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LARRY WALKER ASSOCIATES

October 24, 2018

Anthony Emmert
Executive Director
Fillmore and Piru Basins Groundwater Management Agency
PO Box 1110
Fillmore, CA 93016

Re: Cost Proposal for Larry Walker Associates Response to Request for Qualifications and Proposals for Groundwater Sustainability Plans Preparation for Fillmore Basin and Piru Basin

Dear Mr. Emmert:

The LWA Team proposes to conduct the work outlined in the proposal on a time and materials basis for a total fee not to exceed $ 1,045,150. A breakdown of the budget for each task is provided in attachment. This cost proposal has been developed based on the requirements and process outlined in the RFP. Our proposed cost estimate is based on our experience and cost-effective work processes to manage and develop plans of similar scope, but we are open to discussing potential modifications to the scope and budget, as needed.

The proposed cost proposal has been developed based on the following assumptions:

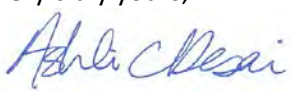
- Model development and other support will be provided by UWCD in accordance with Table 1 of the Request for Qualifications and Proposals.
- Existing data and information will be used for GSP development and if data gaps are identified, those data gaps will either be addressed in future updates of the plan or through data gathering efforts conducted by UWCD or the FPBGSA.
- If model scenarios are needed to evaluate projects and management actions, UWCD will run the model for the developed model scenarios.
- Monthly meetings for progress reporting and coordination with UWCD, with 24 as conference calls and 12 as in person.
- Up to four staff workshops.
- Up to seven stakeholder meetings.

Fee Proposal for the Development of the Fillmore Piru Basins GSPs

Task	LWA	RCS	M&A	Total
Task 1. Project management	$218,130	$7,390	$5,280	$230,800
Task 2 Compilation of existing data	$24,970	$ 35,880	$ -	$60,850
Task 3. Assessment of Existing Data and Data Gap Analysis	$27,820	$ 5,770	$ -	$33,590
Task 4. Monitoring Program and Data Management System	$4,500	$29,200	$ -	$33,700
Task 5. Water Level and Water Quality Data Collection	$ 33,380	$1,840	$ -	$ 35,220
Task 6. Develop Water Budget, Hydrogeologic Conceptual Model, and Numerical Flow Model	$16,390	$ -	$45,320	$61,710
Task 7. Development of Sustainable Management Criteria	$21,400	$ -	$63,760	$85,160
Task 8. Projects and Management Actions	$70,930	$2,100	$ 17,920	$90,950
Task 9. Stakeholder engagement	$ 84,440	$ -	$22,850	$107,290
Task 10. Prepare Groundwater Sustainability Plans	$185,440	$ 12,050	$ 8,440	$ 205,930
Task 11. Grant Assistance	$85,200	$8,670	$6,080	$99,950
Total	**$772,600**	**$102,900**	**$169,650**	**$1,045,150**

Thank you for the opportunity to propose on this project. Please, feel free to contact Dr. Diana Engle at 805-585-1835 or DianaE@lwa.com or me at 310-394-1036 or AshliD@lwa.com with any questions.

Very truly yours,



Ashli C. Desai, President
Larry Walker Associates

Fillmore Piru Basins Groundwater Sustainability Plans
ATTACHMENT A: Fee Proposal Estimate

	Task	Larry Walker Associates							Richard C. Slade Associates							Montgomery and Associates							Estimated Fee Proposal
		President	Associates	Senior Engineer	Staff Engineer	Contract Administrator	Other Direct Costs	Sub-Total	Principal GW Geologist	Senior GW Geologist	Staff GW Geologist	Clerical	(mileage, parking) Other Direct Costs	Other Direct Costs	Sub-Total	Scientist VIII	Scientist VII	Scientist VI	Scientist IV	Expenses	Total Fees & Expenses	Sub-Total	
		$315	$270	$244	$195	$175			$294	$230	$174	$92				$240	$220	$210	$160				
Task 1. Project Management																							
1.1	Project Administration	8	48	48		160		$ 55,192				40			$ 3,680		4	4				$ 1,720	$ 60,592
1.2	Work Plan		8	16	24			$ 10,744							$ -							$ -	$ 10,744
1.3	Kickoff meeting	8	8	16	24			$ 13,264	4	4					$ 2,096	4	4					$ 1,840	$ 17,200
1.4	Monthly Progress meetings and reporting (assume 36 meetings: 24 conference calls and up to 12 in person)	8	60	60	66		$ 1,200	$ 47,430							$ -							$ -	$ 47,430
1.5	Other staff workshops (as requested in Task 1, assume 2 workshops)	8	24	40	40		$ 300	$ 26,860		16	16												
1.6	Agency Coordination	8	48	60	66			$ 42,990							$ -							$ -	$ 42,990
1.7	Presentations			36	66			$ 21,654		4	4				$ 1,616		4	4				$ 1,720	$ 24,990
	Task Subtotal	40	196	276	286	160	1500	$ 218,134	4	24	20	40	0	0	$ 7,392	4	12	8	0	0	0	$ 5,280	$ 230,806
Task 2. Compilation of Existing Data																							
2.1	Compile Basin-wide Well Inventory							$ -			8				$ 1,392							$ -	$ 1,392
2.2	Compile Well Production Records							$ -			8				$ 1,392							$ -	$ 1,392
2.3	Compile Groundwater Elevation Data							$ -			8				$ 1,392							$ -	$ 1,392
2.4	Compile Groundwater and Surface Water Quality Data			8	24			$ 7,832			8				$ 1,392							$ -	$ 9,224
2.5	Compile Precipitation Data							$ -			4				$ 696							$ -	$ 696
2.6	Compile Stream Gaging Data							$ -			4				$ 696							$ -	$ 696
2.7	Compile Groundwater Dependent Ecosystems Data			8	32			$ 8,192			16				$ 2,784							$ -	$ 10,976
2.8	Digital Library of Collected Data			16	32			$ 11,644	4	48	80				$ 26,136							$ -	$ 37,780
	Task Subtotal	0	0	32	88	0	0	$ 24,968	4	48	136	0	0	0	$ 35,880	0	0	0	0	0	0	$ -	$ 60,848
Task 3. Assessment of Existing Data and Data Gap Analysis																							
3.1	Evaluate Existing Monitoring Network		4	8	32			$ 9,272		8					$ 1,840							$ -	$ 11,112
3.2	Evaluate Existing Datasets		4	8	32			$ 9,272		8					$ 1,840							$ -	$ 11,112
3.3	Technical Memorandum: Data Gap Analysis Report		4	8	32			$ 9,272	4	4					$ 2,096							$ -	$ 11,368
	Task Subtotal	0	12	24	96	0	0	$ 27,816	4	20	0	0	0	0	$ 5,776	0	0	0	0	0	0	$ -	$ 33,592
Task 4. Monitoring Program and Data Management System																							
4.1	Develop Recommendations for Network Expansion			4				$ 976	2	8	16				$ 5,212							$ -	$ 6,188
4.2	Develop Monitoring Program			4				$ 976	2	8	16				$ 5,212							$ -	$ 6,188
4.3	Technical Memorandum: Monitoring Program			4	4			$ 1,756	2	8	40				$ 9,388							$ -	$ 11,144
4.4	Data Management System Summary and Location Information				4			$ 780	2	8	40				$ 9,388							$ -	$ 10,168
	Task Subtotal	0	0	12	8	0	0	$ 4,488	8	32	112	0	0	0	$ 29,200	0	0	0	0	0	0	$ -	$ 33,688
Task 5. Water Level and Water Quality Data Collection																							
5.1	Water Level Data Collection and Analysis				8			$ 1,560							$ -							$ -	$ 1,560
5.2	Water Quality Data Collection and Analysis				8			$ 1,560		4					$ 920							$ -	$ 2,480
5.3	Examine Behavior of Constituents of Concern in Basin			32	16			$ 10,928		4					$ 920							$ -	$ 11,848
5.4	Sampling and Analysis Plan (SAP)		8	32	48			$ 19,328							$ -							$ -	$ 19,328
		0	8	64	80	0	0	$ 33,376	0	8	0	0	0	0	$ 1,840	0	0	0	0	0	0	$ -	$ 35,216
Task 6	**Develop Water Budget, Hydrogeologic Conceptual Model, and Numerical Flow Model**																						
6.1	Review preliminary water budgets							$ -							$ -	2	16	8	20			$ 8,880	$ 8,880
6.2	Evaluate available information on groundwater dependent ecoysystems			24	16			$ 8,976							$ -	1	8	16	16			$ 7,920	$ 16,896
6.3	Provide feedback on HCM and model approach			4				$ 976							$ -	2	20	8	8			$ 7,840	$ 8,816
6.4	Provide technical advice during model development			4				$ 976							$ -	4	16	4	16			$ 7,880	$ 8,856
6.5	Evaluate climate change options							$ -							$ -	0	12	0	24			$ 6,480	$ 6,480
6.6	Review internal draft of HCM and VRGWFM tech memo			16	8			$ 5,464							$ -	2	16	8	4			$ 6,320	$ 11,784
	Task Subtotal:	0	0	48	24	0	0	$ 16,392	0	0	0	0	0	0	$ -	11	88	44	88	0	0	$ 45,320	$ 61,712
Task 7	**Development of Sustainable Management Criteria**																						
7.1	Chronic lowering of groundwater levels		2					$ 540							$ -	6	8	40	16			$ 14,160	$ 14,700
7.2	Reduction of groundwater storage		2					$ 540							$ -	4	8	20	16			$ 9,480	$ 10,020
7.3	Seawater intrusion							$ -							$ -	0	0	8	0			$ 1,680	$ 1,680
7.4	Degraded water quality		8	16	16			$ 9,184							$ -	4	16	48	16			$ 17,120	$ 26,304
7.5	Land subsidence							$ -							$ -	0	0	8	0			$ 1,680	$ 1,680
7.6	Depletions of interconnected surface water		8	24	16			$ 11,136							$ -	4	16	60	16			$ 19,640	$ 30,776
	Task Subtotal:	0	20	40	32	0	0	$ 21,400	0	0	0	0	0	0	$ -	18	48	184	64	0	0	$ 63,760	$ 85,160
Task 8	**Projects and Management Actions**																						
8.1	Identify potential management actions and evaluation projcess	8	40	60	60			$ 39,660	4	4					$ 2,096	2	36	12	4			$ 11,560	$ 53,316
8.2	Conduct evaluation process and prepare technical memo	8	40	48	32			$ 31,272							$ -	2	20	4	4			$ 6,360	$ 37,632
	Task Subtotal:	16	80	108	92	0	0	$ 70,932	4	4	0	0	0	0	$ 2,096	4	56	16	8	0	0	$ 17,920	$ 90,948
Task 9	**Stakeholder Engagement**																						
9.1	Planning and calls into meetings for UWCD presentations on water budget, HCM, and modeling (Task 6)		8					$ 2,160							$ -	0	16	0	0			$ 3,520	$ 5,680
9.2	Planning for Task 7 workshops (assume 2 workshops and 2 x planning calls per workshop)		8	8	32		$ 300	$ 10,652							$ -	0	0	20	0			$ 4,200	$ 14,852
9.3	Task 7 stakeholder workshops to present proposed SMCs (assume 2 workshops)	8	24	12	12		$ 300	$ 14,568							$ -	0	0	40	20	900		$ 11,600	$ 26,168

Fillmore Piru Basins Groundwater Sustainability Plans
ATTACHMENT A: Fee Proposal Estimate

	Task	Larry Walker Associates							Richard C. Slade Associates							Montgomery and Associates							Estimated Fee Proposal
		President	Associates	Senior Engineer	Staff Engineer	Contract Administrator	Other Direct Costs	Sub-Total	Principal GW Geologist	Senior GW Geologist	Staff GW Geologist	Clerical	(mileage, parking) Other Direct Costs	Other Direct Costs	Sub-Total	Scientist VIII	Scientist VII	Scientist VI	Scientist IV	Expenses	Total Fees & Expenses	Sub-Total	
		$315	$270	$244	$195	$175			$294	$230	$174	$92				$240	$220	$210	$160				
9.4	Stakeholders meetings on different topics (assume 7 meetings in person)	16	60	80	80		$ 700	$ 57,060							$ -	0	16					$ 3,520	$ 60,580
	Task Subtotal:	24	100	100	124	0	1300	$ 84,440	0	0	0	0	0	0	$ -	0	32	60	20			$ 22,840	$ 107,280
Task 10	**Prepare Groundwater Sustainability Plans**							$ -															
10.1	Prepare Maps detailing the area of the basins and potential recharge areas		8	40	60			$ 23,620		8	8				$ 3,232			4	8			$ 2,120	$ 28,972
10.2	Prepare Draft GSP for FBPGSA review	16	40	80	100			$ 54,860	4	16	16				$ 7,640	2	16	8	4			$ 6,320	$ 68,820
10.3	Prepare public GSP drafts, and include comments	16	40	80	80			$ 50,960							$ -							$ -	$ 50,960
10.4	Final Groundwater Sustainability Plans	32	40	80	80			$ 56,000	4						$ 1,176							$ -	$ 57,176
	Task Subtotal:	64	128	280	320	0	0	$ 185,440	8	24	24	0	0	0	$ 12,048	2	16	12	12			$ 8,440	$ 205,928
Task 11	**Grant Assistance**																						
11.1	Grant Reporting (quarterly progress reports)		8	48	48			$ 23,232		8	8				$ 3,232		4	8				$ 2,560	$ 29,024
11.2	Project completion report	8	8	48	48			$ 25,752		8	8				$ 3,232		4	8				$ 2,560	$ 31,544
11.3	Draft and final invoices			24		60		$ 16,356				24			$ 2,208							$ -	$ 18,564
11.4	Backup documentation and summary document			24		80		$ 19,856							$ -							$ -	$ 19,856
	Task Subtotal:	8	16	144	96	140	0	$ 85,196	0	16	16	24	0	0	$ 8,672	4	8	16		0		$ 6,080	$ 99,948
	Total=	152	560	1128	1246	300	2800	$ 772,582	32	176	308	64	0	0	$ 102,904	43	260	340	192			$ 169,640	$ 1,045,126

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OCTOBER 24, 2018

FILLMORE AND PIRU BASINS GROUNDWATER SUSTAINABILITY AGENCY

PROPOSAL FOR

Request for Qualifications and Proposals for Groundwater Sustainability Plans Preparation for Fillmore Basin and Piru Basin

SUBMITTED BY

LARRY WALKER ASSOCIATES

MONTGOMERY & ASSOCIATES

RCS RICHARD C. SLADE & ASSOCIATES LLC
CONSULTING GROUNDWATER GEOLOGISTS

720 Wilshire Blvd. Suite 204
Santa Monica, CA 90401

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October 24, 2018

Anthony Emmert
Executive Director
Fillmore and Piru Basins Groundwater Management Agency
PO Box 1110
Fillmore, CA 93016

Re: Larry Walker Associates Response to Request for Qualifications and Proposals for Groundwater Sustainability Plans Preparation for Fillmore Basin and Piru Basin

Dear Mr. Emmert:

Larry Walker Associates, Inc. (LWA), in conjunction with Montgomery and Associates (formerly HydroMetrics, WRI); and Richard C. Slade & Associates (RCS) (LWA Team), is pleased to submit the enclosed proposal to the Fillmore and Piru Basins Groundwater Sustainability Agency (FPBGSA) to prepare Groundwater Sustainability Plans (GSPs) for the Fillmore and Piru Basins (Basins). The LWA Team understands that significant agricultural users and the Cities of Fillmore and Piru are reliant on the Basins as their local water supply. Additionally, the Santa Clara River provides habitat for wildlife and endangered species that need to be considered in the GSP development. We understand that the objective of this work is to develop GSPs in accordance with the requirements of the Sustainable Groundwater Management Act (SGMA) that maintain or improve the quantity and quality of groundwater in the Basins, build on existing management strategies, and utilize the extensive amount of existing data and technical information.

LWA has assembled an excellent team with demonstrated experience and proven success in the management and delivery of SGMA and water resource planning services similar to those requested in the RFQ. The LWA project management team consists of Dr. Diana Engle from LWA as the Project Manager, Ashli Desai as the Principle in Charge and Dr. Laura Foglia as the Assistant Project Manager and Technical Lead. Dr. Engle is located in LWA's Ventura office and will serve as the primary point of contact for the project. Dr. Engle manages groundwater projects for the Ventura County Irrigated Agricultural Lands Group and the Calleguas Creek Salt and Nutrient Management Plan (SNMP) and is a Director of the Meiner's Oaks Water District and the Upper Ventura River Groundwater Agency and the alternate Director for independent water agencies on the board of directors of the Association of Water Agencies of Ventura County. Through her work and experience as a Director, Dr. Engle has gained a strong understanding of local groundwater conditions and the challenges faced by groundwater management agencies in areas of Ventura County that rely on groundwater as their primary water supply. Ms. Desai has helped municipal clients throughout Southern California develop approvable and implementable plans to address new, technically complex regulatory programs involving multiple stakeholders, including the Lower Santa Clara River SNMP, which LWA developed in conjunction with

Montgomery and Associates. Dr. Foglia is an expert in groundwater modeling with extensive experience with various modeling approaches in California and Europe. Dr. Foglia is the project manager for LWA's GSP development in Northern California. Dr. Foglia has worked collaboratively with Dr. Thomas Harter of UC Davis to develop models and tools to address issues such Groundwater Dependent Ecosystems.

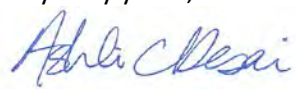
Montgomery and Associates brings valuable expertise in SGMA planning plus important knowledge of the Basins, including hands-on experience with United Water Conservation District groundwater models. Additionally, they provided support to DWR for development of Best Management Practices for SGMA and data sets and information that GSAs can use in their GSPs. RCS brings in depth understanding of the hydrogeology and groundwater conditions in the Fillmore and Piru Basins and experience developing hydrogeological conceptual models for SGMA. Members of the LWA Team are leading or significant contributors to GSP development for Ukiah Valley Basin, County of Siskiyou (3 basins), Santa Cruz Mid-County Basin, Paso Robles Basin, Salinas Valley (6 subbasins) and Kings Basin.

The LWA Team is uniquely qualified to conduct this work based on our:

- Extensive local knowledge and understanding of the Fillmore and Piru Basins, available data, and technical resources, including an understanding of the hydrogeology and groundwater conditions;
- In-depth understanding of SGMA, experience with developing GSPs in other regions, and relationships with Department of Water Resources staff;
- Experienced technical staff with the necessary skills to develop the GSPs, including extensive ground water modeling skills, data analysis, and stakeholder skills required to develop attainable sustainability criteria for the Basins;
- Demonstrated success developing productive relationships with key stakeholders through effective communication and transparent technical evaluations;
- Familiarity with the needs of many Basin users through our work with Ventura County Irrigated Agricultural Lands Group, Ventura County, and City of Fillmore;
- A project management team experienced in leading projects of similar technical and regulatory complexity that involve diverse stakeholders with potentially competing needs;
- Statewide experience in translating new regulatory programs into approvable and implementable plans based on stakeholder needs;
- Capacity to perform the work on time – our team is ready to hit the ground running to deliver the excellent service and responsiveness to individual and collective stakeholder needs that is required for this project.

We feel our project approach will maximize the use of existing information, facilitate stakeholder input, and result in timely and cost effective GSPs that meets all applicable SGMA requirements and can be implemented by the stakeholders. Our history of successful experience with stakeholder groups and regulators in California is a result of our abilities in practical problem-solving and effective application of science within regulatory policy constraints. Thank you for the opportunity to propose on this project. Please, feel free to contact Dr. Diana Engle at 805-585-1835 or DianaE@lwa.com or me at 310-394-1036 or AshliD@lwa.com with any questions.

Very truly yours,



Ashli C. Desai, President
Larry Walker Associates

Table of Contents

1.0 Introduction

Larry Walker Associates, Inc. (LWA) understands that the Fillmore and Piru Basins Groundwater Sustainability Agency (FPBGSA) is seeking a qualified consult to prepare Groundwater Sustainability Plans (GSPs) for the Fillmore and Piru Basins (Basins) in accordance with the requirements of the Sustainable Groundwater Management Act (SGMA).

VALUE-ADDED ADVANTAGE

The LWA Team offers the FPBGSA in-depth knowledge of and direct experience with:

- *Evaluating conditions in the Fillmore and Piru Basins*
- *Working with diverse coalitions and stakeholder groups*
- *Collaborating with DWR on the development of SGMA Best Management Practices*
- *Experience from SGMA projects in other basins*

LWA has assembled a project team that has demonstrated experience and success in the management and delivery of similar projects and has extensive experience in the Basins. LWA, the prime consultant, is teamed with Montgomery & Associates (formerly HydroMetrics, WRI), and Richard C. Slade & Associates, LLC (RCS), hereinafter "LWA Team". The expertise of LWA's team is summarized in ***Figure 1*** below and includes all the regulatory understanding, technical skills, and direct experience necessary to develop the GSPs for the Basins. The Team has successfully collaborated on previous relevant projects *(see Sections 2.0 and 5.0)* to perform similar tasks and develop high-quality work products within budget and schedule constraints. As demonstrated throughout our proposal, the LWA Team offers an in-depth understanding of the requirements of the California Sustainable Groundwater Management Act (SGMA) and how to develop a pragmatic and thorough GSP. Of significant value is our understanding of the Fillmore and Piru Basins, our experience working with the Department of Water Resources (DWR), our experience with similar groundwater sustainability efforts for other California basins, and our expertise in hydrogeological modeling and stakeholder engagement. In addition, the LWA Team has worked extensively with FPBGSA member agencies, led multi-stakeholder efforts throughout the Los Angeles Region and in Ventura County in particular, and has excellent working relationships with key local stakeholders.

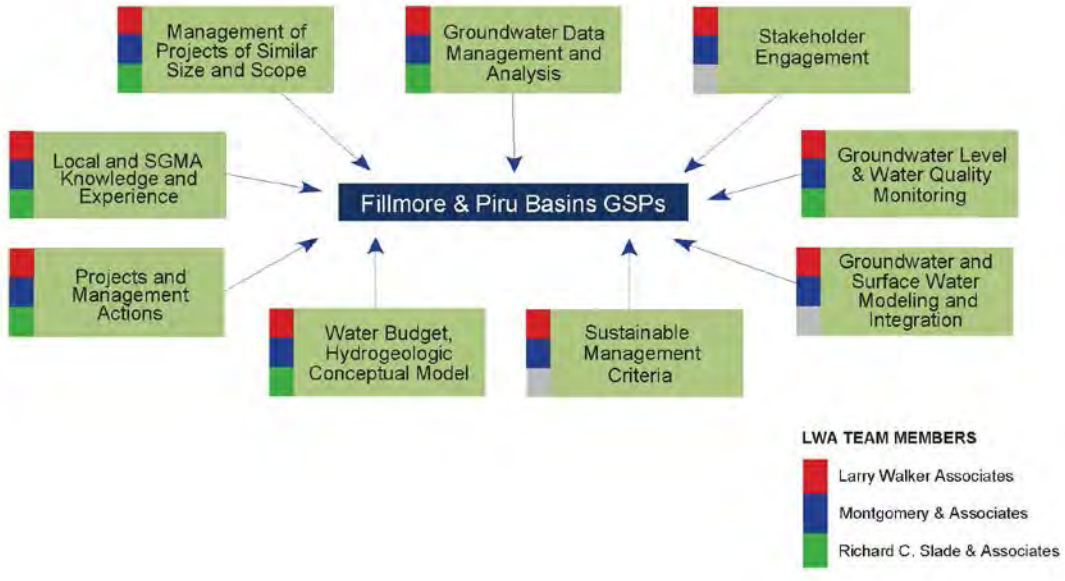


Figure 1. LWA Team Member Expertise to Support the Development of the GSP

2.0 Statement of Qualifications

The LWA Team was formulated based on experience performing similar work, availability, and commitment to support the FPBGSA throughout the term of the contract. The roles for each firm were carefully defined to maximize each firm's strengths and to meet the goals of the project. The LWA Team brings proven experience and extensive knowledge of the Fillmore and Piru Basins, stakeholders and planning processes in Ventura County, and statewide water resource regulations and policies. The Team has supported more than a dozen municipal water districts, more than 20 counties and 80 cities, as well as more than 30 sanitation, wastewater, and other special districts and government agencies with water resources management and engineering services. We understand California's water resources and challenges and the need for flexibility in providing complex planning services and are prepared to adjust approaches to meet changing client needs and regulatory interpretations.

A description of LWA (Prime Consultant) and subconsultant firms on the Team are provided below, with additional company information (role, size and structure, and number of partners and owners) for LWA and our team partners provided in ***Table 1***. As illustrated in ***Table 1***, the LWA Team has the capacity to support the work on this project and assigned staff members are available upon award. Additional highly qualified and experienced staff are readily available to augment the team as needed and as requested by FPBGSA. Provided in *Sections 2.2 and 5.0* are project examples of similar work and references who can attest to our Team's competence and quality of work.

VALUE-ADDED ADVANTAGE

The LWA Team's joint experience will enhance coordination, communication, and quality for the FPBGSA on this project.

