	SLOCPWD	MRWPCA
7(a) Modify model configuration and/or inputs as needed to simulate adaptation / mitigation strategies	<ul style="list-style-type: none"> Coordinate / Support (discuss/review approaches to representing alternatives in sub-area models) 	<ul style="list-style-type: none"> Co-Lead (develop model inputs / configuration to represent each adaptation/mitigation strategy to be evaluated) (Under contract with study partners) 	<ul style="list-style-type: none"> Co-Lead (develop model inputs / configuration to represent each adaptation/mitigation strategy to be evaluated) 	<ul style="list-style-type: none"> Co-Lead (develop model inputs / configuration to represent each adaptation/mitigation strategy to be evaluated) 	<ul style="list-style-type: none"> Co-Lead (develop model inputs / configuration to represent each adaptation/mitigation strategy to be evaluated) 	<ul style="list-style-type: none"> TBD??
7(b) Simulate Baseline Conditions (with adaptation/mitigation strategies)	<ul style="list-style-type: none"> Coordinate / Support 	<ul style="list-style-type: none"> Lead – carry out simulations of baseline conditions with adaptation/mitigation strategies in place using models/inputs developed in Task 7(a) (Under contract with study partners) 	<ul style="list-style-type: none"> Support 	<ul style="list-style-type: none"> Support 	<ul style="list-style-type: none"> Support 	<ul style="list-style-type: none">
7(b) Simulate Future Conditions (with adaptation/mitigation strategies)	<ul style="list-style-type: none"> Coordinate / Support 	<ul style="list-style-type: none"> Lead – carry out simulations of future conditions with adaptation/mitigation strategies in place using models/inputs developed in Task 7(a) (Under contract with study partners) 	<ul style="list-style-type: none"> Support 	<ul style="list-style-type: none"> Support 	<ul style="list-style-type: none"> Support 	<ul style="list-style-type: none">
7(b) Evaluate/Characterize Baseline Conditions (with adaptation/mitigation strategies)	<ul style="list-style-type: none"> Lead Evaluate / characterize baseline water supplies, demands, and operations based on study metrics (with adaptation/mitigation strategies) 	<ul style="list-style-type: none"> Support – develop / review approach to evaluating / characterizing baseline conditions Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> TBD??
7(c) Evaluate/Characterize Future Conditions (with adaptation/mitigation strategies)	<ul style="list-style-type: none"> Lead Evaluate / characterize baseline water supplies, demands, and operations based on study metrics (with adaptation/mitigation strategies) 	<ul style="list-style-type: none"> Support – develop / review approach to evaluating / characterizing future conditions Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> Support – develop / review evaluation approach Support – review / interpret evaluation results Review 	<ul style="list-style-type: none"> TBD??
7(d) Evaluate Adaptation/Mitigation Strategies	<ul style="list-style-type: none"> Co-Lead Compare water supplies, demands, and operations between simulations <u>with</u> and <u>without</u> adaptation/mitigation strategies Quantify effects of adaptation/mitigation strategies on water supplies, demands, and operations based on simulated change in study metrics 	<ul style="list-style-type: none"> Support / Review 	<ul style="list-style-type: none"> Co-Lead Interpret results (with vs. without strategy) (MP, CRB) Consider trade-offs (quantitative trade-off with respect to water supply/demand; qualitative trade-off with respect to environmental and other considerations) 	<ul style="list-style-type: none"> Co-Lead Interpret results (SVB) (with vs. without strategy) Consider trade-offs (quantitative trade-off with respect to water supply/demand; qualitative trade-off with respect to environmental and other considerations) 	<ul style="list-style-type: none"> Co-Lead Interpret results (PRB) (with vs. without strategy) Consider trade-offs (quantitative trade-off with respect to water supply/demand; qualitative trade-off with respect to environmental and other considerations) 	<ul style="list-style-type: none"> TBD??
7(e) Task 7 Tech Memo	<ul style="list-style-type: none"> Lead – outline/template Lead – evaluation results Review – results (all sub-areas) 	<ul style="list-style-type: none"> Support – review 	<ul style="list-style-type: none"> Co-lead (MP, CRB) (interpretation of results, trade-off analysis) 	<ul style="list-style-type: none"> Co-lead (SVB) (interpretation of results, trade-off analysis) 	<ul style="list-style-type: none"> Co-lead (PRB) (interpretation of results, trade-off analysis) 	<ul style="list-style-type: none"> TBD??

Task 8 Final Study Report and Executive Summary

Monterey Peninsula Water Management District

U.S. Bureau of Reclamation

Task	Reclamation	USGS	MPWMD	MCWRA	SLOCPWD	MRWPCA
8(a) Write final report	<ul style="list-style-type: none"> • Lead – writing • Lead – review 	<ul style="list-style-type: none"> • Support – review 	<ul style="list-style-type: none"> • Support – limited writing • Support – review 	<ul style="list-style-type: none"> • Support – limited writing • Support – review 	<ul style="list-style-type: none"> • Support – limited writing • Support – review 	<ul style="list-style-type: none"> • TBD??
8(b) Write executive summary	<ul style="list-style-type: none"> • Lead – writing • Lead – review 	<ul style="list-style-type: none"> • Support – review 	<ul style="list-style-type: none"> • Support – limited writing • Support – review 	<ul style="list-style-type: none"> • Support – limited writing • Support – review 	<ul style="list-style-type: none"> • Support – limited writing • Support – review 	<ul style="list-style-type: none"> • TBD??

Discussion

- Partner agency comments to the suggested distribution of work?
- Process for Partner agencies to determine their input?
- Schedule meeting to discuss as the MOA is signed