- *Extensive local knowledge and understanding of the Basins, available data, and technical resources*
- *Familiarity with the needs of many Basin users through our work with Ventura County Agricultural Irrigated Lands Group (VCAILG), Calleguas Creek Watershed Group, Ventura County, and City of Fillmore*
- *Statewide experience in translating new regulatory programs into approvable and implementable plans based on stakeholder needs*
- *Relationships with Department of Water Resources staff and understanding of SGMA*
- *A project management team experienced in leading multi-stakeholder projects of similar complexity to successful outcomes*

Independence and License to Practice in California.
Members of LWA Team's staff hold advanced degrees, including Ph.D.s as well as the certifications and licenses required to perform the work, including Professional Geologists (PGs), Certified Hydrogeologists, Certified Engineering Geologists (CEGs), and Professional Engineers (PE). ***All staff proposed for the contract maintain active and current professional licenses as required to perform their assigned tasks.*** *Section 2.0 and Appendix A* provide additional details on our Team's licenses, qualifications, credentials, training, and expertise. The LWA Team can meet the insurance requirements as set forth in Standard Professional Services Agreement provided with the RFP.

2.1. Company History and Capabilities

LWA is a privately-owned corporation providing environmental engineering and management services throughout California. Headquartered in Davis, CA, LWA has regional offices in Santa Monica, Carlsbad, Berkeley, San Jose, and Ventura, as well as an office in Seattle, Washington. Founded in 1979, LWA has been a partner, innovator, and industry leader, assisting municipalities and private businesses in navigating and solving complex and important environmental and public policy challenges. LWA provides a wide range of consulting services ranging from traditional water and wastewater engineering to highly specialized water resource management; groundwater modeling, scenario analysis and sustainable planning; surface water and groundwater monitoring; stormwater; and watershed management.

VALUE-ADDED ADVANTAGE

LWA offers the FPBGSA over 20 years of experience working with public agencies and managing complex stakeholder processes to achieve sustainability goals. As a lean and nimble firm, LWA offers the FPBGSA the qualifications found at larger firms but with the benefits of enhanced responsiveness, a local Project Manager, Diana Engle, and direct access to LWA's President, Ashli Desai, Principle in Charge, for any project matter.

Regulatory Assistance. LWA regulatory assistance includes SGMA, Salt and Nutrient Management Plans (SNMPs), Reports of Waste Discharge (ROWDs), anti-degradation analyses, site specific objective studies, use attainability analyses, Basin Plan amendments, and water quality policy review. LWA works with irrigated agricultural coalitions, water, stormwater, wastewater, and recycled water agencies throughout California to ensure adoption of requirements that can be complied with and provide reasonable protection of beneficial uses of California waters. LWA utilizes in-depth knowledge of the Clean Water Act, Porter-Cologne Water Quality Act, California Water Code, and SGMA to support and guide our clients.

SGMA and Groundwater Sustainability Plan (GSP) development. LWA is actively supporting Groundwater Sustainability Agencies for SGMA requirement (such as basin boundary modification and application for DWR Technical Support Services). We are developing GSPs for the Ukiah Valley Basin in Mendocino County, and for the Scott, Shasta, and Butte Basins in Siskiyou County. All these basins are particularly interested in a proper representation of Groundwater Dependent Ecosystems and on the impact of groundwater pumping on interconnected surface water bodies. LWA staff can support the full development of the GSP from stakeholder engagement, data management system development, to numerical groundwater modelling, development of measurable objectives and sustainability criteria, and GSP documentation. LWA is also actively working with the California State Farm Bureau to develop outreach material about SGMA and groundwater hydrology for SGMA specifically targeted to farmers and landowners.

Groundwater Modeling. LWA staff has extensive experience in developing, calibrating, and validating groundwater models to support groundwater management efforts across California. The firm has a highly skilled team of Ph.D. groundwater modelers led by Dr. Laura Foglia (Assistant Project Manager), who currently teaches courses to future groundwater modelers at UC Davis, with a focus on how to address the uncertainty and data gaps that might confound less-experienced modeling teams. The LWA groundwater modeling team regularly attends workshops and training opportunities derived from SGMA and diligently works to ensure that the range of approaches and tools are consistent with the state of the art science. LWA practitioners are also keenly aware of the delicate balance between expending limited resources on complex models and the potential to spend a portion of those limited resources on acquiring site-specific data. The modeling team is prepared to engage FPBGSA and other stakeholders to ensure that limited groundwater evaluation resources are allocated to allow for effective groundwater management. LWA also has unique capabilities in analyzing and effectively communicating the output of groundwater modeling work. Our team combines skills for teaching courses related to groundwater hydrology, groundwater model

development, and data assessment at the academic level with excellent skills for presenting and conveying technical results in an accessible manner to stakeholders.

Groundwater Surface Water Interconnectivity. LWA combines knowledge of geology, hydrology (both surface water and vadose zone hydrology), and hydrogeology with experience in understanding all the processes of interest within a hydrologic basin. LWA staff operates within an internal "One Water" framework where water resources are comprehensively managed. We use our broad understanding of groundwater and surface water requirements to work within existing regulatory structures to comprehensively identify integrated solutions that achieve multiple goals. LWA provides a complete range of hydrogeology assessment capabilities, understanding of the latest research and regulatory requirements, and data interpretation using industry standard and innovative methods to provide a holistic assessment of groundwater basin conditions and factors influencing basin management. In other similar projects, LWA approaches have minimized or eliminated the need for costly on-site drilling, digging and sampling, identified program overlaps and project opportunities that minimized or eliminated additional implementation costs and facilitated reductions in planning and reporting costs across programs by effectively integrating requirements.

Multi-Stakeholder Facilitation. LWA offers over 20 years of experience in the facilitation of and collaboration with stakeholders at the regional, state, and federal levels. LWA is known for our ability to diplomatically communicate, interact, and forge productive relationships with clients' staff, regulators, and other diverse stakeholders, including DWR, Resource Conservation Districts, California Farm Bureau, and UC Cooperative Extensions. LWA has coordinated and facilitated multi-agency collaborative programs in Ventura County, Los Angeles County, San Diego County, Orange County, and the Central Valley. Stakeholder groups where LWA has assumed a significant coordinating role have included the Lower Santa Clara River Salt and Nutrient Management Plan, Calleguas Creek Watershed Total Maximum Daily Load (TMDL) Development and Implementation, Upper Los Angeles River, Ballona Creek, and Upper Santa Clara River Enhanced Watershed Management Programs, Newport Bay Nitrogen and Selenium Management Program, Santa Margarita River Water Quality Improvement Plan, Los Angeles Permit Group Stormwater Permit Renewal, and California Statewide Biological Integrity Regulated Community Stakeholder Group.

LWA has sufficient financial and personnel resources, as well as the management efficiency and flexibility, to successfully complete the scope of work outlined in the RFP. LWA practices sound fiscal management through planning, organizing, controlling, and monitoring financial resources for our company and our client's projects. These practices sustain financial stability and ensure adequate resources are available to complete work. Notably, since 1979, the company has never taken a bank loan. LWA employs 45 professional engineers, scientists, and administrative personnel, and can readily supplement staff as needed to accommodate future resource needs or for other specialized technical services. LWA's continuous growth and the employees' longevity are indicative of the company's operational stability; 65% of the senior staff have been with the company for 10 years or more.

Table 1 Responder Information

Name of Firm:	Larry Walker Associates	Montgomery and Associates	Richard C. Slade Associates
Role:	Prime Consultant	Subconsultant Team Partner-Groundwater Services	Subconsultant Team Partner-Groundwater Services
Local Employees	Ventura and Santa Monica	Oakland, Sacramento and Paso Robles	Sherman Oaks
Company Size (No. of Employees):	45	85	8
Office Leading Work Effort	Ventura (PM), Santa Monica (PIC and technical staff)	Oakland and Paso Robles	Sherman Oaks
Company Legal Structure:	Corporation	Corporation	LLC
Number of Partners & Owners:	4 Owners	16	2 Owners

MONTGOMERY & ASSOCIATES

M&A provides familiarity with local conditions and experience with SGMA

- *Part of the consultant team that developed the Lower Santa Clara River SNMP.*
- *Advisors to DWR and other stakeholders during the development of SGMA policy.*
- *Assisting GSAs with the implementation of SGMA.*

Montgomery & Associates (M&A) combines technical and planning expertise to deliver integrated solutions to water managers and providers in North and South America. Our professionals represent a range of disciplines and feature a team of experienced scientists and hydrologic modelers. For more than 30 years, we have helped achieve successful outcomes for clients in the industrial, mining, energy, municipal, land development, tribal, and agricultural sectors. M&A combines state-of-the-art technical innovation with a strong, practical understanding of groundwater science. We offer services in six main areas: Water Resource Planning, Water Supply & Recharge, Hydrologic Modeling, Environmental Hydrogeology, Water Rights & Impacts, and Mining Hydrogeology. In 2018, M&A acquired HydroMetrics Water Resources Inc. (HydroMetrics), recognized as an industry leader in water resource consulting in California for its high-quality expertise in developing, protecting and managing groundwater resources. By combining our resources and talents, we have enhanced our ability to provide services to clients complying with California's 2014 Sustainable Groundwater Management Act (SGMA) and solidified the core services we have provided for decades to our client base across the western U.S. and Latin America.

M&A staff have been actively involved with SGMA in California since its inception. We have served as close advisors to the Department of Water Resources (DWR), local water agencies, local stakeholders (including growers), and non-governmental organizations such as the California Water Foundation, where we helped develop and direct statewide SGMA policy. We have led all aspects of SGMA implementation including

assisting Groundwater Sustainability Agencies form, modifying groundwater basin boundaries for the Santa Margarita, Santa Cruz Mid-County, and Pajaro Valley Basins, leading GSP development for the Santa Cruz Mid-County Basin, Salinas Valley Basin, and Paso Robles Basin, and developing modeling and sustainable management criteria Best Management Practices on behalf of DWR. Our unique relationship with SGMA policy makers and implementers allows us to effectively resolve issues on our clients' behalf.

As a leader in groundwater modeling, M&A has a reputation for developing and implementing practical and effective models for groundwater management. We have developed and applied groundwater models in some of California's most important agricultural, coastal, and urban basins such as the Santa Cruz Mid-County, Pajaro Valley and Livermore Valley Basins.

Our talented group of professionals specializes in hydrology, geology, soil science, policy and regulatory affairs, groundwater modeling, GIS analyses and 3D visualization, database management, environmental engineering, and instrumentation and monitoring. Most of our principals have more than 20 years of experience; nearly all have master's or doctoral degrees, along with one or more professional registrations. M&A staff members frequently present at conferences, participate in professional organizations, and serve on advisory boards.

Our corporate headquarters is in Tucson, Arizona. We also have U.S. branch offices in Phoenix, Arizona; Denver, Colorado; Salt Lake City, Utah; and Sacramento, Oakland and Paso Robles, California. Our South American offices are located in Santiago, Chile, and Lima, Perú.

RCS RICHARD C. SLADE & ASSOCIATES LLC
CONSULTING GROUNDWATER GEOLOGISTS

Established in 1983 and located in the San Fernando Valley portion of the City of Los Angeles, RCS is comprised of a group of experienced groundwater geologists focused on the development, protection, and management of groundwater resources throughout California. The firm's Principal Hydrogeologist and President, Mr. Richard C. Slade has more than 51 years of hydrogeologic experience in California, and has served since 2009 as the Watermaster of the adjudicated Upper Los Angeles River Area (ULARA) region. Specific areas of expertise for RCS include:

- **Development of conceptual models of groundwater basins**, including characterizing the water-bearing sediments and the base of fresh water in groundwater basins; conducting detailed studies of groundwater conditions in adjudicated and unadjudicated groundwater basins; conducting analysis and correlations of the resistivity signatures on geophysical electric logs available from water wells, oil wells, and groundwater monitoring wells; preparing detailed cross sections using E-logs, to define key aquifer systems and the base of fresh water; defining groundwater flow directions and possible barriers (e.g., from faults) to groundwater flow; and assessing groundwater quality in individual wells and on a basin-wide basis.

VALUE-ADDED ADVANTAGE

RCS has performed hydrogeologic work in the vicinity of the Fillmore and Piru Groundwater Basins, including:

- *Defining the Hydrogeologic Conditions in the Alluvial and Saugus Formation Aquifer Systems of the Santa Clarita Valley area, including quantification of the "perennial yield" of the basin.*
- *Developing a Hydrogeologic Conceptual Model of the Santa Paula Basin as part of the "Hydrogeologic Characterization and Safe Yield Study" of the basin for the United Water Conservation District.*
- *Providing Hydrogeologic Services to the City of Fillmore to evaluate City Well No. 9 and determine its feasibility for future continued use as a City water-supply well.*
- *Ongoing work as the Court-appointed Watermaster to ULARA since 2009 offers a unique perspective on groundwater management.*

- **Development of groundwater supplies**, including identifying the feasibility of constructing new water wells and determining well depths and drilling methods for new wells; preparing Technical Specifications and detailed line item bid sheets for the preliminary design and cost analysis of new wells and deep monitoring wells; providing experienced geologists to field monitor the drilling, final design, construction and testing of new water wells and groundwater monitoring wells; conducting pumping tests and providing technical analyses of pumping test data; and evaluating and monitoring the rehabilitation of older wells.
- **Groundwater management**, including preparing groundwater management plans; evaluating groundwater contamination; providing independent reviews of technical reports prepared by others; and providing expert witness services in hydrogeology.

RCS, a privately held company, is on a sound and stable financial footing and has continuously been in business in California since 1983. RCS has one Principal Groundwater Geologist and six additional full-time professional groundwater geologists, including two senior project-level hydrogeologists, who are licensed Professional Geologists and Certified Hydrogeologists in California. Additional resources to support the project as needed include four staff/field-level geologists who are degreed geologists and licensed Professional Geologists.

2.2 Recent, Relevant Experience on Similar Projects

The LWA Team has the experience and expertise needed to navigate the regulatory and technical requirements, as well as successfully and promptly perform the management and technical tasks required for the development of the GSP within the specified time.

The LWA Team has extensive experience on similar projects for municipal clients with descriptions and references for projects of comparable scale, nature, and complexity provided in *Section 5.0, References*.

The LWA Team has relevant experience and knowledge as well as the technical competence in all services required by the RFP as discussed below.

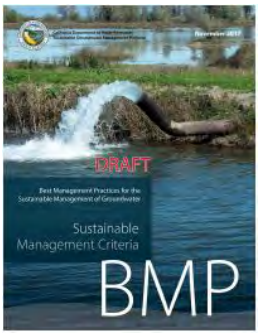
Local Experience and Technical Understanding of the Fillmore/Piru Basins

The LWA Team has been involved with multiple projects involving the Basins and Santa Clara River Watershed. Working with Hydrometrics, LWA led the development of Salt and Nutrient Management Plans (SNMP) for the Lower Santa Clara River. Through this project the LWA Team gained a strong understanding of the available groundwater data, hydrogeology of the Basins, and existing and potential groundwater quality management measures. M&A has previously worked with UWCD on modeling related efforts in these Basins and reviewed the integrated groundwater/surface water model developed for the Upper Santa Clara River Chloride Total Maximum Daily Load (TMDL) with a focus on the impacts on the Piru Basin. RCS has conducted hydrogeologic evaluations in the Santa Clarita River Valley and the Santa Paula Basins. LWA has provided program management and technical support to the Ventura County Agricultural Irrigated Lands Group since 2004. LWA has provided regulatory assistance and assessment of groundwater impacts for the Cities of Santa Paula and Fillmore and Ventura County Waterworks District No. 16 (Piru Wastewater Treatment Plant) and provided regulatory support for the Santa Clara River Chloride TMDL development and implementation.

Locations of Groundwater Quality Data in the Piru and Fillmore Basins (from UWCD, 2012a)

Understanding of SGMA, GSP Development Experience and Relationships with DWR

The LWA Team brings substantial recent experience with SGMA including technical support to Groundwater Sustainability Agencies (GSAs) and preparation of GSPs. LWA utilizes in-depth knowledge of the Clean Water Act, Porter-Cologne Water Quality Act, California Water Code, and SGMA to support and guide our clients. LWA's role in the groundwater service area has become more prominent in recent years. After SGMA was passed in 2014, LWA became directly involved in projects related to the new law, including the Basin Boundary Modification process and preliminary groundwater management plan assessments. LWA is supporting the development of GSPs for the Ukiah Valley Basin in Mendocino County; and for the Scott, Shasta, and Butte Basins in Siskiyou County.



The LWA Team actively supports GSP and SGMA compliance throughout California, working closely with various public agencies to analyze SGMA requirements, organize GSAs, assess and modify basin boundaries, and develop detailed work plans that comply with SGMA and reflect the public agency's goals, needs, and resources. Members of our team have served on advisory committees – for example, assisting with the development of DWR's modeling Best Management Practices (BMPs) for SGMA -- and continue to be involved in meetings and discussions with DWR.

Additionally, LWA is leading a new effort with California State Farm Bureau to develop outreach materials about SGMA and groundwater hydrology knowledge needed to understand SGMA. The outreach materials will be specifically tailored to the needs of farmers and local landowners that are not yet actively engaged with SGMA, but that will be soon affected by the decisions that GSAs will be making.

Technical Expertise Necessary to Develop the GSPs

The LWA Team has assembled a robust team of numerical modelers and supporting hydrogeologists, including experienced groundwater modelers who are trained on various model platforms and graphical user interfaces to support modeling, with three modelers each having approximately 30 years of experience.

The LWA Team has direct experience working on groundwater and water quality projects in the Fillmore and Piru Basins and throughout California involving the technical skills necessary to develop the GSPs.

- The LWA Team has worked with current models developed by USGS, DWR and others and has modified them to fit the specific conditions of individual groundwater basins and to account for surface water-groundwater interactions similar to the conditions in the Lower Santa Clara River.
- The LWA Team has extensive experience identifying tailored approaches to developing detailed water budget and to understanding surface water/groundwater interactions and how models should address them. [1] [2]
- The LWA Team has developed and implemented groundwater monitoring programs and conducted studies to evaluate surface water-groundwater interactions.
- The LWA Team has developed systems for identifying management actions that address multiple stakeholder goals and minimize costs and evaluating those actions to identify optimized strategies to meet the plan objectives.

[1] Foglia L, Neumann J, Tolley D, Orloff S, Snyder R, Harter T. 2018. Modeling guides groundwater management in a basin with river–aquifer interactions. Calif Agr 72(1):84-95. https://doi.org/10.3733/ca.2018a0011

[2] Foglia, L., A. McNally, and T. Harter (2013), Coupling a spatiotemporally distributed soil water budget with stream-depletion functions to inform stakeholder-driven management of groundwater-dependent ecosystems, Water Resour. Res., 49, DOI:10.1002/wrcr.20555

Ventura County Experience and Understanding of Basin Stakeholders

In addition to the local experience described above, members of the LWA Team have worked extensively throughout Ventura County with cities, special districts, school districts, and the County, including with the member agencies of the FPBGSA.

LWA has provided specialized and expert services to Ventura County water districts, cities, wastewater agencies, county departments, and irrigated agriculture for over 20 years. Ms. Ashli Desai and Dr. Diana Engle have spent the majority of their careers at LWA working on projects within Ventura County and have built strong relationships and understanding of the stakeholders, needs, and challenges faced by groundwater users.

Our work in Ventura County has included groundbreaking watershed efforts in the Calleguas Creek watershed, negotiation and implementation support for all wastewater treatment plants in the County, permit and Total Maximum Daily Load (TMDL) negotiation and implementation for all stormwater agencies in the County, and monitoring and technical special studies in all major watersheds in the County.

LWA worked collaboratively with the Ventura County Farm Bureau to negotiate the first conditional waiver for irrigated agriculture and has served as the consultant to VCAILG since its inception. LWA supported both waiver renewals and has been assisting VCAILG with implementing the new groundwater quality requirements in the 2016 waiver for the past two years.

Ability to Successfully Manage Complex Stakeholder Processes to Successful Outcomes

"The (LWA) Staff has a unique ability to communicate technical issues and associated implications to a broad spectrum of stakeholders." –Henry Graumlich, Calleguas Municipal Water District

The LWA Team has extensive experience working with a range of stakeholders including landowners and private well owners, non-governmental organizations, business interests, irrigated agricultural coalitions and farm bureaus, planning agencies, and water supply, stormwater, wastewater, and recycled water agencies throughout California to ensure adoption of requirements that can be complied with and provide sustainable management of California waters. Members of the LWA Team are known for the ability to diplomatically communicate, interact, and forge productive relationships with clients' staff, regulators, and other diverse stakeholders. Many past and present projects undertaken by the LWA Team have required extensive engagement with a stakeholder group while executing a project that affects multiple groups of people, oftentimes with competing or non-overlapping interests. LWA has coordinated and facilitated collaborative programs with many diverse stakeholders for groups in the Central Valley, San Diego, Orange, Los Angeles, and Ventura County.

Several of these projects, including CV-Salts, Calleguas Creek Watershed TMDL development, Upper Santa Clara River EWMP, and Lower Santa Clara SNMP, were multi-year projects involving many complex technical analyses, balancing of regulatory requirements and impacted party needs, and gaining acceptance from watershed stakeholders, similar to the scope and complexity of the development of GSPs. While technical experience is critical to development of a GSP, the LWA Team's experience in managing similar projects to successful conclusions is an equally critical component of a GSP that can be accepted by DWR and also implemented by the FPBGSA.

Experience Translating New Regulatory Programs in Approvable and Implementable Plans Based on Stakeholder Needs

The LWA Team has repeatedly demonstrated our expertise in understanding new regulatory programs and translating them into programs and plans that are understandable by the agencies that need to implement them. The LWA Team has been on the forefront of helping clients successfully implement new regulatory programs, including:

- TMDLs: LWA led the development of the first stakeholder developed Total Maximum Daily Loads in the State of California in the Calleguas Creek Watershed. The unique elements included in some of these TMDLs have supported agencies with meeting some TMDL requirements ahead of schedule and with fewer implementation costs.
- Recycled Water Policy: LWA, along with Hydrometrics WRI (now M&A), led development of the Lower Santa Clara SNMP that was the second SNMP adopted by the Los Angeles Regional Water Quality Control Board and the only SNMP adopted in the region to date that includes a flexible analysis structure to support the changing water resource management needs of the agencies preparing the plan.
- Agricultural Requirements: LWA has supported clients in Ventura County, Central Coast and Central Valley in complying with new agricultural requirements, including implementation of Waste Discharge Requirements in the Central Valley and incorporation of groundwater requirements in Ventura County.
- Water Quality Objectives: Successfully developed the first and only four site-specific water quality objectives adopted in the Los Angeles Region, resulting in reduced implementation costs for multiple clients.
- Los Angeles MS4 Permit: LWA led development of the Upper Santa Clara Enhanced Watershed Management Program (EWMP) which was the first EWMP approved by the Los Angeles Regional Water Quality Control Board and included a unique implementation schedule for the first five years of implementation that was based on the availability of funding for the City of Santa Clarita and Los Angeles County and Flood Control District.

> *"Larry Walker Associates has provided exceptional value to stakeholders through developing cost-effective solutions that meet regulatory requirements."* –Henry Graumlich, Calleguas Municipal Water District

3.0 Proposer's Background

The LWA Team has available and qualified staff as well as the management efficiency and flexibility to meet the needs of the FPBGSA and this contract. Comprised of individuals with relevant experience in groundwater resources management, the proposed personnel offer solid qualifications and experience in their field and are available for immediate assignment. The staff members will be available for the duration of the engagement starting from 90 days after the proposal due date, and changes to management and Team representatives will not occur without the FPBGSA's review and approval.

LWA utilizes a transparent management structure that offers the FPBGSA a single point of contact (POC) for the contract yet provides a management team that includes all the expertise necessary to complete this project and direct access to the project's technical staff leading the tasks. The project team will be led by PM, Dr. Diana Engle, who brings proven organizational and project management skills, experience with water resources in Ventura County through her role as a Director for the Meiners Oaks Water District and the Upper Ventura River Groundwater Agency. Ms. Ashli Desai will serve as principle-in-charge to add her strong track record in leading project teams to accomplish specific technical tasks and addressing complex regulatory issues. Dr. Foglia will serve as Assistant Project Manager to provide technical expertise and quality control for the project. As the primary and day-to-day POC to the FPBGSA, Dr. Engle will oversee the work performed for each task order, manage the contract, and ensure that work is completed on time and within budget. The project management team will be responsible for overseeing and coordinating all work and deliverables to be provided by subcontractors.

LWA will have the overall responsibility to the FPBGSA for the successful completion of all task orders and the delivery of high-quality project deliverables. The organizational chart ***(Figure 2)*** illustrates the project team composition and the functional relationships of the team members and primary personnel. Dr. Engle will work closely with Ms. Desai, Dr. Foglia, and the technical task leads and subconsultants to complete the project efficiently and effectively. RCS and M&A will provide valuable statewide expertise in groundwater management and experience in the Fillmore and Piru Groundwater Basins. LWA and the subconsultants have worked closely together as a seamless team on other groundwater management projects and have the capacity to undertake this important work.

Below are highlights of the credentials and experience for LWA's PM and other key personnel (Strategic Advisor and Task Leads), along with their assigned responsibilities. The project team has the unique experience, as well as the regulatory and technical expertise, to perform the tasks required to develop the GSPs. The staff members have worked together for many years, including on the projects provided in *Sections 2.0 and 5.0*, thereby offering a seamless and efficient team with complementary skills. Detailed information on personnel assigned to perform on this project, including technical knowledge, education, licenses, training, certifications, and relevant experience, is provided in *Appendix A. Key Personnel Resumes*.

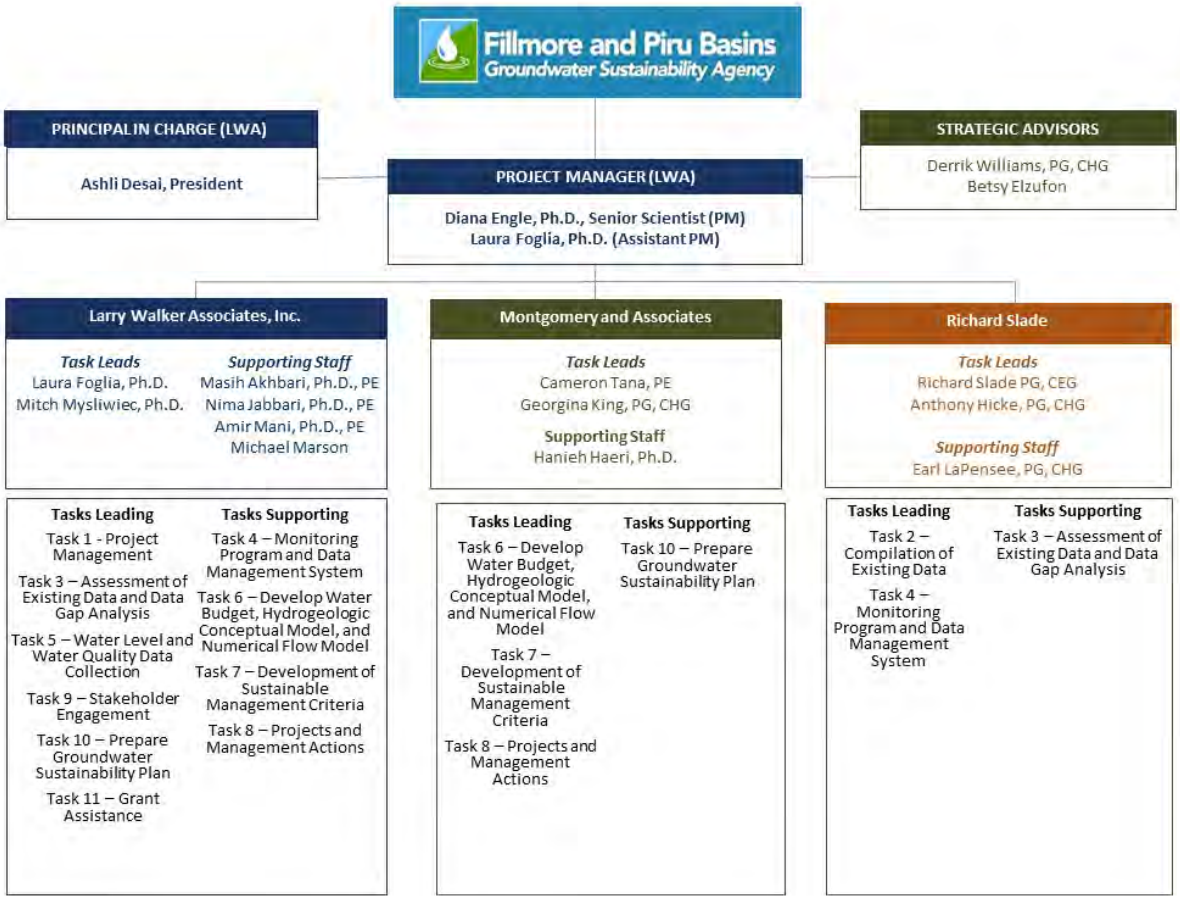


Figure 2 LWA Team Organization

DIANA ENGLE, PH.D.
Project Manager

Responsibilities:

- Overall project performance and execution
- Ensure regulatory and contract compliance
- Primary day-to-day POC, communication and coordination with the FPBGSA
- Establish and implement processes and procedures to effectively manage project and obtain effective input from the FPBGSA and stakeholders
- Review LWA and subcontractor work products
- Support analysis of groundwater dependent ecosystems and surface water interactions, project and management action assessment, and other technical tasks as needed

Diana Engle is a Senior Scientist managing LWA's regional office in Ventura, CA. As a Director of both the Meiners Oaks Water District and the Upper Ventura River Groundwater Agency, Dr. Engle has firsthand experience with SGMA- and GSP-related issues and challenges for basins affected by anadromous fish issues. Dr. Engle also serves as the alternate Director for independent water districts on the board of directors of the Association of Water Agencies of Ventura County. At LWA, Dr. Engle provides support on a wide variety of issues affecting water purveyors, and wastewater, stormwater, and agricultural clients related to NPDES permit and permit waiver renewals, WDRs, SGMA, TMDL and SSO compliance, legal actions, jurisdictional matters, points of discharge, water quality policies, and regulatory options for addressing 303(d) listings. Specific areas of expertise include surface- and groundwater interactions, water quality assessment and monitoring, contaminant source assessment, watershed balances, fate and transport of nutrients and other constituents, aquatic toxicity, algal and food web dynamics, impacts of effluent diversion and reuse, nutrient criteria development, pathogen monitoring and special studies, and other areas of nexus between water quality regulation and watershed science. Recent projects include salt and nutrient management plans, groundwater monitoring plans, TMDL implementation plans and special studies, continuous monitoring of salts, surface flow, and groundwater recharge, and agricultural BMP evaluation and tailwater monitoring.

Laura Foglia is a Senior Engineer at LWA and an Associate Adjunct Professor for the Land Air and Water Resources (LAWR) Department of the University of California, Davis. She has an M.S. in Physics and a Ph.D. in Civil and Environmental Engineering. Her work focuses on groundwater modeling with emphasis on model calibration and uncertainty analysis and applications to different watersheds to enhanced water management solutions. At LWA, she leads the groundwater services for the Ukiah Valley Basin and Siskiyou County Groundwater Sustainability Agencies, Omochumne-Hartnell Water District, and a number of other clients. She has specific interest and knowledge about modeling Groundwater Dependent Ecosystems and Surface Water/Groundwater interactions in general. She has also provided support on projects in the areas of hydrological modeling, groundwater management assistance, TMDL development, and she contributed to large projects involving water scarcity, salinity, and nitrate loads in the Central Valley, California.

LAURA FOGLIA, PH.D.
Assistant Project Manager

Responsibilities:

- Assist the Project Manager with communication and coordination with the FPBGSA and contract implementation
- Provide day to day management of resources and subcontractor, and work plan and schedule
- Review LWA and subcontractor work products
- Provide oversight regarding groundwater management and sustainability options
- Direct evaluation of criteria and analysis associated with understanding impacts to groundwater

At the LAWR Department at UC Davis, Laura teaches a graduate class on model calibration, supervises students, and works on assisting the development of a number of groundwater models worldwide. She has also worked for three years at the Technical University Darmstadt (TUDa), Germany, where she established successful classes on groundwater modeling and model calibration, and she developed proposals related to water resources management and tools to assist authorities and stakeholders complying with new EU Water regulations. Laura offers extensive knowledge about modeling and evaluating groundwater/surface-water interactions as well as experience, supported also by the academic teaching record, in communicating with stakeholder groups.

Ashli Desai is President of LWA and has more than 20 years of experience in managing complex watershed and sustainability project planning for clients throughout Southern California. Ms. Desai has successfully managed multi-stakeholder projects for development of SNMPs, TMDLs, EWMPs, and Water Quality Improvement Plans (WQIPs) throughout Southern California. She specializes in facilitating coordination between municipal agencies, stakeholder groups, and regulatory agencies to allow implementation of stakeholder developed strategies for sustainably managing water resources. Ms. Desai is currently a PM or Principal-in-Charge for multiple projects that involve surface water/groundwater interactions and the development of goals and management actions to meet multiple goals. She works closely with clients to understand how existing and upcoming regulatory requirements may impact their agency. In recent years, she has been emphasizing the relationships between the myriad of planning requirements municipal agencies are required to develop. With the introduction of SGMA, Ms. Desai has increasingly focused on identifying the relationship between surface water and water quality requirements with groundwater management actions required under SGMA to identify projects that will maximize benefits to municipal agencies. Ms. Desai is based out of LWA's Santa Monica office, but has spent the majority of her career working on projects in Ventura County. With her local stakeholder relationships, regulatory expertise, management role for LWA's groundwater projects in Southern California, and more than 15 years of experience in managing complex, multi-stakeholder planning processes, Ms. Desai is uniquely qualified to perform as the Principle in Charge for the Fillmore and Piru Basins GSP development. She has a B.S. in Earth Systems, Environmental Technology and an M.S. in Civil and Environmental Sciences and Engineering from Stanford University.

ASHLI DESAI
Principal in Charge

Responsibilities:
- Provide executive leadership and foster collaboration
- Provide strategic planning, budgeting, scheduling, and quality assurance
- Perform stakeholder engagement and public presentations
- Provide regulatory and other technical support as needed

MITCH MYSLIWIEC
Task Lead

Responsibilities:
- Oversee staff in modeling of surface water/groundwater interaction
- Oversee assessment of projects and management actions

Mitchell Mysliwiec, Ph.D., is an Associate Engineer at Larry Walker Associates. Dr. Mysliwiec has a B.S. in Civil Engineering from Syracuse University and M.S. and Ph.D. in Environmental Engineering from the University of California, Davis. Dr. Mysliwiec is an Associate Engineer with LWA and has over 18 years of experience in the environmental engineering field including wastewater and stormwater NPDES permitting, antidegradation analyses, mixing zone modeling, watershed modeling, and TMDL development. At LWA Dr. Mysliwiec assists communities in obtaining/renewing NPDES permits, stormwater management, and compliance strategies. He also is responsible for overseeing environmental modeling for NPDES special studies and in support of TMDL development. He has developed watershed scale models for salts, metals, sediment, and OP pesticides for the Calleguas Creek Watershed TMDLs. Using field studies and modeling

tools, Mitch has developed implementation plans for structural and non-structural BMPs to effectively meet TMDL allocations. To refine the requirements for meeting TMDLs, he has designed and implemented special studies for field work and water quality monitoring. Dr. Mysliwiec is working on systems integrating continuous sensors with a web accessible database for the real time evaluation of watershed conditions. Additionally, Dr. Mysliwiec assists communities bring technical analysis to effectively work with regulatory agencies and other stakeholder groups for collaborative problem solving and permit compliance strategies. He has prepared mixing zone studies utilizing the CORMIX model in combination with field measurements. He has designed and implemented dynamic model tools for determining copper, lead, zinc, and ammonia effluent limits for the City of Yuba City. Mitch is proficient in C++, java, and FORTRAN.

Cameron Tana, a CA professional engineer, is California Operations Manager and a Principal Hydrologist at M&A. He has 19 years of experience as an engineering hydrologist focused on assisting public agencies in California manage their groundwater resources. He is experienced at communicating technical findings to support improved groundwater management, while accounting for scientific, engineering, legal, economic, and political challenges.

CAMERON TANA, P.E.
Task Lead

Responsibilities:
- Coordinate needs for tasks, participate in meetings, provide including maintenance and support services as needed
- Lead and coordinate support staff
- Oversee all task activities performed by support staff with a focus on GSP preparation and hydrologeologic conceptual model

"We put them on a practically impossible schedule, which they met. We asked them to test about 10 different things, and they did it on schedule. We were amazed." – Dr. Steve Bachman, former UWCD Groundwater Resources Manager, on update of UWCD model

Cameron led the evaluation of constituent effects for the Lower Santa Clara River Salt and Nutrient Management Plan. He also provided technical support to United Water Conservation District (UWCD) in revising its previous regional groundwater model and reviewed the Upper Santa Clara River Chloride TMDL Groundwater / Surface Water Interaction Model, focused on effects in the Piru and Fillmore Basins.

In support of SGMA implementation for the Santa Cruz Mid-County Groundwater Agency, Cameron guided basin boundary modification and reviewed sustainable management criteria development and led modeling to estimate water budgets and evaluate management actions. He recently served as a guest instructor to the University of California Cooperative Extension short course *Introduction to Groundwater and Watershed Hydrology*, where he presented material on developing sustainable management criteria for seawater intrusion.

Cameron has served as Project Manager for studies conducted on behalf of Santa Clara Valley Water District to evaluate the economic benefits of its conjunctive use water management activities and its zones of benefit. In this capacity, he has effectively combined his groundwater expertise and training in economics to support funding for groundwater management.

GEORGINA KING, P.G., C.H.G.
Task Lead

Responsibilities:
- Coordinate development of Sustainable Management Criteria
- Support evaluation of hydrologeologic conceptual model and water budget
- Support assessment of existing data and identification of data gaps

Georgina King, a Professional Geologist and Certified Hydrogeologist, is a Senior Hydrogeologist at M&A with 25 years of experience in groundwater resource management and development. She has worked in both Northern and Southern California on numerous hydrogeologic studies, including water budgets, groundwater basin management, monitoring plans, and groundwater modeling.

Georgina led the characterization of groundwater basins and existing groundwater quality for the Lower Santa Clara River Salt and Nutrient Management Plan. She also was the Project Manager for the effort to develop water supply and demand estimates for Ventura County in 2013.

Georgina has worked on numerous SGMA projects along California's Central Coast. For example, she has provided technical support for SGMA related basin modification requests, helped prepare the alternative GSP submittals for the Pajaro Valley Sub-basin, and is managing the team providing technical guidance for development of the Santa Cruz Mid-County GSP. In the case of the latter, she is supporting ongoing development of sustainable management criteria for all six sustainability indicators and providing regular presentations to the stakeholder advisory committee.

RICHARD SLADE, PG, CEG
Task Lead

Responsibilities:
- Lead development of groundwater monitoring plan for GSP
- Provide expert review of GSP sections
- Provide insight into stakeholder

Richard Slade, PG, CEG, is President and a Principal Hydrologist with RCS. He maintains professional licenses as a PG and CEG in California. Mr. Slade has more than 51 years of groundwater experience in Southern California and has lived and/or worked in the San Fernando Valley as a groundwater geologist for his entire professional career. Mr. Slade has a B.S. and an M.S. in Geology from University of California, Los Angeles (UCLA) and University of Southern California (USC), respectively, and has conducted and/or managed/supervised more than 700 groundwater projects in many groundwater basins throughout California and virtually every recognized groundwater basin in Southern California that has active water wells. Since 2009, Mr. Slade has served the Superior Court as the court-appointed Watermaster for ULARA.

ANTHONY HICKE, PG, CHG
Task Lead

Responsibilities:
- Oversee compilation of existing data
- Coordinate with UWCD regarding existing data bases
- Support identification of data gaps

Anthony Hicke, PG, CHG, is a Senior Groundwater Geologist and PM with RCS and has been with the company since 2001. Major areas of groundwater work include numerous groundwater development projects, including well construction projects, groundwater basin evaluations, and aquifer testing studies throughout California for Municipal entities and agricultural clients. In addition, Mr. Hicke serves as the lead geologist during the creation of hydrogeologic conceptual models, including the management and utilization of large electronic databases of subsurface geologic data for use in preparing Hydrogeologic Evaluations of California Groundwater basins. Such evaluations include calculating estimates of underflow and groundwater in storage, review and analysis of water quality data; pumping data analysis, and performing groundwater in storage calculations. For previous basin study projects, Mr.

Hicke has managed multiple large databases of water level data, geologic data, and GIS data. Since Mr. Richard Slade's appointment as the ULARA Watermaster in December 2008, Mr. Hicke has performed the duties of the Assistant ULARA Watermaster

4.0 Negative History

The LWA Team is proud to affirmatively state that there is no negative history of alleged significant prior or ongoing contract failures, any civil or criminal litigation or investigation pending which involves LWA or any member of the LWA Team (which includes no judgements guilt or liable within the last 5 years).

5.0 Client References

The LWA Team's reputation is a direct result of the dedication of our professional staff and our commitment to fostering long-term relationships built on trust with our clients. Below are 10 public agency references who can attest to each firm's experience and past performance on projects with comparable services, including our ability to deliver work of the highest quality and our history of meeting schedule and budget requirements. While we have listed 8 references, we can provide additional references who can confirm our expertise, professional character and integrity, and proven processes that deliver projects on time, within budget, and to the satisfaction of our clients.

Reference 1. Ventura County Watershed Protection District and Lower Santa Clara River Stakeholders - Lower Santa Clara River SNMP

Client Name and Project Manager	Ventura County Watershed Protection District Gerhard Hubner (retired), now with Gerhardt Hubner Consulting P.O. Box 5743, Ventura, CA 93005 (805) 585-8752 hubnerg@icloud.com
Other Public Agency Reference Contacts:	Al Sexton, Laboratory Supervisor, City of Simi Valley 600 West Los Angeles Avenue Simi Valley, CA 93065 (805) 583-6446, asexton@simivalley.org Dan Detmer, United Water Conservation District 106 N. 8th Street Santa Paula, CA 93060 (805) 525-4431, dand@unitedwater.org
Project Dates:	6/2013 - 7/2015
Consultant Name and Role:	Larry Walker Associates (Lead Consultant), Hydrometrics WRI, now M&A (Subconsultant)
Key Personnel:	Ashli Desai (Project Manager), Georgina King, Cameron Tana

Project Description and Services:

Technical Competence: Lower Santa Clara River stakeholders sought and obtained Proposition 84 Integrated Regional Water Management Planning (IRWMP) Grant from the DWR for the development of a SNMP to meet the requirements of the State's Recycled Water Policy.

In 2013, the stakeholder group selected the LWA Team, consisting of Hydrometrics WRI, Carollo, and Rincon Consultants to develop the SNMP through a stakeholder process including a Technical Advisory Group (TAG), the Regional Water Board, and the Santa Clara River Watershed stakeholder committee. The TAG consisted of the Cities of Ventura, Oxnard, Santa Paula and Fillmore, the County of Ventura, the United Water Conservation District, and representatives of the agricultural community.

The LWA Team provided the following services:

- LWA developed the conceptual approach for the SNMP as a flexible planning document to guide

RELEVANCE TO RFP

- ✓ Experience in Fillmore and Piru Basins
- ✓ Experience with UWCD groundwater model
- ✓ Experience with DWR, LARWQCB
- ✓ Worked with multiple stakeholder agencies and addressed sensitive political issues
- ✓ Facilitated meetings and workshops with agencies and interested parties from the public
- ✓ Provided services directly applicable to GSA needs including: compile and manage groundwater data; describe groundwater conditions; identify sustainable management criteria and goals; identify projects and management actions to meet goals; develop groundwater monitoring networks and plans; and manage stakeholder processes
- ✓ Comparable in complexity, scale, and nature

management and regulation of discharges of salts and nutrients as projects are implemented in the future because water purveyors in the watershed are in the early stages of recycled water planning.

- LWA and Carollo identified management actions that could be used to offset salt and nutrient loadings to the groundwater basin. The process considered water resource needs, MS4 permit and irrigated lands program requirements, and wastewater planning to determine strategies that could meet multiple program goals.
- Hydrometrics WRI conducted groundwater modeling using UWCD model inputs and technical data analysis to develop thresholds for evaluating projects to meet water quality objectives and other sustainability requirements developed by the TAG.
- LWA led the stakeholder process including regular meetings with the TAG, meetings with LARWQCB staff, and briefings to the stakeholder committee.
- LWA coordinated with UWCD and Ventura County to develop the monitoring program that relies on a network of existing wells to provide a cost-effective means of characterizing water quality in the basin.
- LWA managed the consultant team, coordinated deliverables, held project meetings, and created a SharePoint site for the team to share draft work products. LWA provided regular reports to meet the grant reporting requirements.

All deliverables and reporting requirements were met in accordance with the project deadlines and time frame. LWA successfully negotiated and managed modifications to the project schedule driven by external stakeholders including the grant manager from DWR and the LARWQCB. The LSCR SNMP was adopted by the Los Angeles Regional Water Quality Control Board in July 2015. The SNMP was the second one adopted and includes an adaptable framework for evaluating projects that allows agencies to streamline permitting and approvals for recycled water projects that meet the SNMP requirements. By adopting the SNMP with an adaptable framework, the SNMP allows for flexibility in planning and project identification within the Fillmore, Piru, Santa Paula and Mound Basins and avoids the need to modify the Basin Plan if projects change.

Reference 2. Ukiah Valley Basin Groundwater Sustainability Plan Development, Mendocino County, CA

Reference (Company and Contact Person):	Ukiah Valley Basin Groundwater Sustainability Agency 501 Low Gap Road, Room 1010, Ukiah, CA 95482 Sarah Dukett, Senior Administrative Analyst (707) 463-4441 | uvbgsa@mendocinocounty.org
Dates of Service:	2018-present
Performed By:	Larry Walker Associates, Inc.
Key Personnel:	Laura Foglia (Project Manager), Tom Grovhoug (Principal/Technical Advisor), Amir Mani (Support Staff); Katrina Arredondo (Support Staff)

Project Description and Services:

Starting in 2018, LWA has led a consultant team to work with the Ukiah Valley Basin Groundwater Sustainability Agency (UVBGSA) in developing a GSP (UVBGSP) for the Ukiah Valley groundwater basin.

The LWA Team is assisting UVBGSA with evaluating the most cost-and resource-effective plan toward groundwater sustainability, in compliance with SGMA. Extensive communication with UVBGSA members and Ukiah Valley stakeholders ensures that groundwater management remains at the local level, while sustainably managing groundwater resources.

LWA's efforts include program management and client coordination; facilitation and outreach; analysis of existing data and evaluation of enhancements to the data collection network; supporting the GSA with application for Technical Support Services at DWR; evaluation and improvement of existing groundwater numerical flow model and water budget; coordination with neighboring subbasins and parallel efforts (USGS and SWRCB); development of sustainability goals, measurable objectives and management scenarios; development of UVBGSP implementation plan; and preparation of draft and final UVBGSP. Final outcome of the project is the GSP that needs to be completed by January 2022.

RELEVANCE TO RFP SCOPE

- ✓ Support Stakeholder Communication and Engagement (C&E) Process
- ✓ Perform Data Syntheses and Analysis
- ✓ Develop Hydrogeologic Conceptual Model
- ✓ Establish Groundwater Model Objectives, Evaluate and Select Model
- ✓ Develop and Analyze Baseline Scenario and Alternative Management Scenarios
- ✓ Document and Archive Groundwater Models
- ✓ Develop Sustainable Management Criteria and Management Actions
- ✓ Describe Monitoring Network Objectives
- ✓ Develop GSP Implementation Plan
- ✓ Prepare Draft GSP and Final GSP
- ✓ Data Management System
- ✓ Sustainable Groundwater Management Act (SGMA)
- ✓ Support for groundwater quality regulatory programs

Reference 3. Conditional Waiver and TMDL Compliance, Ventura County, CA

Client Name and Project Manager:	Ventura County Agricultural Irrigated Lands Group (VCAILG) John Krist, Chief Executive Officer Ventura County Farm Bureau P.O Box 3160, Ventura CA 93006 ,(805) 289-0155, john@farmbureauvc.com
Project Dates:	Start: 2004 Completion: Ongoing
Consultant Name:	Larry Walker Associates, Inc.
Key Personnel:	Ashli Desai (Senior Advisor), Diana Engle (Task Lead), Nima Jabbari (Support Staff), Amir Mani (Support Staff)

Project Description and Services:

Technical Competence: Since 2004, LWA has provided regulatory assistance to the Ventura County agricultural community through the local Farm Bureau for compliance with the Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands (Conditional Ag Waiver). LWA provided assistance with negotiating the terms of all three Conditional Ag Waivers adopted by the Los Angeles Regional Board. Following adoption of the first Conditional Ag Waiver, LWA coordinated the formation of the discharger group (VCAILG) and developed a membership database, which is currently maintained for over 1,100 enrollees over more than 75,000 irrigated acres.

RELEVANCE TO RFP

- ✓ Experience in the Fillmore and Piru Basins
- ✓ Engagement of interested parties and stakeholders
- ✓ Identification of projects and management actions
- ✓ Analysis of groundwater monitoring data and trends
- ✓ Development of groundwater monitoring networks
- ✓ Data management system development

Services provided include:

- A major addition to the 2016 Conditional Ag Waiver was the inclusion of certain groundwater requirements. LWA is leading the tracking of groundwater trends and the evaluation of management practices impact to groundwater quality.
- LWA developed and maintains a database for enrollment, parcel, ownership, grower records, education credits and the results of farm management practice surveys regarding agricultural best management practice (BMP) implementation. Websites have been designed and used for farmers to enroll in VCAILG and complete the BMP survey. Plans are underway to utilize the website for outreach and education purposes specific to farm location and assist in implementation of the Water Quality Management Plan. LWA contributes to education meetings informing farmers of their responsibilities for Conditional Ag Waiver compliance and the water quality monitoring data.
- LWA assisted with selection of all monitoring sites within the 3 major Ventura County watersheds and conducted site assessments to verify relevance to the monitoring program and safe access. LWA has led the Conditional Ag Waiver monitoring effort since commencement in 2007. LWA developed and maintains the monitoring database of all water, sediment, and fish tissue.
- LWA is responsible for the development of Water Quality Management Plans (WQMPs) triggered by exceedances of water quality "benchmarks". The WQMP process includes surveying growers to identify current Best Management Practice implementation and to provide outreach and guidance in areas that could be improved in order for agriculture to meet Conditional Waiver requirements. BMP implementation is now compulsory and must be tracked over time along with the completion of pesticide management plans and certified nutrient management plans, where required.

LWA has completed monitoring plans, annual reports, WQMPs, and special studies to meet requirements for three different conditional waivers, all of which have been accepted by the Los Angeles Regional Water Board. LWA has been under budget every contract year and has worked with the Farm Bureau to identify mechanisms to streamline and simplify the regulatory requirements for VCAILG members.

Reference 4. Calleguas Creek Watershed TMDL Development and Implementation, Simi Valley, CA

Client Name and Project Manager	Stakeholders Implementing TMDLs in the Calleguas Creek Watershed Ewelina Mutkowska, County of Ventura Watershed Protection District 800 S. Victoria Ave., Ventura, CA (805) 645-1382 ewelina.mutkowska@ventura.org
Project Dates:	Start: 1998 Completion: Ongoing
Consultant Name:	Larry Walker Associates, Inc.
Key Personnel:	Ashli Desai (Project Manager), Diana Engle (Project Lead), Mitch Mysliwiec (Task Lead), Amir Mani (Support Staff), Masih Akhbari (Support Staff), Nima Jabbari (Support Staff)

Project Description and Services:

Technical Competence: LWA has provided technical support to the Calleguas Creek Watershed Management Plan (CCWMP) process since 1998 and has assisted in watershed planning, monitoring, and management activities. The CCWMP includes agricultural dischargers, municipal dischargers, and wastewater dischargers.

RELEVANCE TO RFP

- ✓ Experience in Ventura County
- ✓ Engagement of interested parties and stakeholders
- ✓ Identification of projects and management actions
- ✓ Analysis of groundwater monitoring data and trends
- ✓ Implementation of new regulatory programs
- ✓ Data management system development
- ✓ Comparable in complexity, scale, and nature

LWA assisted the CCWMP with development of Third Party TMDLs for nitrogen, salts, metals, bacteria, toxicity, organochlorine pesticides and PCBs as well as provided support for Los Angeles Regional Board-developed TMDLs for trash and sediment. For the Third Party TMDL development, LWA developed Work Plans following USEPA procedures for developing TMDLs. The work plans developed by LWA for the CCW included an assessment of the impaired water body listings and water quality objectives in the watershed, identification of sources, and the development of TMDL implementation strategies. The Work Plans also included field monitoring programs, which were designed and conducted by LWA to support TMDL development. TMDL reports developed by LWA for the CCWMP have, to-date, formed the basis for five TMDLs adopted by the State. All of the TMDLs were adopted without significant opposition by any stakeholder or non-governmental organization.

During the metals TMDL development, LWA identified alternative approaches to addressing copper and zinc, which was found to no longer be exceeding water quality objectives. For zinc, the TMDL included targets, but no allocations and only monitoring is required to ensure zinc levels stay below water quality objectives. For copper, a water-effect ratio (WER) was completed by LWA for the lower portion of Calleguas Creek and Mugu Lagoon. The WER was adopted as a site-specific objective (SSO) by the Regional Board on November 9, 2006, the first such SSO adopted in the Los Angeles region. The SSO has resulted in the watershed being in compliance with the TMDL targets for copper.

Since 2006, LWA has been coordinating the implementation of all TMDLs in the Calleguas Creek Watershed, including those developed as Third Party TMDLs and those developed by the Regional Board. LWA is responsible for tracking and conducting all special studies, conducting compliance monitoring, and performing reporting requirements. Additionally, LWA provides guidance for implementation of best management practices and manages the implementation schedule.

Special studies being conducted or previously conducted by LWA:

- Urban and agricultural water quality management plans and source identification studies
- Sediment transport and impacts study
- Monitoring and identification of high concentrations of pesticides and metals in soils
- Algae quantification and nutrient source and loading studies
- Groundwater selenium studies, including the evaluation of natural sources of selenium
- Development of a SNMP for the Arroyo Santa Rosa, Arroyo Las Posas and Simi Basins

LWA is also currently developing a comprehensive implementation plan for all TMDLs and other water quality priorities in the CCW. The implementation plan includes identification of water quality priorities through an extensive evaluation of water quality data. The models originally used for TMDL development were updated and then used to conduct an evaluation of existing and planned control measures identified to address pollutants that are exceeding water quality objectives. Control measures for urban dischargers, agricultural dischargers, and wastewater treatment plants were identified and opportunities for regional projects with multiple benefits were evaluated.

As noted above, LWA has successfully supported the Stakeholders with development of a wide range of technical work products, many of which have the first of their kind to be approved by the regulatory agencies in the Los Angeles Region. LWA's work in the watershed has involved surface water and groundwater requirements and we routinely support stakeholders with identification of implementation strategies that can meet multiple requirements. We are currently working with the Stakeholders to identify mechanisms to coordinate SNMP and TMDL strategies with the GSP being developed by the Fox Canyon Groundwater Management Agency. LWA has been under budget every year of our implementation contract and has met multiple tight regulatory deadlines for completion of the required work products.

Reference 5. Santa Cruz Mid-County Groundwater Sustainability Agency Support, Santa Cruz, CA

Organization Contact:	City of Santa Cruz Rosemary Menard, (831) 420-5205, rmenard@cityofsantacruz.com
Project Dates:	Start: 2016 - Present
Consultant Name:	HydroMetrics WRI (Now Montgomery and Associates)
Key Personnel:	Georgina King, Cameron Tana

Project Description and Services:

Technical Competence: HydroMetrics WRI (now M&A) provided technical support to the GSA formation committee during the GSA formation process. Based on HydroMetrics WRI's input, all of the signatories to the GSA clearly understood the basin's condition, and each GSA members' contribution to the basin condition.

At the same time, HydroMetrics WRI successfully applied for a basin boundary modification, combining parts of four basins into a single basin and excluding fringe areas of the basin that do not impact groundwater management.

RELEVANCE TO RFP

- ✓ Working with GSAs and stakeholder groups.
- ✓ Development of sustainable management criteria
- ✓ Characterization of basin settings basin conditions.

M&A is currently providing technical assistance to the GSA to develop the GSP, focusing on presenting options for sustainable management criteria to the GSP advisory committee of stakeholders. We are working with the GSA to map out the decisions that must be made over the next two years. Included in this ongoing contract is assistance developing the sustainable management criteria, assistance defining the basin setting, and groundwater modeling to assess the impacts of various groundwater management projects or actions. Final outcome of the project is the GSP that needs to be completed by January 2022.

Reference 6. Department of Water Resources Sustainable Groundwater Management Act Implementation, Sacramento, CA

Organization Contact:	California Department of Water Resources Trevor Joseph, Supervising Engineering Geologist 901 P Street, Sacramento CA 95814, (916) 651-9218 Trevor.joseph@water.ca.gov
Project Dates:	Start: 2017 - Present
Consultant Name:	Montgomery and Associates
Key Personnel:	Derrik Williams

Project Description and Services:

Technical Competence: Drafting and developing the best management practices and guidance for implementing Sustainable Groundwater Management Act (SGMA)

Developing tools for DWR to accept data and Groundwater Sustainability Plans (GSP) as they are delivered by various Groundwater Sustainability Agencies (GSA)

Strategizing how to identify the most important and critical parts of a GSP, and working with DWR to develop the data sets and information that GSAs can use in their GSPs.

RELEVANCE TO RFP

- ✓ Understanding of GSP requirements and process
- ✓ Relationship with DWR staff
- ✓ Understanding of SGMA data management process

As part of this contract, we meet with DWR regularly to formulate statewide SGMA policy and draft policy documents. The final outcome was the draft best management practice documents.

Reference 7. Hydrogeologic Conditions in the Alluvial and Saugus Formation Aquifer Systems

Organization Contact:	Keith Abercrombie, Chief Operating Officer, SCVWA (661) 297-1600| kabercrombie@scwater.org
Project Dates:	Start: 1987 Completion: Ongoing
Consultant Name:	Richard C. Slade & Associates LLC
Key Personnel:	Richard Slade (Project Director), Earl LaPensee (Project Manager), Anthony Hicke (Task Lead)

Project Description and Services:

Technical Competence: Since 1985, RCS has been involved with numerous hydrogeological studies and well construction, and well rehabilitation projects for several agencies in the Santa Clara River Valley, namely: Castaic Lake Water Agency (CLWA), Newhall County Water District (NCWD), Santa Clarita Water Division (SCWD), and Valencia Water Company (VWC). In January 2018, each of these agencies formally merged into one entity: the Santa Clarita Valley Water Agency (SCVWA) and RCS continues onward with its role for this regional agency.

RELEVANCE TO RFP

- ✓ Expertise in regional geologic and hydrogeologic conditions.
- ✓ Experience in compiling and interpreting datasets to create a hydrogeologic model of a groundwater basin
- ✓ Designated as Monitoring Entity for the DWR CASGEM program

Complexities and tasks included:

- RCS performed the first major basinwide hydrogeological and perennial yield groundwater studies wherein the key aquifer systems (the shallow alluvial system and the Saugus Formation) were identified and evaluated in detail. This initial study achieved a characterization of the hydrogeologic conditions of the groundwater basin up to that time through the use of oil-well electric logs (E-logs), water well E-logs, and available driller's logs for these wells. These logs

enabled RCS to correlate the depths and thicknesses of the alluvial and Saugus Formation throughout the Santa Clara River Valley East Subbasin. The initial studies were updated in 2001, with the acquisition of new data derived from the drilling and construction of new wells in both aquifer systems. These studies by RCS provided the basis for later groundwater modeling activities now being performed by others for the SCVWA.

- Based on the conceptual model, RCS was involved over the years in the siting, design and construction of 15 alluvial-supply and 4 Saugus Formation water-supply wells. RCS was also involved with the development of well destruction guidelines for the region and provided technical support in the destruction of 19 old alluvial and Saugus Formation cable tool water-supply wells.
- RCS is the current Monitoring Entity (ME) of the SCVGB for the Department of Water Resources (DWR) California Statewide Groundwater Elevation Monitoring (CASGEM) Program. Through this program, RCS administers and manages water level data from selected wells throughout the valley, providing input to the online CASGEM data portal.

Reference 8. Santa Paula Basin Hydrogeologic Characterization and Safe Yield Study Ventura County, CA

Organization Contact:	Mauricio Guardado, Jr., General Manager, United Water Conservation District (805) 525-4431 | mauriciog@unitedwater.org
Project Dates:	Start: October 2014 Completion: May 2017
Consultant Name:	Richard C. Slade & Associates LLC
Key Personnel:	Richard Slade (Project Director), Anthony Hicke (Project Manager)

Project Description and Services:

Technical Competence: RCS provided an independent and detailed definition of a hydrogeologic conceptual model of the Santa Paula Groundwater Basin to help better understand the hydrogeology of the basin, and to describe the movement of groundwater into and through the basin. To do so, RCS created detailed hydrogeologic cross sections of the basin by correlating key marker beds detected on available geophysical electric logs of oil wells, production water wells, and monitoring wells. Using those subsurface interpretations, and groundwater elevation data, RCS calculated the estimated amount of groundwater underflow that entered and exited this groundwater basin. Ultimately the work was used to help re-calculate the safe yield of the groundwater basin.

RELEVANCE TO RFP

- ✓ Direct Coordination with United Water Conservation District Technical Staff
- ✓ Experience in compiling and interpreting datasets to create a hydrogeologic model of a groundwater basin

Complexities and tasks included:

- Coordination with United Water Conservation District (UWCD) to access and efficiently parse their significant electronic database for data necessary for the subject work. Data needs included electric logs, well completion reports, water level data, and water quality data. Compilation of data not included in UCWD's database was also performed, including data from the local municipal water purveyor.
- Created multiple geologic cross sections using geophysical electric log (E-log) correlations to illustrate subsurface geologic conditions in the groundwater basin, and created multiple maps to illustrate spatial and temporal differences/changes in water elevation and water quality.

6.0 Project Proposal

California's SGMA was passed in 2014, with subsequent regulations promulgated in 2016. Under SGMA, all groundwater basins in the state are required to be managed sustainably at the local level. Our fundamental goal for this project is to collaboratively work with the recently-formed FPBGSA to support the development and implementation of GSPs for the Fillmore and Piru Groundwater Basins. The LWA Team will work with United Water Conservation District (UWCD) and the other member agencies of the FPBGSA including: the City of Fillmore, Ventura County, Fillmore Basin Pumpers Association (FBPA), and the Piru Basin Pumpers Association (PBPA) to develop GSPs for the Basins that satisfy the requirements of SGMA, address issues unique to the Basin and reflect the goals of the FPBGSA member agencies and other interested parties and stakeholders.

Our understanding of the project and approach to the project as described in the RFP is provided below.

6.1. Understanding of the Project

Unlike other basins scheduled for GSP development, the Fillmore and Piru Basins do not have existing critical overdraft. However, due to the high dependence on groundwater for municipal, domestic, agricultural, and environmental needs, our understanding of the project is to create GSPs that embody a vision for sustainable future ongoing use and management of the basin, while recognizing greater Santa Clara Watershed real-world constraints on groundwater use.

In essence, we see the GSP as a mechanism for pulling together numerous goals and interests to create a shared vision for the Basin that is based in the reality of existing constraints, potential future impacts (if not appropriately managed), and climate change. In addition, the GSP must be supported by strong technical analysis, stakeholder buy-in into the vision and supporting analysis, and acceptability to DWR by meeting all SGMA requirements.

The primary goal of this project is to develop GSPs that support effective management of the Basins to maintain or improve the quantity and quality of groundwater in the Basins and optimize the public benefits of the groundwater resource. The LWA Team will support UWCD (as the coordinating entity for the FPBGSA) in achieving this goal and managing all the elements of the process to develop the GSP. This will include stakeholder outreach, coordination with member agencies, and overall project management with the goal of an efficient process that results in a sustainable plan for managing the local groundwater resources.

6.2. Project Approach

The LWA Team has extensive experience in managing stakeholder-driven processes to develop effective and compliant planning documents. We will use our proven approach to efficiently gather and process existing data and information, facilitate stakeholder input, and identify flexible and yet cost-effective implementation measures to support groundwater sustainability. We will use our in-depth local knowledge and technical expertise to leverage existing data and the modeling tools under development, while providing an outside review of the tools and existing analyses to identify any needed modifications or adjustments.

The LWA Team also recognizes the need to conduct a process that is understandable to key stakeholders and supports effective collaboration among the GSA member agencies and communication with DWR and to the extent possible all interested stakeholders. A key aspect of our approach is upfront stakeholder and visioning work help so that varied interests are understood prior to initiating the key technical work. This will allow the approach to the technical work to be informed by a bigger picture perspective. While not all interests may directly fall under the scope of SGMA, understanding and considering the impact and

relationship of the GSP to other programs (e.g. stormwater compliance) will allow for development of a GSP that is holistic in supporting overall sustainability goals.

The development of a GSP is complex and involves substantial, interrelated technical work. The LWA Team will conduct the work using the guidance and tools provided by DWR and align the work with the DWR developed Best Management Practices (BMPs), tailored to meet the local conditions. The LWA Team's general approach to the project involves four major steps:

1) **Setting the foundation for a successful GSP**. This will be done through identifying upfront processes, communication plans, and key decisions and points for working with the FPBGSA, UWCD, adjacent groundwater basins, and stakeholders. This step also includes notifying DWR and establishing protocols for meeting and engaging with this agency throughout the development process. Finally, needed data and technical information will be identified and procedures for managing and using the data will be developed so that data are easily accessible and required information can be provided to DWR in the recommended format.

2) **Understanding the broader context for the GSP development.** This step will identify related activities and requirements that should be considered during GSP development. This will be accomplished using our understanding of the Los Angeles Regional Water Board and State Water Resources Control Board (SWRCB) requirements, Ventura County MS4 permit, and recycled water plans in Ventura County combined with input from the FPBGSA member agencies and interested stakeholders. As part of this step, the LWA Team will seek to understand the interests of the FPBGSA members and key interested stakeholders. All this information will be used to inform the identification of beneficial uses and development of the sustainability goal for the Basins.

3) **Developing the GSPs**. This step forms the bulk of the work and will consist of multiple technical tasks (as detailed in the proposed scope of work below), stakeholder engagement, and project management. Based on our previous work on these types of projects, we anticipate developing initial materials or presentations in coordination with UWCD that will allow the FPBGSA to provide feedback on our proposed approach to key elements of the GSP. Once the approach is agreed upon, the LWA Team will conduct the work in coordination with UWCD to prepare the administrative draft sections of the GSP for review by the FPBGSA. After comments from the FPBGSA have been incorporated, the drafts will be provided to the stakeholders for review. Comments from interested stakeholders will be incorporated into the draft GSP document. We will support efforts to gather early input from interested stakeholders on the approach to developing the sustainability criteria and projects and management actions. We will work with the FPBGSA to identify the key decision points and interested stakeholders to engage at various points in the GSP development.

6.3 Scope of Work

The scope of work presented in this section is provided below consistent with the workflow described in the RFP. We anticipate an interactive process for GSP development with some subtasks being conducted in parallel. An overview of the schedule is provided in *Section 7.0* to provide a clearer understanding of the project work flow. This scope of work provides a detailed discussion of the tasks necessary to develop a successful GSP.

Task 1. Project Management

Our extensive experience working with a diverse set of entities in Ventura County will allow us to communicate effectively and develop work products that are understandable and accessible. We are experienced at explaining complex hydrogeological data and model results to audiences ranging from

laypersons to academics and will apply those talents in explaining investigative results to all interested parties (stakeholders) and customers.

Subtask 1.A. Project Administration

Given the complexity of the work effort and the need to communicate with and involve a diverse set of interested agencies and stakeholders, the LWA Team has developed a proposed Project Management Plan to specifically identify how we will manage this work effort to ensure that the project: (a) maintains clear lines of communication, (b) informs and receives input from the interested stakeholders on an ongoing basis, (c) stays on schedule, and (d) stays within budget. This Project Management approach has been used successfully with other complex stakeholder-driven projects, including the projects provided in *Section 5.0* to ensure completion of quality work on time and within budget.

The project management and coordination activities that will be utilized by the LWA Team include developing a document sharing structure and project charter to ensure all staff and subcontractors have access to necessary information. Regular LWA Team meetings will be conducted to ensure work products are developed on time and budget. These activities will be employed to maintain a clear focus on the assignments, to clearly communicate progress on the necessary technical information, to receive early feedback from the FPBGSA, and to apply the knowledge gained most effectively.

The LWA Team includes a PIC, PM, APM, Technical Staff, and subconsultants, with technical guidance provided by LWA, RCS, and M&A staff. At the start of the project, we will clearly define roles and lines of authority to ensure the most efficient performance possible. ***Dr. Engle, LWA PM, will coordinate and work closely with the LWA Team, the FPBGSA and UWCD*** to ensure that the LWA Team meets the time schedule and provides high quality and technically accurate deliverables. To achieve program performance standards and outcomes, Dr. Engle will use the performance management process outlined below throughout the duration of the project.

- **Project Management -** The LWA PM will provide overall project management and oversight for all task assignments and will be the day-to-day contact for the project. The LWA PM will oversee tasks in progress and work closely with the Technical Task Leads to ensure that the work meets overall project needs and is completed on schedule and within budget.
- **Coordination & Communication** - The LWA PM will serve as the primary POC for the team, providing clear, constant, consistent, and honest communication with the FPBGSA and the LWA Team. The LWA PM will respond to requests in a concise and timely manner.
  - Email - All email communication from Team members to the FPBGSA will be copied to the LWA PM. Communication on administrative and general technical aspects of the projects can be provided to the LWA PM for review and distribution. Any questions on the work (scope, schedule, and budget) will be communicated to the LWA PM.
  - Progress Conference Calls –The LWA PM will have scheduled check-in calls with the FPBGSA POC at an agreed upon frequency.
- **Subconsultant Coordination** - The LWA PM and APM will be responsible for notifying subconsultants about task schedules and budgets and communicating with subconsultants to identify challenges that arise during the course of the work. However, to facilitate effective communication, subconsultants may communicate with key individuals directly to promote their understanding of the project requirements. The LWA PM and APM will be copied on all email correspondence for each task to help with monitoring of task status.
- **Schedule and Budget** - The LWA APM will maintain a master schedule with the due dates and budget for each task. Use of scheduling tools will help facilitate clear communication between the Team and

the FPBGSA to identify progress and scheduling constraints, as well as set upcoming deliverables and review times.

- **Task Coordination** - The LWA PM and/or APM will also participate in task-level conference calls and meetings as needed to ensure project goals and requirements are understood and integrated into task work plans. The LWA PM or APM will communicate with each Task Leads to ensure that work products are completed on schedule and budget.
- **Quality Control (QA/QC)** - The LWA PM and APM will lead the implementation of the QA/QC approach to verify that the work products meet established goals, and the project processes used to manage and develop the work products are effective. LWA's QA/QC approach involves participation by all project staff, subconsultants, FPBGSA, and any other applicable interested parties. Task Leads will review task deliverables before submittal to the LWA PM or APM for review. Results of key analyses affecting important decision points and draft work products will be reviewed by the Strategic Advisor or external experts as needed.
- **Administrative** - The LWA PM will be responsible for administrative tasks associated with this project, including the development and execution of sub-agreements with subconsultants. Sub-agreements will clearly identify the subconsultant roles and responsibilities, as well as scopes, budgets, and schedules, described in this proposal, or as potentially adjusted/revised during subsequent negotiation.

Subtask 1.B. Work Plan

The LWA Team will work with FPBSGA and UWCD to formalize this scope of work into a Work Plan. In the review and approval process of the Work Plan, the persons, organizations, and agencies will be assigned to each of the tasks. Discussion of the tasks in the Work Plan will include collaboration with UWCD and defined responsibilities for the components of the task. The center point of the work plan will be the Gantt Chart of activities and meetings necessary to build the GSPs for both basins so they will be acceptable to both FPBGSA and DWR.

Subtask 1.C. Kickoff Meeting

The LWA Team will present the Draft Work Plan to the FPBGSA at a Kickoff meeting. The agenda for the meeting will include overall activities necessary to complete the GSPs, responsibilities of data and data transfer, and how and who will perform the tasks as outlined in the draft Work Plan. The discussion during the Kickoff meeting will be incorporated into a revised Workplan that will be submitted to FPBGSA for approval.

Subtask 1.D. Monthly Progress Meetings and Reporting

The LWA Team will assist in the coordination and facilitation monthly meetings with the FPBGSA representatives. These meetings will form the core of the decision-making and input process for the GSP. While all elements will be provided for input to the interested stakeholders and broader community, the member agencies will provide the day-to-day guidance and direction for the project. As a result, these meetings will be critical for ensuring that the project is successful. Based on the LWA Team's experience with projects similar to GSP development, the effectiveness of these meetings is one of the most critical elements to the success of the project.

LWA will work with the FPBGSA to develop a project charter or other guiding documents for communication and decision-making within the FPBGSA member agency meetings. Based on past experience, successful communication and engagement by this group is one of the most critical factors for project success.

As a result, the LWA Team has developed strategies to support gathering effective feedback and facilitating decision-making through these meetings. Strategies include providing concise presentations and/or other meeting materials that outline approaches or impacts of key decisions ahead of the meetings. Agendas are prepared that include the desired outcomes or goals for each meeting and each agenda item. The LWA Team then presents the requisite materials at each respective meeting and leads a discussion to achieve the outlined goals for the meeting. The LWA Team will also provide updates to the FPBGSA representatives on project status and schedule and discuss the overall process and upcoming work products and decisions.

For these meetings to be successful, it is critical that a process be established to allow decision making and resolution of conflicting opinions within the FPBGSA. The LWA Team will work with the FPBGSA to develop a project charter or procedures that can be used throughout the project.

The LWA Team will also work with the UWCD representative to develop a procedure for setting up and distributing meeting materials. The proposed scope of work assumes that the UWCD representative will be responsible for setting meeting dates and identifying meeting locations and the LWA Team will prepare the agenda, presentations and meeting materials for each meeting with input from UWCD staff as needed. The LWA Team will chair meetings, facilitate the discussions and provide presentations or identify the appropriate FPBGSA representatives to present as applicable. LWA will prepare draft meeting summaries with identified action items within 1 week of each meeting, and final meeting summaries, based on review by the FPBGSA, will be available with the next month's meeting notice.

Subtask 1.E. Conduct Staff Workshops

The specific objectives of the workshops will be to educate FPBGSA board members, stakeholders, members of the public, water management agencies, and others identified during the GSP development process on the different aspects of the GSP development. Public workshops provide an excellent platform for increasing the visibility of an issue and inviting community members to get involved and feel invested in the FPBGSA's project. The workshops serve as the ideal opportunity to listen to the vocal supporters and opponents, which is the critical first step in getting community buy-in. The specific topics for the workshops will be determined in consultation with the FPBGSA, but a draft list of potential stakeholder workshop topics include:

- *Basin Boundaries:* focusing on the basin characteristics and achieving a common understanding of groundwater conditions.
- *Past Groundwater Management Actions:* providing background information on past actions, limitations, and successes.
- *Proposed Groundwater Management Actions:* to provide a common understanding of the feasibility of proposed groundwater management actions.
- *Santa Clara River Basins Groundwater Flow Model:* presentation of the model assumptions, appropriate use of the model, and model limitations.
- *Groundwater Dependent Ecosystems in Basins:* descriptions of the potential groundwater dependent ecosystems (GDEs) in the basins and the hydrologic features of these GDEs.

Subtask 1.F. Agency Coordination

Building off the DWR Guidance Documents including the January 2018 Stakeholder Communication and Engagement Guidance Document, the LWA Team will develop and establish a Project Communication Plan (CommPlan) and then execute the CommPlan for the efficient and effective coordination of internal/external communications and to support stakeholder engagement efforts under Task 9.0. The CommPlan will be an iterative document that is updated as needed throughout the project term. This will ensure the most up-to-date information related to project communication is contained in the CommPlan.

A key element of the LWA Team's approach is to gain early input on the potential future uses, stakeholder interests, potential issues of concern, FPB beneficial uses and other requirements faced by the FPBGSA. This input will inform the approach for the technical work.

Subtask 1.G. Presentations

As noted above, the LWA Team, in conjunction with UWCD where appropriate, will prepare appropriate presentation, handouts, and other meeting materials.

Task 1 Deliverables:

1. *Draft work Plan*
2. *Final work plan*
3. *Monthly progress reports*
4. *Meeting minutes*
5. *Presentation slides and handouts*

Task 2. Compilation of Existing Data

For this task, the LWA team led by RCS will compile the data necessary for the development of the GSP. RCS is aware that UWCD maintains a significant database related to groundwater and surface water for the Fillmore and Piru Groundwater basins. RCS has a historically-strong working relationship with UWCD staff and most recently interacted with UWCD Staff as part of work in the Santa Paula Groundwater Basin.

Significant data for the Basins will be derived/compiled from the data sources for the 2014 and 2015 "Piru & Fillmore Basins Biennial Groundwater Conditions Report," prepared by UWCD. That UWCD report includes data on precipitation, groundwater levels, surface water flows, surface water and groundwater quality, and other data pertinent to the GSP. That report is currently available on the UWCD website. RCS will coordinate with UWCD to receive current datasets that are used to prepare that document for use as part of the subject GSP work.

Other key data compiled, as available, for the GSP work will include:

- Accurate location information (GPS data plotted in a GIS database) of currently known water-supply wells (owned by the City of Fillmore, by the local mutual water companies (MWCs), and private citizens); groundwater monitoring wells; and surface water gaging stations, proximal rainfall stations, and significant spring sources.
- A topographic base map of the area, and a digital elevation model (DEM) of the Basin.
- GIS-based watershed boundaries, groundwater subbasin boundaries, "water agency" boundaries, and/or MWC boundaries.
- State Department of Water Resources (DWR) well completion reports (driller's logs) and casing records of known, historically-drilled, private- and municipal-supply water wells in the Basins, including geophysical data where available. RCS will determine whether or not the UWCD internal database has been compared to the data available from the new California online Well Completion report tool by DWR.

- Well drilling data from the various MWCs in the area. RCS will determine with the help of UWCD if well data for the two MWCs in the Piru Basin and the 12 MWCs in the Fillmore Basin have provided the most-current data to the UWCD database.
- Geologic logs and available electric logs of monitoring wells drilled and/or constructed in the Basins, including these data from the MWCs. This includes data derived from the California Geological Survey (CGS) online Borehole Database.
- Geologic and geophysical data for the wildcat oil wells drilled over the years in the Basins to help identify the thickness of water-bearing sediments and the depth to the underlying nonwater-bearing bedrock at those drill sites. The bottom of the water-bearing sediments represent the base of fresh water in the Basins. UWCD maintains a significant repository for these types of data, and RCS will cross reference the current California Division of Oil, Gas, and Geothermal Resources (DOGGR) dataset to check for any newly available data are available.
- Hydrogeologic characterization of key aquifer/aquicludes, as available from pumping test data and existing modeling efforts within the Basins; all available aquifer test data and calculations by others for the hydrogeologic properties of the aquifers (transmissivity, storativity and hydraulic conductivity; T, S, and K, respectively. Some of these data are readily available to this project team, because LWA and M&A completed the Salt and Nutrient Management Plan work for the Piru and Fillmore Basins. In addition, because of RCS's prior work for the City of Fillmore, RCS may have data in their in-house files that may not exist in the current UWCD database.
- Geologic fault data prepared over the years to display the locations, names and alignments of various faults in/near the Basins. This includes data from recent CGS fault mapping of the region which do not tend to display some of the fault structures postulated previously by others to be subbasin boundaries within the Basins.
- Soil surveys, including maps in GIS format (as available) and soil characteristics within the Basin.
- Climate data, including precipitation from area raingages and potential evapotranspiration (PET) data over time from climate and CIMIS (California Irrigation Management Information System) stations.
- Historical and current land use information and aerial photos to evaluate extent and density of urbanization, current agricultural uses, streams (channelized or unchannelized), and natural vegetation including riparian areas.
- Additional water supply information, including imports to the Basins, recycled water, and groundwater pumping amounts over time for the Basins and the adjoining hill/mountain areas, as well as water used for municipal, industrial, remediation, dewatering, agricultural, landscaping, and domestic purposes.
- Wastewater disposal practices, including location and extent of sewered and unsewered areas within the Basins.
- Groundwater elevation contour maps and change maps for different time periods.
- Groundwater quality data from known wells and groundwater monitoring wells, and from local leaking underground storage tanks (LUST) data from the GeoTracker website.

In addition to the data above, LWA and M&A will compile data associated with surface water flows and surface water quality in the Santa Clara River. Significant work has been completed by the team members as a part of the Salt and Nutrient Management Plan in 2013-2015. Data compiled will include:

- Surface water locations and hydrology
- Land use
- Groundwater dependent ecosystems
- The possible presence of threatened or endangered species

***Task 2 Deliverables*:**

1. *Digital Library*

The data will be compiled and organized into a digital library. File types will consist of Excel files, Access database(s), or ESRI shapefiles, consistent with the current digitization of each dataset by UWCD. As prescribed in the RFP, the digital library will include:

- A well inventory for the Basins
  - Wells included as part of the inventory will be existing and/or destroyed water supply wells, monitoring wells, and oil wells
  - These data will include geologic data, geophysical data, and well completion reports
- Well production records
- Groundwater elevation data
- Groundwater and surface water quality data
- Precipitation data
- Stream gage data
- Groundwater dependent ecosystems

In addition to the list above, the project team proposes a references database that includes references necessary for the GSP development (assuming inclusion will not violate any copyright or privacy restrictions that may exist for those documents).

Task 3. Assessment of Existing Data and Data Gap Analysis

Available hydrogeologic subsurface data identified in Task 2 will be evaluated by the LWA Team in coordination with UWCD in comparison to the needed data required for GSP development and create a Data Gap Analysis Report. The Santa Clara River Basins Model has been used to identify the need for two additional monitoring wells in the boundary area between the Fillmore and Piru Basins and the Fillmore and Santa Paul Basins. Installation of these wells is part of the Planning Grant awarded to the FPBGSA. The team will identify other key data gaps in the Basins to serve as a reference for areas of future study when funding for such studies may become available.

The Data Gap Analysis Report will identify data gaps through the process identified above and in consideration of the hydrogeologic conceptual model, water balance, modeling, and sustainability indicators developed throughout execution of this scope of work. These data gaps may include augmented surface water data collection, subsidence monitoring, and other data needs. Resolution of data gaps will be addressed in the GSP Implementation Plan. Update of the GSP every five years will include ongoing evaluation of the monitoring network (Reg. § 354.38).

Task 3 Deliverable:

1. *Technical Memo: Data Gap Analysis Report*

Task 4. Monitoring Program and Data Management System

For this task, RCS, as task lead, will evaluate the existing monitoring network in coordination with UWCD that has been developed over time by UWCD, and described in the "Piru & Fillmore Basins Biennial Groundwater Conditions Report." In addition, RCS and the project team will consider data collected as part of the Salt and Nutrient Management Plan developed for the Basins. In coordination with UWCD, RCS and the project team will develop a Technical Memorandum (deliverable) that includes the following:

- Documentation of the existing data collection methods and protocols practiced by UWCD and other agencies who collected data for the existing monitoring work

- Recommendations for improvement of the monitoring network with respect to data gaps identified by the project team as a result of the GSP preparation, including:
    - Ability of the monitoring program to meet SGMA reporting standard requirements, as set forth in GSP Regulations Section 352.4
    - Types of data to be monitored
    - Spatial coverage of the basins
    - Temporal considerations for the frequency of data collection
    - Specific constituents/properties for water quality analysis
    - Data applicability to key sustainability indicators developed by the project team
- A summary of the UWCD data management system, including
    - Methods/formats for data storage
    - Details on data backup protocols
    - Information as to the physical location of the dataset
    - Details and contact information for data access

Task 4 Deliverable:

1. *Technical Memo: Data Management System Summary and Location Information*
2. *Data Management System Summary and Location Information*

Task 5. Water Level and Water Quality Data Collection and Analysis

This task will establish a monitoring network and monitoring protocols for the GSP, formalizing the sampling protocol, analytical methods, and quality assurance/quality control requirements in the Sampling and Analysis Plan (SAP). Whereas ongoing monitoring of certain types of data does exist within the Basins, work as a part of this task will unify those efforts as part of the GSPs to benefit both Basins. Where appropriate, specific monitoring requirements will be attributed to each of the specific GSA members. The overall goal of the monitoring plan will be to collect the data necessary to demonstrate that current practices and management actions within the Basin are leading toward the overall goal of sustainability, with respect to the Sustainable Management Criteria developed as part of Task 7. The monitoring plan will also serve to provide as a means by which "undesirable results" within the Basin are identified as they may occur. The SAP will be developed in close coordination with UWCD as they currently house the bulk of the available monitoring data and information.

The SAP will be designed to collect basin-wide criteria, with a focus on the areas of the Basins where groundwater extraction is more significant or has the potential to cause measurable "undesirable results". Protocols for data collection (including location, frequency, and methods) will be provided as part of the monitoring plan to help the various parties executing the plan to collect data of sufficient quality and quantity that are necessary to assess conditions in the Basin. The SAP will define the technical standards, data collection methods, and other procedures or protocols to ensure reliable and comparable data and methodologies, consistent with GSP regulations sections § 352.2 and 352.4 and the Monitoring BMPs. Details regarding monitoring frequency, monitoring methods, QA/QC protocol, data recordation and storage protocol will be provided.

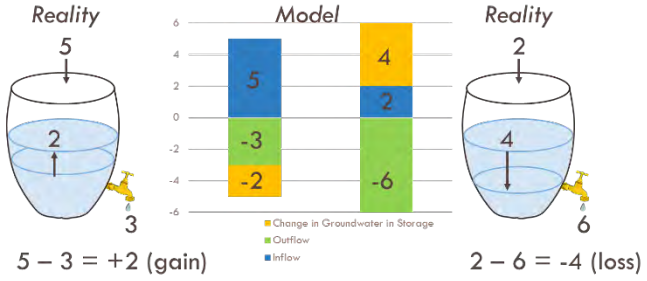
Task 5 Deliverable:

1. *Sampling and Analysis Plan*

Task 6. Develop Water Budget, Hydrogeologic Conceptual Model, and Numerical Flow Model

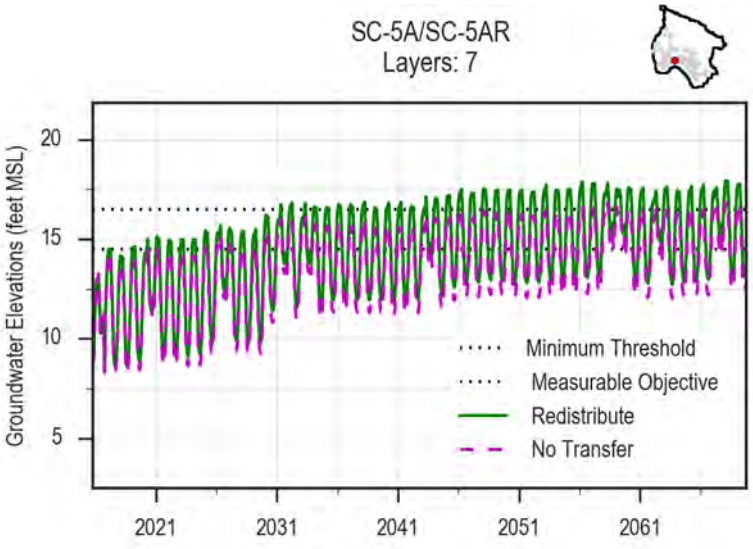
As UWCD is taking the lead on this task, the LWA Team led by M&A will take a review role for this task. This review ideally will be ongoing in consultation with UWCD as it develops its product to ensure that the product is scientifically defensible, meets requirements of the GSP, and is useful to FPBGSA and its stakeholders.

For the water budgets and hydrogeologic conceptual model, the LWA Team will compare UWCD products to previous hydrogeological reports, review defensibility of UWCD choices in developing water budgets and hydrogeological conceptual model, particularly in areas of potential controversy, and provide guidance on presentation of the information for stakeholders and to meet the requirements of the GSP. For example, in our experience with stakeholders, the concept of groundwater in storage can be challenging to communicate: we will help UWCD clearly communicate that the water budget shows a change of groundwater in storage as opposed to total groundwater in storage and what positive and negative changes represent.



Conceptual Graphic for Change of Groundwater in Storage

For the numerical model, we will evaluate the model construction for consistency with the conceptual model, assess calibration and model uncertainty to help define model limitations, guide UWCD to produce model output that will meet requirements of the GSP, and understand capabilities of the model to inform development of sustainable management criteria, and to evaluate projects and management actions. Where possible, sustainable management criteria need to be designed so that model results can be compared with the sustainable management criteria, often by using groundwater level proxies for the criteria. Projects and management actions can then be evaluated based on whether model results show sustainable management criteria are being met.



Example Model Results Compared to Groundwater Level Proxies for Sustainable Management Criteria

LWA will oversee the LWA Team's effort to evaluate groundwater dependent ecosystems by using the Nature Conservancy's Groundwater Dependent Ecosystem mapping tool and comparing results to available reports for the subbasins and aerial photos. We will advise UWCD on using the groundwater model to identify where groundwater may be shallow enough to provide a supply source for groundwater dependent ecosystems.

We will evaluate the State of California's datasets and guidance for climate change for whether they are appropriate for use in the Basins. DWR's choices for global circulation models to represent specific conditions, particularly with respect to precipitation, may not represent those specific conditions in all areas of the state. We will also describe the limitations of the state's climate period analysis approach that applies climate change factors to historical data, which assumes inter-annual variability does not change from historical conditions. FPBGSA needs to be comfortable with these limitations because it is possible inter-annual variability can affect groundwater conditions, especially with respect to surface water flows on

the Lower Santa Clara River and releases from Lake Piru. When a climate change approach and dataset is selected, we will advise UWCD on implementing the climate change scenario in the numerical model.

Our advice and guidance for this task will best facilitate successful development of the GSP and utility for the FPBGSA and its stakeholders if it involves ongoing consultation. GSP development could be delayed if we do not review UWCD product until they provide deliverables on the dates provided in the RFP. Specifically, for numerical model development, we propose that UWCD provide a technical memorandum or presentation describing an outline of the hydrogeologic conceptual model and approach to the Ventura Regional Groundwater Flow Model (VRGWFM) expansion as well as planned model output by July 2019 so that we can understand and provide feedback on direction during model development. In preparation for receiving this information, we will review available documentation on the VRGWFM. We will also be available to advise on any technical issues that arise during VRGWFM development.

Task 6 Deliverables:

Deliverables include review and assistance as needed to UWCD in producing:

1. *Water Budget*
2. *Hydrogeologic Conceptual Model*
3. *Groundwater Flow Model and Documentation*
4. *Draft Text for Inclusion in GSPs*

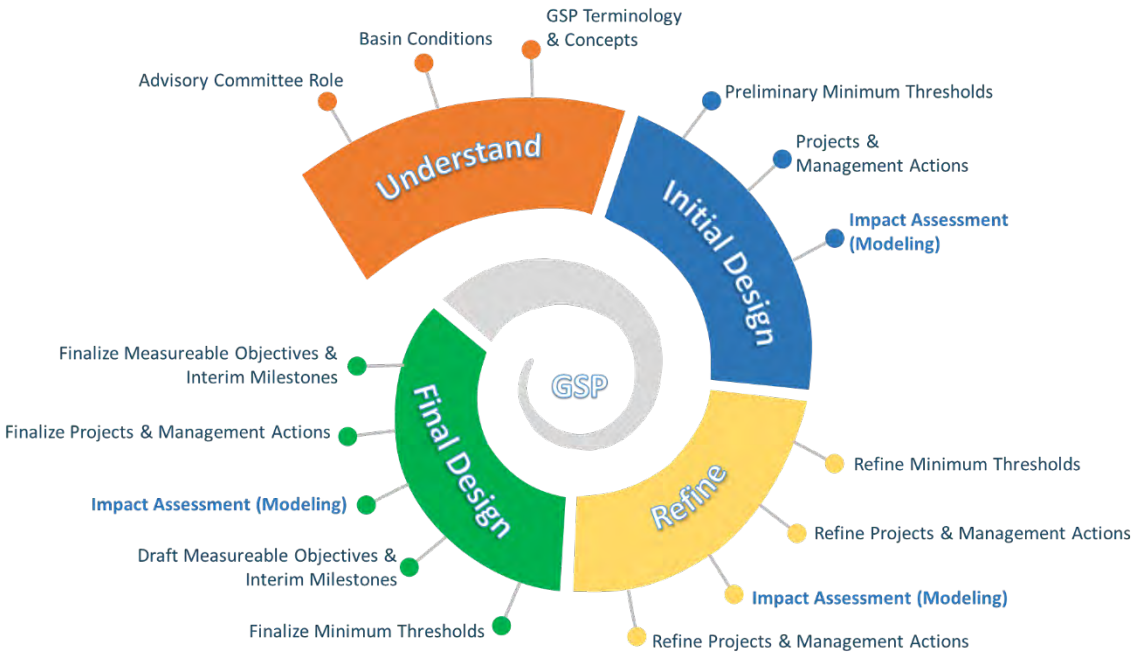
Task 7. Development of Sustainable Management Criteria

The 2013 AB 3030 Groundwater Management Plan (2013 GMP) for the Fillmore and Piru Basins are a good starting point for establishing Sustainable Management Criteria (SMC) required under SGMA. The main 2013 GMP goal for the Fillmore and Piru Basins related to SMCs, as established in a public meeting that was part of the AB 3050 planning process, is to maintain or improve the quantity and quality of groundwater in the basins. To provide for a measure for achieving this goal, the 2013 GMP included numeric Basin Management Objectives (BMO) limits for both groundwater and surface water quality, and groundwater levels. Since 2013, BMOs have been used to evaluate basin conditions biannually, as reflected in the 2012 – 2013 and 2014 – 2015 and Fillmore and Piru Basins biennial groundwater conditions reports. These reports cover the recent drought period where groundwater levels in key wells dropped below their BMOs.

The level of effort reflected in our budget for Task 7 assumes that although all six sustainability indicators need to be addressed, the location of the Fillmore Basin approximately 15 miles inland, means that the seawater intrusion sustainability indicator will not require the same level of analysis and description as the other five indicators. Furthermore, given the UWCD's long-term management of the basins and their experience developing BMOs, they will uniquely assist in efficiently selecting representative monitoring wells and establishing "strawman" sustainability goals, minimum thresholds, measurable objectives, and interim milestones.

The approach we have taken in other groundwater basins where we are developing GSPs is to prepare "strawman"/proposed initial SMCs, which may get adjusted based on results of modeling impacts from projects and management actions. The figure below illustrates the iterative process used in the critically overdrafted Santa Cruz Mid-County Basin. It is envisioned that a similar process could be used for the Fillmore and Piru Basins, but that the already established BMOs could be used as preliminary minimum thresholds. Based on results of modeling impacts from projects and management actions, minimum thresholds can be refined. Both desired quality and groundwater levels together with results of modeling will be used in the development of measurable objectives.

These initial SMCs will be developed in coordination with the FPBGSA and UWCD and presented to stakeholders and the public in public meetings. These public meetings will be conducted as described in Task 9.0, Stakeholder Engagement.



Iterative Process for Developing SMCs in the Santa Cruz Mid-County Basin

The general approach we propose taking for developing initial SMCs for each of the six sustainability indicators is provided below:

1. Provide a proposed statement of what would be considered **Significant and Unreasonable** basin conditions related to each sustainability indicator. These may be different for each basin or maybe the same. These statements provide for conditions that must be avoided in order to reach the GSA's sustainability goal and help guide development of the other SMCs.
2. Provide a proposed statement of what would be considered **Undesirable Results** for each sustainability indicator. This SMC focuses on how Significant and Unreasonable conditions may occur. For example, the minimum threshold can be exceeded a certain number of times in representative monitoring points, after which undesirable results would cause Significant Unreasonable conditions in the basin.
3. Provide proposed **minimum thresholds**. As mentioned before these could be the BMOs already established at key wells within each basin for groundwater levels, groundwater quality and surface water quality. More detail is provided below for each sustainability indicator as to how minimum thresholds may alternatively be established.
4. Provide proposed **measurable objectives** that reflect desired groundwater conditions in the basins. Although this metric is not enforceable, the Plan should demonstrate how projects and management actions will achieve these objectives by 2042.
5. Provide proposed **interim milestones** every five years after plan implementation and up to 2042. These SMCs need to indicate to DWR what an expected path to meeting measurable objectives looks like. For efficiency purposes, it is best to develop interim milestones after the final measurable objectives have been established.

Proposed SMCs for each sustainability indicator will be presented to stakeholders and revisions made based on input received. Written responses to technical feedback/comments provided by stakeholders will be provided.

Although the final approach to developing SMCs will be discussed and agreed to with UCWD input, below are some considerations to make based on our experience in developing GSPs for other basins.

Chronic lowering of groundwater levels: current BMOs are set to maintain groundwater elevations above the low elevations recorded near the end of the 1984 to 1991 drought. Since groundwater levels have dropped below these limits during the recent 2012 to 2016 drought, it may be necessary to revise them if there is a possibility that groundwater levels could be at these levels after 2042, and considering climate change. There are a number of ways that BMOs could be revised to achievable minimum thresholds, however, the guiding principle should be that groundwater elevations should not drop to a level below which groundwater users cannot meet their demand, as this would be an obvious Significant and Unreasonable condition.

Reduction in groundwater storage: this is a sustainability indicator that can be developed after all other applicable sustainability indicators are addressed. Our experience indicates that if minimum thresholds are met for all the other indicators, reduction in basin storage metrics result from the combined effects of meeting those thresholds. The groundwater model will be used for this purpose.

Depletion of interconnected surface water: this sustainability indicator requires identification of whether groundwater is connected to surface water and whether there are groundwater dependent ecosystems (GDEs) occurring within the basin that could be impacted by depletions in interconnected surface water flows. Groundwater in both the Fillmore and Piru Basins is connected to surface water as evident by localized areas of rising water at the western boundary of each basin. Depending on how the groundwater model simulates surface water flow, it may not be possible to use the groundwater model to determine when groundwater elevations reduce surface water flow. There is however good monitoring well data near the Santa Clara River which can be used to correlate at what groundwater elevations rising water occurs or ceases. Consideration of non-native surface water flows in periods when there is limited natural surface water flows need to be taken. A recent document by the Environmental Defense Fund proposes an approach for the sustainability indicator which states that if groundwater levels in the vicinity of a stream or river are not lower than they were prior to January 1, 2015 (allowing for inter-annual and seasonal variability), then it can be assumed that groundwater pumping is not causing significant unreasonable depletions of surface water that must be addressed under SGMA. Accordingly, if a GSA manages the basin so that groundwater levels in the vicinity of the stream are not lower than they were prior to 2015, it is reasonable to conclude that under this approach that SGMA's requirements related to surface water have been satisfied.

Degraded water quality: the intent of this sustainability indicator is in effect a "do no harm" indicator. This means that management actions and projects that are implemented as part of the GSP should not degrade water quality in the basin. This does not prevent GSAs from improving water even if current conditions are not viewed as Significant and Unreasonable. As groundwater quality in these basins is strongly influenced by the quality of surface water in the Santa Clara River, basin management should consider already established TMDLs and other water quality management actions required by stakeholders (e.g. SNMP and wastewater treatment plant permits). In contrast to groundwater elevations, existing BMOs, which are the Los Angeles Regional Water Quality Control Board's current groundwater basin objectives, may serve as measurable objectives, instead of minimum thresholds.

Subsidence: The Fillmore and Piru Basins have not had historic reports of subsidence attributable to declining groundwater levels. Both basins have a low potential for subsidence based on geology. Our experience with DWR regarding inapplicable sustainability indicators is that if a GSA believes a sustainability

indicator is not applicable, it may provide evidence in the GSP that the indicator does not exist or could not occur, and thus SMCs do not need to be established.

Seawater intrusion: the Fillmore basin is over 15 miles from the coast and as such, groundwater levels within the basin have no influence on seawater intrusion since there are two other groundwater basins between it and the ocean. Furthermore, groundwater elevations in both the Fillmore and Piru Basins are well above sea level. Similar to subsidence, evidence will be provided in the GSP to establish this indicator does not exist or could not occur in the future.

Task 7 Deliverables:

1. *TM: Draft Basin Sustainable Management Criteria*
2. *Summary of Comments from Public Meetings*
3. *TM: Final Basins Sustainability Management Criteria including Summary of Responses to Comments*

Task 8. Projects and Management Actions

If needed, projects and management actions necessary to achieve the sustainability goals for the Basins will be identified. The identification of projects and management actions will start with a compilation and evaluation of existing management actions and planned projects to assess their ability to meet the sustainability goals as planned or with modifications. Meetings with the FPBGSA and UWCD will be held to solicit other potential management actions and potential projects identified to address other requirements (e.g. stormwater recharge projects for meeting stormwater permit requirements) will be compiled for evaluation.

The LWA Team believes GSP development provides an opportunity to integrate multiple programs and requirements for sustainably managing available water resources.

Once the range of potential projects and management actions are identified, an evaluation process will be developed and vetted with the FPBGSA and UWCD. The evaluation process will likely include both quantitative evaluations using the model and qualitative assessments of other benefits. The projects and management actions will then be evaluated using the process to identify the most cost effective and efficient solutions.

For the quantitative evaluation, potential projects and management actions may be evaluated with the groundwater model under projected future population, land use, climate, and streamflow conditions. Although not listed as a task for UWCD in the RFP, we assume that UWCD will perform the modeling consistent with its modeling responsibility for the rest of the GSP scope, if needed. Therefore, we will provide advice and guidance to UWCD in two areas: preparing model input and evaluating model output for sustainability. We will advise UWCD on developing model scenarios that represent baseline future projections as well as scenarios of individual projects and management actions and combinations of projects and management actions. We will guide UWCD on processing model output to compare model results versus SMCs to evaluate whether projects and management actions achieve sustainability. The most typical output is comparing groundwater level results from the model to groundwater level proxies for SMCs.

Stakeholder engagement on the potential projects and management actions, evaluation process and evaluation results will be critical for acceptance of the plan. We will develop presentations/briefings and will engage in discussions with the FPBGSA and interested stakeholders, as needed.

Task 8 Deliverable:

1. *Technical Memo: Projects and Management Actions*

Task 9. Stakeholder Engagement

A key factor in successful community engagement on any issue is identifying and getting to know stakeholders critical to the project success. To effectively develop the public workshops, we need to understand whom we are communicating with, their information needs, and their concerns. This understanding will lead to activities that reach the right audiences with the right message delivered effectively. The LWA Team will work with the FPBGSA and UWCD to identify the key stakeholder groups and their interests. As noted under our project approach, we suggest early stakeholder engagement to identify both stakeholder interests and related requirements and activities that should be considered during GSP development.

Using the developed stakeholder information, the LWA Team will develop presentation materials, present information in public meetings, receive comments, and respond to comments. For each of the stakeholder meetings, the LWA Team will develop a draft agenda and prepare presentation materials, as necessary. We understand the meetings will be facilitated by FPBGSA staff but will require coordination with us as after each meeting, we will provide a written summary serving as a record of key discussion topics, majority and minority opinions, and action items. The LWA Team will provide written materials in newsletter format to facilitate public understanding of meeting content.

We understand the FPBGSA is working with the Watersheds Coalition of Ventura County's Disadvantaged Communities Outreach Program to improve its outreach to underserved communities that will be affected by the GSPs development effort. Depending upon this coordination, the LWA Team will provide support for these additional public outreach meetings, as appropriate.

Seven stakeholder meetings are proposed with topics including:

- Introduction of Stakeholders to GSP Process (Feb 2019)
- Water Budgets for Fillmore and Piru Basins
- Review of Draft Sustainability Criteria for Fillmore and Piru Basins
- Management Actions
- Public Draft GSPs for Fillmore and Piru Basins
- Review of Comments and Responses
- Review of Final GSPs

Task 9 Deliverables:

1. *Agendas*
2. *Meeting materials*

Task 10. Prepare Groundwater Sustainability Plan

SGMA and the GSP Regulations both have detailed requirements for the GSP and its technical content, and for collaboration among agencies, communication with the public and interested stakeholders, and notification to DWR through its SGMA Portal. Team key personnel are well versed in SGMA and the GSP Regulations, are familiar with the Portal, and already have assisted multiple agencies with tasks that precede preparation of the GSP itself.

Subtask 10.1. Prepare Notification to DWR of GSP Preparation

The FPBGSA already has an account with the SGMA Portal, which was used to submit the GSA Formation notification. This account can be used by FPBGSA staff for the GSP Notification. If desired, one of our consultant teams can be designated as an administrator to assist (the FPBGSA Plan Manager would be notified of any changes).

In this task, we will work with FPBGSA staff to fulfill requirements of GSP Regulations §353.6.; first, note that no formal hearings or resolutions are required. As indicated by the template provided on the Portal, the main task is to provide general information about the planned processes for developing the GSP, including descriptions of how interested stakeholders can contact the FPBGSA and participate in the GSP. We recommend that FPBGSA identify a Plan Manager and provide a link to the website where GSP information is made available to the public. We will develop a succinct description of the Communication Plan including establishment of an advisory committee (if desired). Pursuant to SGMA §10727.8, we will also provide a brief letter template that can be used to provide formal GSP notification to land use planning agencies in the GSP plan area, and to Public Utilities Commission (for local regulated water companies).

LWA Team members maintain regular communication with DWR and are familiar with all notification requirements. We have developed annotated GSP outlines for other GSAs and will customize them for the Fillmore and Piru Groundwater Basins.

Subtask 10.2. Provide Draft Annotated GSP outline

Team personnel have experience with developing GSP outlines based on the requirements of SGMA §10727.2 and GSP Regulations Article 5, Plan Contents. Moreover, we bring experience with writing GSPs (in progress).

In this task, we will begin with DWR's Annotated Outline Guidance Document, a summary of which is provided below in ***Figure 3***. We recognize that the DWR Outline cannot be considered as one-size-fits-all. Accordingly, we will start with the DWR Outline, retaining most of its features to expedite comparability with the regulations and to ease the eventual evaluation by DWR. Nonetheless, we will also tailor it to Fillmore and Piru Groundwater Basins conditions and target audiences. This recognizes the GSP as the basis for local management.

Based on our experience, the GSP document will contain specific sections that cannot be written until the GSP process is completed. These include not only the Executive Summary, but other sections, for example, the §354.6(e) discussion of GSP implementation costs and how the FPBGSA will meet those costs.

We will provide a draft outline, submit it to the FPBGSA, and address any comments received. If the FPBGSA wishes, the final Annotated Outline will be suitable for posting on the FPBGSA website for informational purposes.

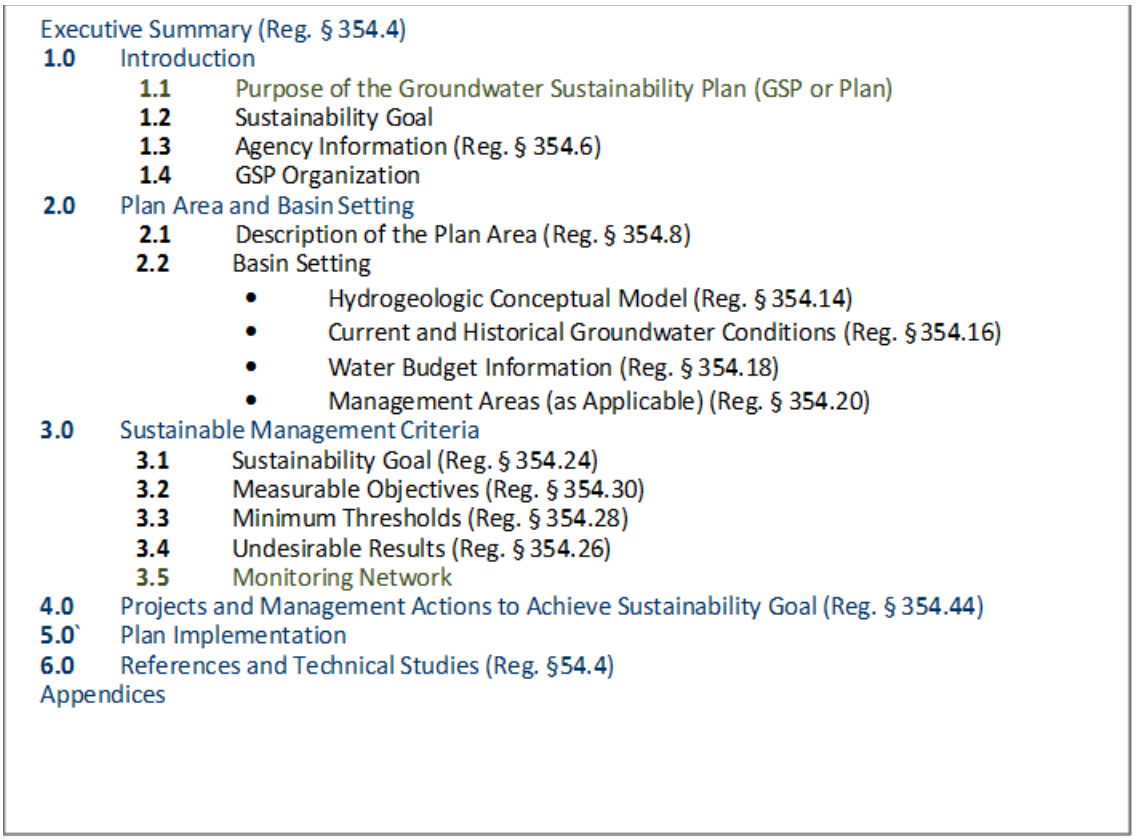


Figure 3. Major GSP headings from GSP Annotated Outline Guidance Document

Subtask 10.3. Prepare Draft GSP

The LWA Team will prepare Preliminary Draft GSPs for each basin and make them available to FPBGSA for review and comment. For each of the previous tasks, administrative draft and stakeholder draft GSP sections will have been developed. Under this task, the LWA Team will compile all the draft GSP sections, address stakeholder comments on those draft sections and add the remaining items, such as the executive summary, to create a complete plan.

Subtask 10.4. Plan Implementation

The LWA Team will assist the FPBGSA in developing an implementation plan to meet all SGMA and State of California regulations. The implementation plan will be a highly detailed document defining monitoring and reporting requirements, roles and responsibilities, schedules, and funding requirements. It will define adaptive management strategies such as how the FPBGSA will react to regional changes, how to assess public and stakeholder reactions to project implementation and how project sequencing may be altered as implementation is carried out. For defined regional implementation priorities, short-term and long-term milestones will be defined, with detailed timelines for all planned projects and other policy or programmatic actions and additional studies. We will develop well defined methods for tracking progress and periodically communicate with the FPBGSA to check for compliance with the defined schedules.

The implementation plan will also include a schedule designed to meet SGMA requirements to have a GSP in place by January 2022 and to conduct the necessary assessments and obtain the input needed to ensure that the plan results in sustainable management of the Basin.

The LWA Team will outline a process for preparing annual reports and assessing progress every 5 years that will be incorporated into the implementation plan.

Subtask 10.5 Prepare GSP Document

The technical work to prepare the GSPs will have been conducted during previous tasks. As a result, this task consists primarily of compiling the technical work and FPBGSA inputs on the interim work products into a document that can be adopted by the FPBGSA. We will carefully tailor our findings from the previous tasks and proposed sustainable management plan to fully comply with Article 5 of the Emergency Regulations. Under this task, the LWA Team will prepare the remaining analyses necessary to complete the GSP and develop draft documents for review and comment by the interested parties and public.

An administrative draft FPBGSP will be prepared for review by FPBGSA members and the other interested stakeholders. Included in this effort will be preparation of an Executive Summary and compilation of electronic copies of specific references to be provided to DWR.

Feedback will be incorporated into a final public review draft FPBGSP. Written comments from the public and interested stakeholders will be sought, and oral public comments will be received during up to two FPBGSA workshops.

The LWA Team will compile the public comments and will work with the FPBGSA to decide how public comments will be addressed and a final report will be prepared. Conflicting comments and significant policy differences implied by conflicting comments will be resolved by decision of the FPBGSA.

Public comments will be used to prepare the final GSPs that will be considered for adoption by the FPBGSA. The Executive Summary and reference documents will also be revised and finalized as needed based on public comments. A draft resolution to adopt the FPBGSP will be prepared by the LWA Team for consideration.

The LWA Team has extensive experience in developing regulatory documents that support stakeholder interests as outlined in *Section 2* of this proposal. This experience will allow us to prepare a GSP document that meets the needs of interested stakeholders and regulatory requirements necessary to adopt the GSP.

Task 10 Deliverables:

1. *Maps detailing area of basins and boundaries (provided by UWCD)*
2. *Maps identifying existing and potential recharge areas (provided by UWCD)*
3. *Preliminary Draft GSPs for FPBGSA review*
4. *Draft GSPs*
5. *Responses to Comments on Draft GSPs*
6. *Final GSPs*

Task 11. Grant Assistance

The LWA Team will assist FPBGSA in the administration of the Sustainable Groundwater Planning Grant. The experience of the team in complying with grant requirements will facilitate the proper preparation of the required reporting and invoicing procedures.

Subtask 11.1. Reporting

The LWA Team will prepare reports quarterly detailing the work completed within that period. The reports will sufficiently detail tasks completed to allow the DWR program manager to understand and review attachments. Quarterly reports will be revised per DWR comments, as appropriate.

A draft completion report will be prepared for FPBGSA to submit to the DWR program manager within 90 days of project completion. The report will follow grant guidelines and will be revised per the DWR comments.

Subtask 11.2. Invoicing

The LWA Team will generate the invoicing under the direction provided by the DWR project manager using the template provided by DWR. The documentation by task will be organized by task in the grant agreement budget, and an excel summary document will be provided to track the budget, and verify correctness prior to submittal. The team will respond to the DWR project manager comments to create the final invoices.

Task 11 Deliverables:

1. *Quarterly Project Progress Reports*
2. *Project Completion Report*
3. *Draft and final invoices*
4. *Backup documentation*

7.0 Estimated Project Schedule

The LWA Team has the capacity to perform the work according to the timeline and will be ready upon award to deliver the quality service that is required to ensure the success of this high-profile project. The Team will work closely with the FPBGSA to complete the required tasks to submit the GSP by January 31, 2022. Given the complexity of the work effort and the need to communicate with the FPBGSA, our approach for successfully developing the GSP is based on: 1) maintaining clear lines of communication, 2) informing and receiving input from FPBGSA staff on an ongoing basis, 3) controls to complete tasks on schedule, and 4) controls to complete the project within budget. This approach has been used successfully on other projects to ensure completion of high quality work on time and within budget.

The estimated project schedule presented in ***Figure 4*** pertains to the activities and deliverables described in our proposal and is based upon our understanding of the tasks to be completed as required within the RFP. The schedule is preliminary and based on an anticipated Notice to Proceed (NTP) in the December of 2018), a draft GSP by July 31, 2021 and a final GSP to DWR by January 31, 2022. The schedule will be refined based on discussions with the FPBGSA and finalization of the meeting and workshop schedule to include specific dates for deliverables and review periods. No less than two weeks will be provided for review for all interim work products and a minimum of one month will be provided for review of all draft GSP chapters. To the extent possible, depending on the NTP date and the contract period, the schedule will include extra time to allow for additional engagement or resolution of questions and conflicts, particularly for those elements requiring significant stakeholder engagement.

Once the specific schedule has been developed, adherence to timelines for work product development and review timelines will be needed to meet the draft GSP deadline for July 31, 2021, and submittal date of January 31, 2022. Should schedule steps require additional time by others, we will take all reasonable measures to accommodate the changes while minimizing disruption to other schedule elements. We will promptly identify potential delays and the best possible manner to rectify the schedule and communicate a revised schedule to the FPBGSA PM.

	Task Name	Start	Finish
	Contract Award	Wed 12/5/18	Wed 12/5/18
	Contract Start	Wed 12/5/18	Wed 12/5/18
	Fillmore and Piru Groundwater Basin - Groundwater Sustainability Plan	**Wed 12/5/18**	**Sat 7/31/21**
1.	**Project Management**	**Wed 12/5/18**	**Tue 7/6/21**
	Kick-off Meeting	Wed 12/5/18	Wed 12/5/18
	Monthly Progress Meetings	**Tue 1/1/19**	**Tue 7/6/21**
2.	**Compilation of Existing Data**	**Thu 12/6/18**	**Tue 1/8/19**
	Digital Library	Thu 12/6/18	Tue 1/8/19
3.	**Assessment of Existing Data and Data Gap Analysis**	**Wed 1/9/19**	**Tue 9/3/19**
	Technical Memo: Data Gap Analysis Report	Wed 1/9/19	Tue 9/3/19
4.	**Monitoring Program and Data Management System**	**Wed 9/4/19**	**Tue 12/3/19**
	Technical Memorandum: Monitoring Program	Wed 9/4/19	Tue 12/3/19
	Data Management System Summary and Location Information	Wed 9/4/19	Tue 12/3/19
5.	**Water Level and Water Quality Data Collection and Analysis**	**Tue 1/7/20**	**Tue 4/7/20**
	Sampling and Analysis Plan (SAP)	Tue 1/7/20	Tue 4/7/20
6.	**Develop Water Budget, Hydrogeologic Conceptual Model, and Numerical Flow Model**	**Wed 1/9/19**	**Wed 9/30/20**
	Preliminary Water Budget	Wed 1/9/19	Fri 3/29/19
	Technical Memorandum: Hydrogeologic Conceptual Model and Groundwater Flow Model	Mon 4/1/19	Tue 6/30/20
	Draft Text for Inclusion in GSPs: Water Budget, HCM and Modeling	Thu 7/2/20	Wed 9/30/20
7.	**Development of Sustainable Management Criteria**	**Tue 4/2/19**	**Wed 2/5/20**
	Technical Memo: Draft Basin Sustainable Management Criteria	Tue 4/2/19	Wed 2/5/20
	Summary of Comments from Public Meetings	Tue 4/2/19	Wed 2/5/20
	Technical Memo: Final Basins Sustainability Management Criteria	Tue 4/2/19	Wed 2/5/20
	Draft Text for Inclusion in GSPs	Tue 4/2/19	Wed 2/5/20
8.	**Projects and Management Actions**	**Tue 6/2/20**	**Tue 8/4/20**
	Technical Memo: Projects and Management Actions	Tue 6/2/20	Tue 8/4/20

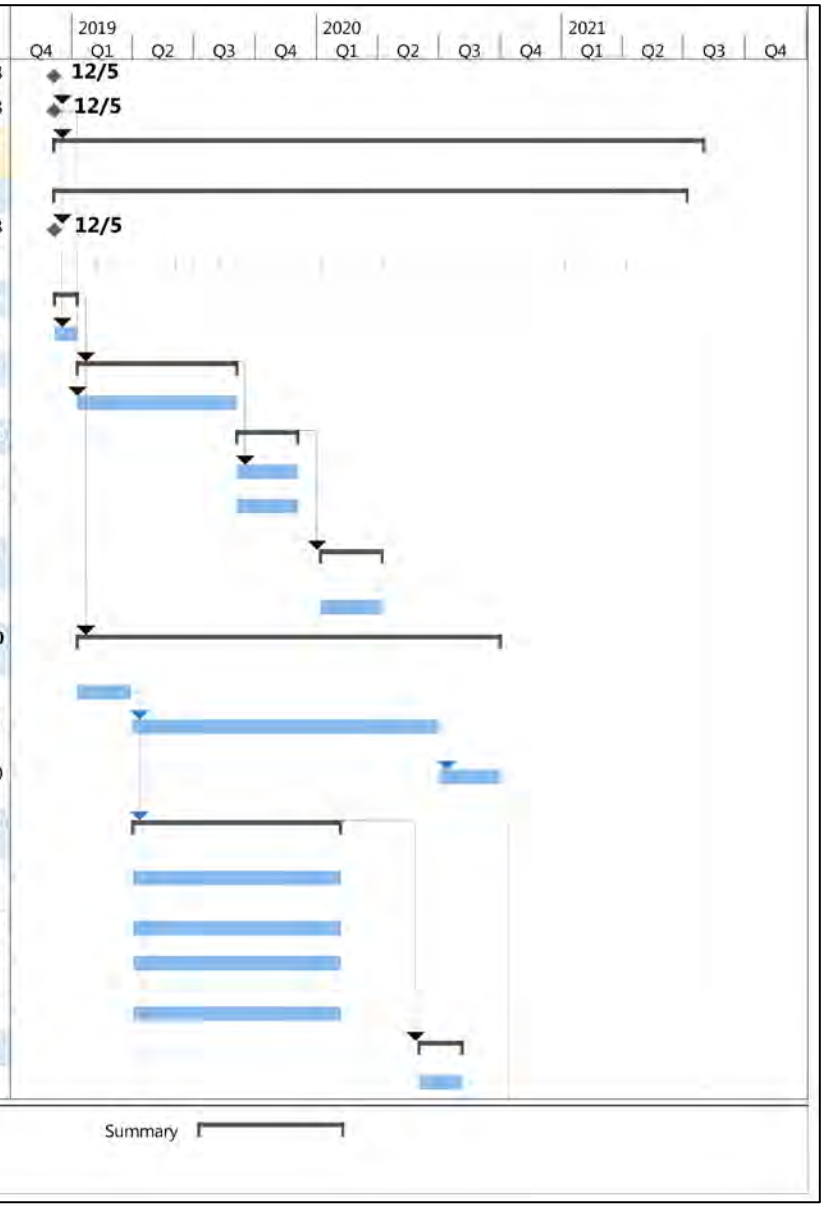


Figure 4. Project schedule for the Fillmore Piru Basins GSP development

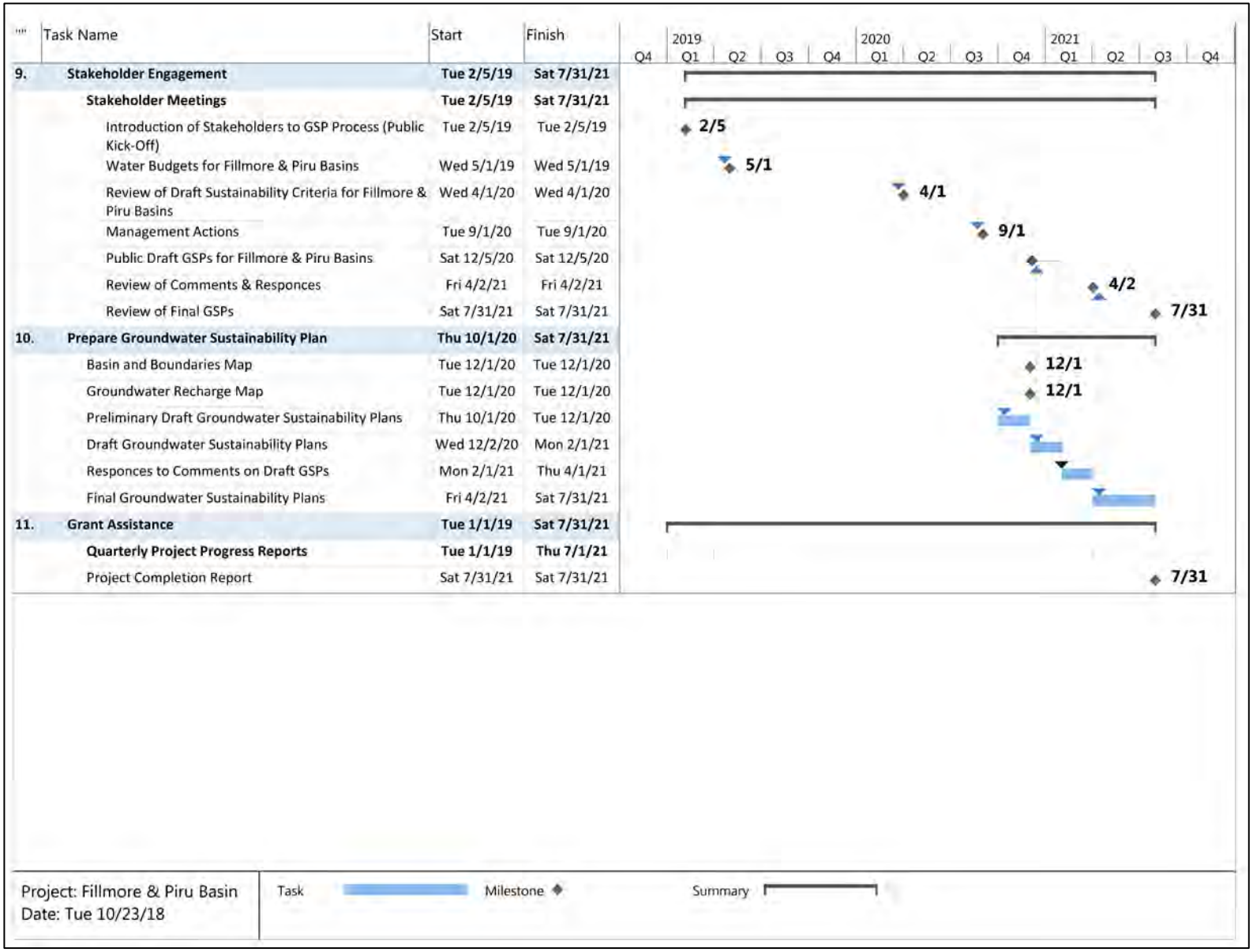


Figure 4. Project schedule for Fillmore Piru Basins GSP development

APPENDIX A

Resumes

Ashli Desai

President

EDUCATION

M.S., Civil Engineering-Environmental Engineering and Science, 1996, Stanford University, Stanford

B.S., Earth Systems-Environmental Technology, 1995, Stanford University, Stanford

REGISTRATIONS

CA E.I.T. XE100093

YEARS OF EXPERIENCE

With LWA: 21
With other Firms: 1

PROFESSIONAL AFFILIATIONS

Member, California Stormwater Quality Association

Member, Groundwater Resources Association of California

Stormwater Representative, Stakeholder Advisory Group for Statewide Nutrient Policy Development

Ms. Desai provides management of complex watershed and sustainability project planning to clients throughout Southern California. Ms. Desai has successfully managed multi-stakeholder projects for development of Salt and Nutrient Management Plans (SNMPs), Total Maximum Daily Loads (TMDLs), Enhanced Watershed Management Programs (EWMPs), and Water Quality Improvement Plans (WQIPs) throughout Southern California. Ms. Desai specializes in facilitating coordination between municipal agencies, stakeholder groups, and regulatory agencies to provide solutions that allow implementation of stakeholder developed strategies for sustainably managing water resources. With her extensive experience in the Los Angeles region, local and regional stakeholder relationships, leading role in LWA's groundwater projects in Southern California, more than15 years of experience in managing complex, multi-stakeholder planning processes and an office in Santa Monica, Ms. Desai is uniquely qualified to perform as Project Manager for the Santa Monica Basin Groundwater Sustainability Plan (GSP) development.

Groundwater and Watershed Management

Lower Santa Clara River Salt and Nutrient Management Plan for City of Ventura, City of Santa Paula, City of Fillmore, County of Ventura, Ventura County, CA. 2013-2015

Project manager responsible for the development of a SNMP for the Lower Santa Clara River. Responsible for facilitating the stakeholder process, outlining the SNMP approach, compiling potential management measures, developing the monitoring plan, preparing the antidegradation analysis, compiling technical work from multiple subcontractors into the final SNMP, and coordinating with the Los Angeles Regional Water Quality Control Board to ensure approval of the SNMP.

Calleguas Creek Watershed and City of Oxnard SNMPs, Ventura County, CA. 2012-Present

Project Manager responsible for the development of a SNMP for the Calleguas Creek Watershed. Assisted the stakeholders with evaluating the regulatory requirements of the SNMP, identifying existing management plans that can be used to meet the SNMP requirements, and reviewing and compiling recycled water projects and goals. Currently overseeing the analysis of available assimilative capacity, preparing an initial draft SNMP, and identifying ways to coordinate SNMP preparation with the GSP preparation for the Fox Canyon Groundwater Management Agency. Also, supported the City of Oxnard's SNMP in adjacent groundwater basins and facilitated the coordination between the adjacent basins. As subcontractor to Carollo, responsible for supporting the SNMP approach, source assessment, and conceptual model development.

Upper Santa Clara River Enhanced Watershed Management Plan (EWMP) for City of Santa Clarita, Los Angeles County, and Los Angeles County Flood Control District, CA. 2013-2015

Project manager responsible the development of an EWMP and Coordinated Integrated Monitoring Plan (CIMP) for the Upper Santa Clara River Watershed. The EWMP and CIMP are required for compliance with the 2012 Los Angeles County MS4 Permit. The multi-year project included the identification of water quality priorities for the planning area, evaluation of control measures to address the identified priorities, identification of interim and final goals and milestones, demonstration that implementation of the control measures will meet the goals and

milestones, and preparation of a coordinated monitoring plan to characterize stormwater and non-stormwater discharges and the receiving water. Responsible for facilitating the stakeholder process, coordinating with the Los Angeles Regional Water Quality Control Board, and managing all of the technical work to develop an approvable EWMP Work Plan, EWMP, and CIMP.

Calleguas Creek Watershed Management Plan TMDL Development for Stakeholders Implementing TMDLs in the Calleguas Creek Watershed, Ventura County, CA. 1998-Present

Project manager responsible development of five stakeholder-led TMDLs for the Calleguas Creek Watershed. As part of the TMDL development for salts, developed a unique implementation strategy that considered groundwater/surface water interactions and allowed for alternative implementation strategies, focused on reducing groundwater impacts due to salts. Currently the project manager responsible for implementing all aspects of the effective TMDLs for toxicity, organochlorine pesticides and polychlorinated biphenyl (PCB), sediment, metals and selenium, and salts in the Calleguas Creek watershed. Responsibilities include development and conduct of special studies, identification of implementation actions, coordination with stakeholders and Regional Board, incorporation of TMDL requirements into NPDES permits, and management of monitoring and reporting requirements. As part of this effort, Ms. Desai is responsible for managing a watershed-wide implementation effort to meet implementation requirements for watershed TMDLs, MS4 permit, wastewater permit and agricultural order requirements. This effort considers local SNMP, GSP, and Stormwater Resource Plan (SWRP) efforts to maximize multiple benefits for the projects identified in the plan, minimize duplicative efforts, and maximize funding opportunities. As part of this project, Ms. Desai is responsible for tracking and commenting on regulatory requirements impacting the watershed stakeholders. Through this effort, she is tracking the development of the GSP for the Fox Canyon Groundwater Management Agency Area and providing support on review of sustainability criteria and management measures to best coordinate with other implementation efforts in the watershed.

Santa Maria Integrated Plan for City of Santa Maria, Santa Barbara County, CA. 2015-2016

Senior advisor for the development of the City of Santa Maria's Integrated Plan. Evaluated regulatory requirements and constraints for the City's stormwater and wastewater programs and impacts and benefits to the groundwater basin that serves as the primary water supply for the City. In conjunction with other members of the consultant team, developed a multi-benefit assessment tool to rank projects and assessments of the potential load reduction benefits of the projects. Developed recommended projects and methods for assessing projects and making decisions on future projects. Included information to facilitate the use of the plan as a functionally equivalent SWRP and as the planning document to meet requirements for all TMDLs and the Phase II MS4 permit.

Papers and Presentations

Association of Water Agencies Ventura County, Oxnard, CA. 02/2013

Salt and Nutrient Management Plans and TMDLs in Ventura County
Update on the status and approaches to developing SNMPs to better coordinate with TMDL requirements in Ventura County.

Diana Engle, Ph.D.

Senior Scientist

EDUCATION

Ph.D. Ecology, Evolution and Marine Biology, University of California, Santa Barbara, CA.

B.S. Biology w. High Honors & High Distinction, University of Michigan, Ann Arbor, MI.

YEARS OF EXPERIENCE

With LWA: 10
Other Pertinent: 15

PROFESSIONAL AFFILIATIONS

Director, Meiners Oaks Water District, 2016-Present

Director, Upper Ventura River Groundwater Agency, 2017-Present

Director, Association of Water Agencies of Ventura County, 2018-Present

Member, CASQA, 2014-Present

Member, Association of California Water Agencies, 2018-Present

Member, Interagency Ecological Program (IEP) POD Contaminant Workteam, 2008-2017

Member, Delta Nutrient Numeric Endpoints Macrophyte Science Work Group, 2015

SPECIALIZED TOOLS

ArcGIS Desktop I. ESRI Redlands, October 2008

ADDITIONAL TRAINING

Federal Wetland Delineation, Wetland Training Institute, San Diego, CA August 2007

Dr. Engle is a Senior Scientist managing LWA's regional office in Ventura, CA. At LWA, Dr. Engle provides support on a wide variety of issues affecting water purveyors, and wastewater, stormwater, and agricultural clients such as NPDES permit and permit waiver renewals, WDRs, SGMA and GSP development, TMDL and SSO compliance, legal actions, jurisdictional matters, points of discharge, water quality policies, and regulatory options for addressing 303(d) listings. Specific areas of expertise include surface- and groundwater interactions, water quality assessment and monitoring, contaminant source assessment, watershed balances, fate and transport of nutrients and other constituents, aquatic toxicity, algal and food web dynamics, impacts of effluent diversion and reuse, nutrient criteria development, pathogen monitoring and special studies, and other areas of nexus between water quality regulation and watershed science. Recent projects include salt and nutrient management plans, groundwater monitoring plans, TMDL implementation plans and special studies, continuous monitoring of salts, surface flow, and groundwater recharge, agricultural BMP evaluation and tailwater monitoring, and testimony at Regional Board and State Water Resources Control Board hearings. As a Director of both the Meiners Oaks Water District and the Upper Ventura River Groundwater Agency, Dr. Engle has firsthand experience with SGMA- and GSP-related issues and challenges for basins affected by strong surface water-groundwater connectivity and anadromous fish issues. Dr. Engle also serves as the alternate Director for Independent Water Districts on the board of directors of the Association of Water Agencies of Ventura County.

Groundwater & Watershed Management

Calleguas Creek Watershed Salt and Nutrient Management Plan, 2016-Ongoing
As Project Manager, currently leading the development of a Salt and Nutrient Management Plan (SNMP) for the groundwater basins underlying the Calleguas Creek Watershed including the Simi Valley, Arroyo Las Posas, Tierra Rejada, Conejo Valley, and Arroyo Santa Rosa, Oxnard Plain, and Pleasant Valley groundwater basins. Project includes calculation of assimilative capacity for TDS, sulfate, chloride, boron and nitrate, and evaluation of projects linking basins together including recycling projects involving six wastewater treatment facilities, regional and distributed groundwater desalters, two aquifer storage and recovery projects, a groundwater recharge project using recycled water, surface water diversions, blending of water for salinity control, stormwater capture and infiltration basins, and a regional brine line.

Surface and Groundwater Interactions in Arroyo Las Posas, 2011-Present
As Project Manager, conducted a two-year study to delineate the losing and gaining reaches of the Arroyo Las Posas and Arroyo Simi, and quantify daily volumes of surface water and groundwater exchanges. Field work included gaging of streams in multiple reaches using customized stilling wells, continuous depth monitors and development of rating curves at twelve stations. Project required a variety of strategies to address a highly dynamic, sandy active channel with limited channel controls. Ongoing work includes wet and dry event water quality sampling, ongoing tracking of the location of the terminus of surface flow, and flow measurements near groundwater basin boundaries. Work is conducted in support of groundwater management and water supply planning in the Calleguas Creek Watershed, on behalf of Calleguas Municipal Water District and the Las Posas Water Users Group.

Review of Groundwater Sustainability Plan for the Pleasant Valley Basin, 2018-Ongoing

As Project Manager, reviewing and commenting on drafts of the Pleasant Valley Basin GSP on behalf of the City of Camarillo. Focus of comments is integration of non-SGMA regulatory requirements (such as SNMPs, TMDLs) into the GSP and the implications of water quality characterizations and sustainability indicators in the GSP on the permitting, allocations, and future operation of a regional desalter.

Calleguas Creek Watershed Salts Balances, 2011-Present

As Project Manager, leads the calculation of annual watershed balances for TDS, boron, sulfate, and chloride to address interim milestones for load reductions in the Calleguas Creek Watershed Salts TMDL. Work involves the computation of salt loads in imported water supplies, salt loads in extractions of confined groundwater, additions of salt to municipal water supplies, salt loads from pesticide applications, and salt exports through surface stream flows and brine disposal from desalination facilities through a salinity management pipeline (brine line).

County-wide Groundwater Quality Trends Monitoring for Ventura County Agricultural Irrigated Lands Group, 2016-Present

As Project Manager, led the development of a groundwater quality monitoring plan to satisfy new requirements in the 2016 Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Agricultural Lands within the Los Angeles Region. On ongoing basis, managing the annual reporting of nitrate trends in fourteen groundwater basins.

Groundwater Management Practice Evaluation Plan for Ventura County Agricultural Irrigated Lands Group, 2018-Present

As Project Manager, currently leading development of a workplan to evaluate the effectiveness of agricultural BMPs for managing nitrate contributions from irrigated agriculture to Ventura County aquifers.

Real-time Compliance Monitoring of Salt Concentrations and Fluxes in the Calleguas Creek Watershed, 2011-Present

As Project Manager, leads the monitoring program and the reporting activities for the Calleguas Creek Watershed Salts TMDL. Program includes continuous real-time monitoring of salt concentrations and discharge using a watershed-wide network of multi-sensor sondes equipped with telemetry. Concentrations of boron, TDS, sulfate, and chloride are derived using site-specific surrogate relationships between EC and salt constituents, and discharge is derived from continuous time series of depth paired with site-specific rating curves.

City of Ventura OVSD Reuse Feasibility Study, 2014

As Task Lead, participated in a feasibility study for the reuse of effluent from the Ojai Valley Sanitary District (OVSD) WWTP. Responsible for evaluating the implications of diversion of effluent from the perspectives of applicable permits (NPDES, local conditional-use, and recycling permits), TMDL allocations and reopeners, 303(d) listings, and related State and Regional Board activity regarding water recycling.

Camarillo Sanitary District Effluent Diversion Pipeline, 2013

As Project Manager, assisted the Camarillo Sanitary District with their responses to comments on a draft EIR for a pipeline project related to increased use of reclaimed water and cessation of discharge of effluent to surface waters. Work included application of HSPF model output, real-time continuous stream discharge data, in-stream water quality monitoring data, and effluent and groundwater quality data to evaluate the consequences of effluent diversion on in-stream flows and water quality in Conejo and Calleguas Creeks.

MS4 Implementation Plan for the Ventura River Watershed Algae TMDL, 2015

As Project Manager, led the development of an Implementation Plan (IP) for urban stormwater dischargers in the Ventura River Watershed to meet the MS4 allocations for total N and P in the 2012 TMDL for Algae, Eutrophic Conditions, and Nutrients in the Ventura River and Its Tributaries. The IP included GIS-based quantification of load reductions from a proposed suite of structural and programmatic BMPs, identification of representative monitoring sites, elucidation of WLA compliance pathways for wet and dry weather, an adaptive management strategy, and an implementation schedule.

Natural Attenuation Rates of OC Pesticides and PCBs in Calleguas Creek Watershed, 2015-2016

As Assistant Project Manager, led statistical evaluation of several decades of monitoring data to determine natural attenuation rates of organochlorine pesticides and PCBs in fish tissue and sediment in Calleguas Creek Watershed, and predicted timelines for attainment of TMDL targets. Authored the resulting special study report required by the OC Pesticides and PCBs TMDL for Calleguas Creek.

Ventura River Technical Advisory Group, 2009-2012

As Project Manager, was instrumental in the formation of a technical advisory group (TAG) formed by local agencies in response to the development of the Ventura River Algae TMDL. Was responsible for technical comments, presentations, client support at meetings and negotiations with Los Angeles Regional Board and USEPA, and other regulatory assistance related to the development of the Ventura River Algae TMDL and USEPA Draft Flow TMDL. Clients in the TAG include the Ojai Valley Sanitary District, the Cities of Ventura and Ojai, Ventura County Public Works Department, Ventura County Agricultural Irrigated Lands Group, and the Ventura River Horse and Livestock Coalition.

Ventura River Watershed Nutrient Source Evaluation, 2009

As Assistant Project Manager, conducted a detailed, land-use based assessment of sources of nitrogen and phosphorus in the Ventura River Watershed. Seasonal loadings were quantified from urban areas, national forest, septic tanks, irrigated agricultural land, horses and livestock operations, and WWTP discharges. Work was conducted on behalf of Ojai Valley Sanitary District in support of development of the Ventura River Algae TMDL.

Ventura River Flow TMDL, County of Ventura, CA, 2012-2013

As Task Lead provided extensive comments on the regulatory and compliance implications of the Draft USEPA Ventura River Flow TMDL on behalf of the Ventura River Technical Advisory Group.

Agricultural Water Quality

Water Quality Management Plans (WQMPs) for Ventura County Irrigated Agricultural Lands Group (VCAILG), 2011- present

As Task Lead, designs and carries out methodologies for evaluating and reporting annual survey data regarding BMP use by the VCAILG membership for inclusion in annual WQMPs. Contributed to the design of a web-based user interface for BMP use surveys. In 2015, derived Water Quality Indices using long-term monitoring data from several dozen monitoring locations in the county and used ArcGIS to communicate spatial relationships between water quality “scores” and BMP adoption rates. From 2016 onward, tailoring new agricultural BMP recommendations based on water quality trends and benchmark attainment. Recent work included extensive GIS work to define water quality responsibility areas covering all agricultural land in Ventura County which are used to spatially link parcel-based BMP survey data to county-wide monitoring data produced by VCAILG and TMDL compliance monitoring programs.

Special Study on Bacterial Discharges from Irrigated Agricultural Lands, 2012-2015

As Task Lead, on behalf of Ventura County Irrigated Agricultural Lands Group (VCAILG), designed and currently implementing a multi-year Special Study to evaluate occurrence and abundance of bacteria in agricultural runoff in Ventura County. Monitoring program includes edge-of-field monitoring of bacteria concentrations in stormwater runoff and dry weather tailwater from row crops, orchards, nurseries, and sod operations, monitoring of bacteria concentrations in tile drain sumps and outfalls, comparison with bacteria concentrations in receiving waters and with Basin Plan objectives, and evaluation of relationships between bacteria discharges and crop type or other factors.

Wastewater & Other Regulatory Assistance

Regulatory Support for Sacramento Regional County Sanitation District, Sacramento, CA, 2008- 2015

From 2008-2015, provided technical and regulatory assistance related to hypothesized roles of nutrients and other contaminants on water quality and biological resources in the Sacramento-San Joaquin Delta. Activities include testimony at State Board hearings and workshops; NPDES permit review and hearing testimony; support at meetings with State and federal officials, resource agencies, and NGOs; scientific commentary; and participation in stakeholder and technical advisory groups. Responsible for analyzing science and policy arising from entities such as State and federal task forces, resource agencies, SWRCB, Central Valley Regional Water Quality Control Board, Interagency Ecological Program (IEP), Bay-Delta Conservation Plan (BDCP) and CA Waterfix, and the Delta Stewardship Council (Delta Plan and Delta Science Plan). Between 2008-2012, provided technical support during the 2010 NPDES permit renewal process and during subsequent legal appeals. In 2015, provided support related to a federal lawsuit alleging indirect effects of WWTP effluent on endangered fish species.

Regulatory Implications of Discharge Options for the Future City of Morro Bay Water Reclamation Facility, Morro Bay, CA, 2014

As Task Lead, conducted a technical review of the regulatory and treatment challenges associated with several discharge scenarios for a new wastewater treatment facility planned by the City of Morro Bay. Discharge scenarios included percolation ponds, discharges to two creeks with different environmental sensitivities, and an ocean outfall. Considerations included types of permits needed, potential resource agency involvement, the level of treatment that would be required, the beneficial uses and status of different receiving waters and groundwater basins, existing TMDLs, and vehicles for new water quality standards at the regional level (e.g., salt and nutrient management plans) and state level (e.g., inland water nutrient or biological criteria) that could affect future NDPES permits or WDRs.

Redefinition of Waters of the United States, City and County of San Diego, CA, 2014-2015

On behalf of both the City of San Diego and County of San Diego, evaluated and prepared extensive comments regarding the USEPA and US Army Corp of Engineer's redefinition of the Waters of the United States and the potential implications for public agencies. Materials reviewed included the proposed and final Rules, the USEPA Draft Report: *Connectivity of Streams and Wetlands to Downstream Waters: A Review and Synthesis of Scientific Evidence*, related USEPA Science Advisory Board work products, and pertinent US Supreme Court Justice opinions.

NPDES Permit Renewal, Ojai Valley Sanitary District, Ojai, CA, 2018

Project Manager for the preparation and submittal of the Report of Waste Discharge

(ROWD) for OVSD's upcoming NPDES permit renewal. In addition to data compilation and review, and preparation of the required state and federal forms, the project included a Reasonable Potential Analysis and an evaluation of the likely consequences of incorporation of the requirements of the state Toxicity Policy (i.e., use of Test of Significant Toxicity, or TST) in the next permit.

Prioritization Tools for Sewer Main Upgrades in the City of San Mateo, San Mateo, CA, 2014-2015

As Task Lead, led the development of a mapping tool in ArcGIS using a variety of criteria to assign levels of risk of cross contamination between the storm drain system and individual sewer pipes in the City of San Mateo, with particular focus on pathways for transfer of sewage-related pathogens to Marina Lagoon. Project was conceived to support the City of San Mateo with efforts to comply with a 2009 Cease and Desist Order regarding SSOs and with the upcoming San Francisco Bay Beaches Pathogens TMDL. Schemes for assigning numeric scores to individual sewer pipes were developed based on thousands of CCTV inspections, spatial relationships between sewer and stormwater system assets, and degree of hydraulic isolation between storm drain networks and the seasonally stage-controlled receiving waters. The resulting scoring tool enables user-defined queries based on selection of risk factors and levels, with output available as spreadsheet asset inventories or maps with color coded sewer pipes ("heat maps"). The tool has been used by city staff to assist with capital improvement planning and sewer upgrades.

Jurisdictional and Permit Issues Related to Detention Basin Maintenance, Delta Diablo, CA, 2014

On behalf of Delta Diablo Sanitation District, performed an evaluation of state and federal jurisdictions and permit requirements related to maintenance of detention basins. Task required review of language in the Code of Federal Regulations (CFR), the legal definition of Waters of the US, California state wetland policy (under development), wetland jurisdiction and permitting and guidance documents, and pertinent State Board orders and federal court cases.

City of Stockton Regional Wastewater Control Facility Permit Renewal, Stockton, CA, 2014

On behalf of the City of Stockton, prepared and provided oral testimony at an NPDES Permit adoption hearing in June, 2014, regarding potential effects of treatment plant effluent on the pelagic and benthic organisms in the Bay-Delta and in reservoirs of the State Water Project.

City of Ventura OVSD Reuse Feasibility Study, Ventura, CA, 2014

On behalf of the City of Ventura, participated in a feasibility study for the reuse of effluent from the Ojai Valley Sanitary District (OVSD) WWTP. Responsible for evaluating the implications of diversion of effluent from the perspectives of applicable permits (NPDES, local conditional-use, and recycling permits), TMDL allocations and reopeners, 303(d) listings, and related State and Regional Board activity regarding water recycling.

Camarillo Sanitary District Effluent Diversion Pipeline, Camarillo, CA, 2013

As Project Manager, assisted the Camarillo Sanitary District with their responses to comments on a draft EIR for a pipeline project related to increased use of reclaimed water and cessation of discharge of effluent to surface waters. Work included application of HSPF model output, real-time continuous stream discharge data, in-stream water quality monitoring data, and effluent and groundwater quality data to evaluate the consequences of effluent diversion on in-stream flows and water quality in Conejo and Calleguas Creeks.

Laura Foglia, Ph.D.

Senior Engineer

EDUCATION

Ph.D. in Environmental Engineering, 2006, ETH Zurich Switzerland

M.S., Physics, 1999, University of Milan, Italy

YEARS OF EXPERIENCE

With LWA: 8

With UC Davis: 8

With Technical University Darmstadt: 3

SPECIALIZED TOOLS

MODFLOW and IWFM hydrologic models
Calibration models
Fortran, Python

PROFESSIONAL AFFILIATIONS

American Geophysical Union

European Geophysical Union

IAHS, International Association of Hydrological Sciences

Secretary of International Commission of Groundwater, IAHS

Dr. Foglia is a Senior Engineer with Larry Walker Associates (LWA) where she assists with projects in the areas of hydrological modelling, groundwater management assistance, and TMDL development. At LWA, she is leading the groundwater services for the Ukiah basin Groundwater Sustainability Agency and for the Siskiyou county for the development of their Groundwater Sustainability Plan. She is also involved in the development of a pilot groundwater recharge project for the Omochumne-Hartnell Water districts. Dr. Foglia and Prof. Steffen Mehl worked on behalf of Sacramento County Water Agency for the development of the testimony regarding the potential impact of the California WaterFix project on the groundwater resources in the South American Basin. She was involved in the first Pilot Project in 2009 that promoted by the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) coalition, a collaborative basin planning effort aimed at protecting vulnerable and essential water resources. Since January 2016, Dr. Foglia is also an Adjunct Faculty Staff in the Land, Air, and Water Resources (LAWR) Department at University of California, Davis where she teaches a graduate class on model calibration, supervises students, and works on the Scott Valley project for the assistance of the Scott Valley community with the development of the groundwater management plan. She has extensive experience teaching groundwater modelling and integrated hydrological modelling, with tailored material developed for short courses for stakeholders. She has relevant scientific publications on groundwater/surface water model development, assessment of data, evaluation of alternative models.

Groundwater (most recent)

Ukiah Valley Basin Groundwater Sustainability Plan

Dr. Foglia is engaged with the Ukiah Valley Groundwater Sustainability Agency for the development of their GSP. The plan for the Ukiah valley is due in January 2022 and it needs to focus on river/aquifer interactions, groundwater dependent ecosystems, and decrease in water levels as possibly most important undesirable results. Dr. Foglia is managing the project and playing an active role in the development of the numerical model.

Siskiyou County Groundwater Sustainability Plan

Dr. Foglia is working with Siskiyou county staff and with UC Davis for the development of the GSPs for three basins: Scott valley, Shasta valley and Butte Basin. All the basins are defined as medium priority and their plans are due in January 2022. As in Ukiah, the main focus is on understanding river/aquifer interactions, and groundwater dependent ecosystems. Dr. Foglia is managing the project and playing an active role in the stakeholders engagement process as well as in the development of the numerical model.

Scott Valley Groundwater Study, Scott Valley, CA

As part of the LAWR Department at UC Davis, Dr. Foglia provided research services for the Scott Valley groundwater/surface water management project, funded by the North Coast Regional Water Quality Board. The aim of the project is to assist the Scott Valley community with the development of a groundwater management plan that can lead to better streamflow conditions mainly during the summer months, preserving the water needed for agriculture activity. Dr. Foglia assisted with the development of a new GIS-based, irrigation driven, conceptual model for the analysis of the soil and water balance in the Scott Valley watershed. She worked closely with the stakeholders,

communities, and landowners.

Groundwater and Engineering services

Sacramento County Water Agency California WaterFix Groundwater Modeling Impact Assessment Support

Dr. Foglia teamed with Prof. Steffen Mehl to support the Sacramento County Water Agency in the Evaluation of the potential impact of the California WaterFix project on the groundwater system in South American Subbasin. Existing models for the entire Central Valley (CVHM) and for the Delta region (CVHM-D) have been extensively used and results analyzed to demonstrate wether the potential impact of the p;roject on water resources (mostly river/aquifer interactions) has been properly considered by the Petitioners. A testimony and a surrebuttal testimony have been submitted as results of this study.

Omochumne-Hartnell Water District: on-call engineering services

Dr. Foglia is managing the in-call engineering services contract with OHWD. Work includes the repurpose of an existing Proposition 84 grant Integrated Regional Water Management to design an off-season irrigation project to enhance aquifer recharge to the underlying groundwater aquifer and the South American and Cosumnes groundwater basins. The project includes repurpose of the grant, development of the RFPs for the construction services, groundwater monitoring design, stakeholder coordination.

Omochumne-Hartnell Water District and Sloughhouse Resource Conservation District Basin Boundary adjustment

Dr. Foglia, together with the LWA team, assisted Omochumne-Hartnell Water District (OHWD) and Sloughhouse conservation district (SRCD), in putting together and submitting a jurisdictional and scientific basin boundary adjustment request for the Cosumnes Subbasin's northern boundary, located along the Cosumnes River, to DWR in 2016. The project involved the development of technical material as well as the preparation of stakeholders meetings to support the boundary adjustment request.

CV-SALTS Salt & Nitrate Sources Pilot Implementation Study, Central Valley, CA

Dr. Foglia managed and performed analysis of salt loads in the Central Valley aquifers for the completion of a Salt and Nitrate Sources Pilot Implementation Study on behalf of the Central Valley Salinity Coalition (CVSC) to help develop a Basin Plan Amendment (BPA) to address the issue of salt and nutrient management in California's Central Valley. The resulting methodology provided a defensible means to relate downstream impacts to upstream sources in watersheds. The objectives were to develop and document procedures and methodologies to quantify the significant salt and nitrate sources in the Central Valley and to pilot test them by applying them in three areas to validate the region-wide applicability.

Journal Articles (Most Relevant)

Foglia L, Neumann J, Tolley D, Orloff S, Snyder R, Harter T. 2018. Modeling guides groundwater management in a basin with river–aquifer interactions. Calif Agr 72(1):84-95.https://doi.org/10.3733/ca.2018a0011.

Rossetto, R., De Filippis, G., Borsi, I., Foglia, L., Cannata, M., Criollo, R., Vázquez-Suñé, E., 2018. Integrating free and open source tools and distributed modelling codes in GIS environment for data-based groundwater management, Environmental

Modelling & Software, 107:210-230

Foglia, L., Borsi, I., Mehl, S., De Filippis, G., Cannata, M., Vasquez-Sune, E., Criollo, R., Rossetto, R., 2018. FREEWAT, a Free and Open Source, GIS-Integrated, Hydrological Modeling Platform. Groundwater – Technology Spotlight. DOI 10.1111/gwat.12654

Rasa E., Foglia L., Mackay D.M., and K.M. Scow, (2013) Effect of different transport observations on inverse modeling results: Case study of a long term tracer test at a high resolution groundwater monitoring site, Hydrogeology Journal 21: 1539-1554, DOI 10.1007/s10040-013-1026-8.

Foglia, L., A. McNally, and T. Harter (2013), Coupling a spatiotemporally distributed soil water budget with stream-depletion functions to inform stakeholder-driven management of groundwater-dependent ecosystems, Water Resour. Res., 49, DOI:10.1002/wrcr.20555.

Foglia, L., S. W. Mehl, M. C. Hill, and P. Burlando (2013), Evaluating model structure adequacy: The case of the Maggia Valley groundwater system, southern Switzerland, Water Resour. Res., 49, DOI:10.1029/2011WR011779.

Foglia, L., Mehl, S.W., Hill, M.C., Burlando, P. (2009) Calibration and testing of a distributed, physically based hydrological model using an error-weighted objective function, Water Resources Research, 45, DOI: 10.1029/2008WR007255.

Foglia, L., Mehl, S.W., Hill, M.C., Perona, P., Burlando, P. (2007): Testing alternative groundwater models using cross validation and other methods, Ground Water, Vol. 45:5, pp. 627-641, DOI: 10.1111/j.1745-6584.2007.00341.x.

Work History

Larry Walker Associates, Inc., Senior Engineer. 2007-present

Adjunct Professor, Land Air and Water Resources, UC Davis. Jan. 2016 - present

Technical University of Darmstadt, Germany, Assistant Professor w/o tenure track, research group of Prof. Christoph Schueth. March 2013-Dec. 2015

University of California, Davis, Department of Land, Air and Water Resources, Post-Doctoral associate, Prof. Thomas Harter. Aug. 2011-June 2013

University of California, Davis, Civil and Environmental Engineering Department, Post-Doctoral associate, Prof. Tim Ginn. 2007-2009

USGS National Research Program, Boulder, Colorado, Visiting researcher, Dr. Mary Hill. Oct.-Dec. 2003, Oct.-Dec. 2004, June-July 2005, May 2006, March 2007

University of Applied Sciences, Southern Switzerland (SUPSI), Institute for Earth Sciences (IST), and ETH Zurich, Scientific collaborator & Doctoral Student. 1999-2006

Mitchell Mysliwiec, Ph.D.

Associate Engineer

EDUCATION

Ph.D., Environmental Engineering, 2000, University of California, Davis

M.S., Environmental Engineering, 1994, University of California, Davis

B.S. (Summa Cum Laude), Civil Engineering, 1992, Syracuse University

REGISTRATIONS

Passed the Fundamentals of Engineering in 1992. Professional exam is pending.

YEARS OF EXPERIENCE

With LWA: 16
With other Firms: 4

PROFESSIONAL AFFILIATIONS

CASA Regulatory Work Group, Water Committee Co-Chair

Dr. Mitchell Mysliwiec, Associate Engineer, demonstrates his skill set in NPDES permitting and watershed management at LWA. He has over 20 years of experience and is not only responsible for NPDES/WDR permitting and TMDL development and implementation, but also develops/analyzes/evaluates methods to ensure appropriate water quality objectives are maintained both at the discharge and watershed scales. Prior to joining LWA in 2001, Dr. Mysliwiec worked as a post doctorate researcher and lecturer for lower and upper division engineering courses at the University of California, Davis. He serves as a co-chair on the CASA Regulatory Work Group Water Committee. Representative projects include the following:

Watershed Management/TMDLs

Calleguas Creek Management Plan, TMDL development

- Developed Sources and Linkage analysis aspects of TMDL development in the watershed for salts, toxicity, OP pesticides, and metals and selenium.
- Developed custom models incorporating a systems approach to determine the ultimate fate and transport of salts and OP pesticides. Custom salts model incorporated surface flow interaction with shallow groundwater. Extended HSPF hydrologic model for the watershed to include sediment, and total and dissolved fractions of metals and selenium. Used the HSPF model to evaluate watershed response to reductions in loading from specific land uses. Currently modifying the HSPF model for bacteria simulations.
- Evaluated methods of pollutant reduction with developed modeling tools to ensure water quality objectives would be met.
- Interacted with Regional Board and USEPA staff throughout entire TMDL development process.

Lake Tahoe, TMDL development

Assisted Caltrans in review and assessment of the Lake Tahoe Clarity TMDL. Detailed analysis and critique of the LSPC watershed loading and Lake Clarity modeling tools used by the Regional Water Board in TMDL development. Through targeted comment letters and meeting with the Regional Water Board affected the outcome of the final TMDL by demonstrating the watershed loading model overestimated loading by urban areas.

Stormwater

Los Angeles Region Watershed Groups

Project Manager for assistance in developing Watershed Management Plans, Enhanced Watershed Management Plans, and Coordinated Integrated Monitoring Plans to provide path for MS4 Permit Compliance for three Watershed Groups. Identified water quality priorities. Developed watershed specific monitoring approaches. Identified monitoring sites through Group member's direction. Developed monitoring plans to provide meaningful information, allowing Group members to make informed decisions on potential watershed actions.

Wastewater

City of Yuba City

Project Manager for NPDES permit renewals. Coordinated preparation of ROWD. Facilitated meeting with Regional Water Board to address discharge specific issues, including mixing zone application, pond use, and effluent limitation calculation procedure. Performed technical analyses including: mixing zone study and CORMIX modeling to meet SIP requirements, dynamic model for WQBEL calculations for copper, zinc, lead, and ammonia, review of aluminum criteria and aluminum WER study development, antidegradation analysis, evaluation of appropriate hardness selection for CTR metals criteria, de minimis mercury mass load modeling, and coordinated sub-consultant work. Provide ongoing permit assistance. Completed a water quality study for the City's disposal ponds, and potential impacts of flood induced discharge. Assisted in the Regional Water Board presentation preparation Permit hearing.

Sacramento Regional County Sanitation District

NPDES permit renewal assistance. Dissolved oxygen modeling of the Sacramento River to determine downstream effects of discharge and appropriate UOD limitations. Continuous sensor modeling of dissolved oxygen and related parameters in the Sacramento River. Developed appropriate WQBEL from dynamic model output. Attended Regional Board meetings regarding modeling approach and Thermal Plan compliance. Prepared antidegradation analyses and associated modeling efforts for the proposed future discharge condition incorporating treatment improvements. Participated in permit development process.

City of Modesto

NPDES permit compliance. Developed a copper translator study as per USEPA guidance. Performed Plume modeling to define appropriate dilution credits using CORMIX. Antidegradation analysis. Developed dissolved oxygen model for San Joaquin River with QUAL2E evaluating the effect of the discharge on downstream conditions and assessing compliance with an existing TMDL.

Department of Water Resources

NPDES permit renewal for the William E. Warne Power Plant. Developed work plans for dilution monitoring and modeling. Coordinated technical analyses of mixing zone study demonstrating available dilution. Verified CORMIX modeling with field measured dilution incorporating cumulative discharge to account for unique discharge configuration. Managed CORMIX modeling to meet SIP requirements. Assisted in the Regional Water Board presentation of findings.

Work History

Larry Walker Associates, Inc., 2001-Present

University of California, Davis, 1996-2001

Betsy Elzufon

Associate

EDUCATION

M.S., Chemical Engineering, 1983, University of California, Berkeley

B.S., Chemical Engineering, 1981, Cornell University, Ithaca

YEARS OF EXPERIENCE

With LWA: 24
With other Firms: 11

PROFESSIONAL AFFILIATIONS

Past – Chair, California Water Environment Assoc. Industrial and Hazardous Waste Committee (1998-99)

Chair, Annual West Coast Water Pollution Prevention Symposium (1995, 1996, 1997)

Board of Trustees, Explorit Science Center (1997-2011, Davis, California)

Ms. Elzufon has more than 30 years' experience in the areas of chemical engineering, industrial processes, regulatory assistance and pollution prevention. She coordinates wastewater permit renewal for discharges to surface water (NPDES) and discharges to land (WDRs) and permit implementation efforts for clients throughout California including the Los Angeles, Central Coast, Central Valley and Lahontan Regions. For WDRs in the Lahontan and Colorado River Regions, she has managed projects to evaluate impacts to groundwater from wastewater and recycled water. In addition, she has worked with a coalition of stakeholders to evaluate sustainable water supply management approaches in the Mojave River Valley Groundwater Basin. She has also assisted municipalities with obtaining Water Recycling Permits (WRRs, MRPs). She has managed national studies on source control and program effectiveness measurement for the Water Environment Research Foundation and the National Association of Clean Water Agencies.

Regulatory Assistance

Victor Valley Wastewater Reclamation Authority (VVWRA), Hesperia, CA. 2008-Present

Project Manager for VVWRA regulatory assistance including issuance of WDRs/ WRRs for its Subregional Facilities, implementation of its NPDES permit and technical and regulatory assistance associated with its December 2010 sewer line breach. LWA also assisted VVWRA with obtaining a WDR for additional percolation ponds at its main facility and renewing its NPDES permit. She has worked with VVWRA and Mojave Water Agency on comprehensive watershed planning to sustainably manage water supplies in the Mojave groundwater basin. Ms. Elzufon also assisted with obtaining coverage for its Recycled Water Program Statewide General Order and implementation of the approved program. Successful permit negotiation has relied heavily on analysis of impacts to groundwater including an antidegradation analysis for groundwater. She assisted VVWRA with preparing a non-waste determination to allow use of VVWRA biosolids as a fuel for nearby cement kilns.

City of Palm Springs, Palm Springs, CA. 2017-Present

Project manager for WDR permit renewal and required technical studies. Ms. Elzufon assisted the City of Palm Springs with the review of the WDR issued in 2017 including modifying elements of technical studies required by the WDR to assess the groundwater monitoring network and groundwater impacts associated with nitrates and TDS. LWA is currently assisting the City with these technical studies.

City of Santa Paula, Santa Paula, CA. 2015-Present

Project manager for WDR permit renewal and development of Recycled Water Program. WDR permit renewal has relied heavily on the development and implementation of a chloride compliance strategy and analysis of localized impacts to groundwater and nearby water supply wells. Ms. Elzufon assisted with developing the recycled water program and applying for coverage under the Statewide General Order for Water Recycling Requirements. She also assisted with stakeholder outreach to educate potential recycled water users and gain their support for the program.

City of Victorville, Victorville, CA. 2011-Present

Project Manager for City of Victorville WDR/WRR issuance for the Industrial Wastewater Treatment Plant. Includes preparation of ROWD, groundwater antidegradation analysis, Title 27 exemption analysis and revisions to Title 22 Engineering Report. LWA also assists the City with updates to the City's Sewer System Management Plan and with submittal of annual reports.

NPDES Permit Renewals, CA. 2007-Present

Ms. Elzufon currently works with the Cities of Redding and Davis, Paradise Irrigation District and VVWRA on NPDES permit renewals for 2018. She previously assisted with permit renewals for Cities of Burbank (2012, 2017), San Luis Obispo (2012, 2017), Cities of Thousand Oaks and Simi Valley and Camarillo Sanitary District (2014), City of Burbank (2012, 2017), City of Lompoc (2011), City of Davis (2013), Cities of Rio Vista (2015), and Roseville's (2008).

Watershed Management/TMDLs

Integrated Plan Development, Santa Maria, CA. 2015-2016

Assistant Project Manager for the City of Santa Maria Integrated Plan development. Managed a team of consultants to assist the City in development of the first California Integrated Plan based on the EPA Framework intended to address the City's regulatory requirements associated with the Phase II Stormwater Permit; Nutrient, Bacteria and Pesticide TMDLs; Trash Policy; Central Coast Post-Construction Requirements; Wastewater Waste Discharge Requirements; Safe Drinking Water Act; and other regulatory programs. Projects considered included stormwater capture, expansion of secondary water system for irrigation and nutrient trading.

Municipal Agricultural Collaboration, USA. 2014

Project Manager for the preparation of a Municipal-Agriculture Collaboration White Paper for the National Association of Clean Water Agencies (NACWA). Developed eight case study examples of Municipal Agricultural collaborations throughout the United States.

Water Environment Research Foundation, Washington, DC. 1996-2001

Principal investigator for a study to develop tools to measure source control program effectiveness and a nationwide literature assessment regarding commercial and residential sources of wastewater and stormwater pollution for the Water Environment Research Foundation.

Relevant Experience Prior To Larry Walker Associates

Regulatory Assistance, Alexandria, VA. 1992-1993

Assisted New Jersey Department of Environmental Protection and Energy (NJDEPE) in drafting the rules and regulations for New Jersey Pollution Prevention Act.

Research and Development, Columbia, MD. 1983-1992

Research Engineer working in research and development for Fortune 100 specialty chemicals company. Five years' experience evaluating photopolymers and coating processes used in printed circuit board fabrication which includes experience in metal finishing. Three years' experience in fermentation and amino acid production at the pilot plant scale.

Masih Akhbari, Ph.D., P.E.

Project Engineer II

EDUCATION

Ph.D. Civil and Environmental Engineering, 2012, Colorado State University, Fort Collins, CO

M.S., Civil and Environmental Engineering, 2005, Amirkabir University of Technology, Tehran, Iran

B.S., Civil Engineering, 2003, Islamic Azad University

REGISTRATIONS

Professional Engineer, State of Colorado, License No. 0053388

YEARS OF EXPERIENCE

With LWA: Joined July 2018
With other Firms: 14

PROFESSIONAL AFFILIATIONS

Member, American Society of Civil Engineers

Member, American Water Resources Association

Member, American Geophysical Union

SPECIALIZED TOOLS

RiverWare, ArcSWAT, WEAP21, WQRRS, RTEMP, Indicators of Hydrologic Alteration (IHA)

MATLAB, Python, VBA, R

ESRI ArcGIS, TSTool

Dr. Masih Akhbari joined LWA in July 2018 as a Project Engineer II and is experienced with interdisciplinary projects that require systemic approaches to plan and manage water supply in the context of environmental concerns, sustainability, and climate change. He has co-authored a textbook on groundwater hydrology and developed multiple conceptual, hydrologic, and integrated models as decision-making support tools to plan and manage water resources. Dr. Akhbari has conducted projects in the State of California, across the United States, and internationally. These projects involved collaboration with decision-makers and stakeholders, facilitation among them, incorporation of social science concepts into the engineering models, managing and analyzing large data sets, conducting hydrologic and statistical analyses, computer programming, and using Geographic Information Systems applications to conduct work.

Experience Prior To Larry Walker Associates

Hydrologic Simulation and Analysis

Hydrologic Hazards Analysis, Tennessee Valley Authority, TN. 2016 to 2018

As the lead RiverWare modeler developed a comprehensive rule-based model for the Tennessee Valley Authority (TVA) to simulate a system of more than 30 reservoirs with interconnected operations. The objective of this project was to create a comprehensive tool that forecasts upcoming hazardous events (i.e., floods).

Forecast System Support, Idaho Power, ID. 2015

Performed double mass analysis of mean areal precipitation and temperature time series and developed Python scripts to automate data preparation. Created more than 10 reservoir simulation models, converted from ResJ models, in RiverWare.

Flood Warning System

Design and Implementation of a Flood Warning Operation System, New York State Canal Corporation, NY 2015

Acquired and verified data, performed time series quality control, used the Interactive Calibration Program (ICP) to calibrate National Weather Service River Forecast System models (i.e., SNOW17 and SAC-SMA), set up input and model configuration files in MIKE CUSTOMIZED, created Python scripts to prepare input files for different models, compared MAP and multi-sensor precipitation estimates data for validation purposes, prepared GIS layers, and performed GIS analysis.

Hydrologic and Statistical Analyses

Data Analysis Support, Tennessee Valley Authority, TN. 2015

Developed a statistical analysis tool in PowerPivot to calculate the annual peak flow, exceedance frequency and rates, moving average with selectable time intervals, and partial duration peak flow.

Applied Statistical Analysis Techniques for Hydro Generation and Runoff, CEATI International. 2015 - 2016

This project was conducted for the Hydropower Operations and Planning Interest Group (HOPIG) at CEATI International, Inc. Acquired information about applied statistical techniques for practical applications of interest to hydropower operators through a literature review and interviews, evaluated the techniques for

applicability, feasibility, and transferability, documented their use in real-world applications, summarized surveys taken from HOPIG members, developed customized questions to interview each of the HOPIG members, and participated in the interviews.

Agricultural Water Conservation

Moving Forward on Agricultural Water Conservation in the Colorado River Basin, Department of Agriculture, CO, WY, UT, NM, AZ, NV, and CA. 2014 - 2016

Investigated and documented over 80 relevant case studies to identify the strategies that assist in conserving agricultural water in the Colorado River Basin to increase the security of urban and environmental water supply. Evaluated sociological, economic, and regulatory and legal barriers to provide the conserved water to other users. Participated in or facilitated meetings during which farmers, environmentalists, water lawyers, policy analysts, academic figures, and water conservation districts' staff convened to share their concerns and discussed the ambiguities associated with agricultural water return flow, conservation, and efficiency.

Water-Energy-Food Nexus

The U.S. Perspective on the Water-Energy-Food Nexus, Department of State and U.S. Corps of Engineers Nationwide. 2014

As the lead researcher, prepared a background report to show the status of each sector and to identify challenges and opportunities to implement a nexus approach, with focuses on infrastructure and technology, finance, governance, and partnerships. Organized a workshop about the nexus dialogue with experts from the Department of State, USACE, U.S. Department of Energy's national laboratories, nongovernmental organizations, industry, and academia. Facilitated a working group in the workshop titled *Lessons Learned*, the outcomes of which were presented by the director of the Colorado Water Institute at the 2014 World Water Week in Stockholm, Sweden.

Energy-Water Nexus in the Developing World with a Specific Focus on India and Sub-Saharan Africa, Factor(E) Ventures (a joint venture between Shell Foundation and the Energy Institute at Colorado State University, CO. 2014

As a consultant, evaluated the energy needs of irrigation and other agricultural activities in the developing world, with a specific focus on India and sub-Saharan Africa, determined potential opportunities, challenges, and barriers to implement solutions, and identified practical ways to reduce agricultural energy consumption.

Climate Change

Considering Climate Change in Hydropower Relicensing: A Case Study of the Yuba River Watershed, California Energy Commission, CA. 2012 - 2013

Collected, analyzed, and managed data. Created and calibrated a series of linked models, including a watershed simulation, a reservoir quality simulation, and a stream temperature simulation model to investigate the effects of hydroclimatic changes and hydropower operations on stream temperatures and ecological habitats. Developed Python scripts to link models and run them for the 1950–2100 period on a daily basis. Performed statistical analyses to compare historical and future conditions.

Decision Support and Watershed Planning

Managing Conflicts Over Water Issues in the San Joaquin Watershed, CA. 2010 - 2012

As an interdisciplinary study, integrating hydrologic-environmental-social/institutional aspects of water resources management, this project formed Dr. Akhbari's PhD dissertation at Colorado State University. Developed a decision-making support framework and incorporated it into a conflict management model to manage conflicts in the San Joaquin River watershed. The model included an optimization, a watershed simulation, and a behavioral simulation model, which simulated stakeholders' reactions to management scenarios by employing a sociologic diffusion model. To develop and scale this model, created a questionnaire and administered a survey to a range of agencies and stakeholders in the study area. Used this model to determine the rate of water allocations to agricultural fields, taking into consideration environmental water rights, competing water needs, and institutional interactions.

Methodology for Cost-Based Decisions on Water Main Renewal, Nationwide. 2010

Performed a comprehensive literature review to determine the consequences and risks associated with a main break, weighting factors in order to help set priorities for pipe replacement, maintenance and repair costs, replacement costs, indirect and intangible costs associated with a main break, and optimum year when a pipe should be replaced.

Modeling the South Platte River Basin in ArcSWAT, South Platte River Basin, CO 2009 - 2010

Acquired, prepared, and managed hydrological, meteorological, and geographical data to create a comprehensive data inventory to support model development and calibration. Created GIS maps for the South Platte River Basin. Used GIS tools to combine National Agricultural Statistics Service (NASS) and National Land Cover Dataset (NLCD) land use layers with irrigated field maps and to combine soil data sets to fill missing regions in Soil Survey Geographic (SSURGO) by State Soil Geographic (STATSGO) data sets. Set up the South Platte River Basin simulation model in ArcSWAT.

Sefidrood River Water Pollution Prevention, Control, and Reduction, Iran 2007 - 2008

Acquired and prepared data, performed GIS analysis to determine locations of river water quality sampling points, investigated sites, and developed river water sampling plans. Sampled river water, coordinated sampling groups and organized their interactions with laboratories, supervised employees from different disciplines and assigned their tasks, wrote reports, and reviewed reports prepared by other disciplines.

Qualitative and Quantitative Planning and Management of Water Allocation with Emphasis on Conflict Resolution, Iran. 2004 - 2005

Designed and created a system dynamics–based conflict resolution model and linked it to a river water quality simulation model, to determine the optimal agricultural water and waste load allocation policies in the Karkheh River system.

Water Supply Performance Analysis

Retrospective Analysis of Performance of Dual Distribution Systems, National and International. 2010

Created an inventory of cases in which dual systems were implemented across the United States; identified claimed benefits, costs, and risks associated with dual distribution systems; and reviewed evaluations regarding the performance of dual

distribution systems across the United States. Determined the extent of using recycled water in other countries, including: Canada, Australia, Japan, Namibia, Israel, United Kingdom, Spain, Germany, and South Africa.

Air Pollution

Master Plan for Air Pollution Control in Abadan City (2005)—

Reviewed reports to estimate pollution load of different air quality variables originated from various sources (i.e., urban, industrial, agricultural, and miscellaneous). Performed a statistical analysis of changes in concentration of different air pollutants. Used results to help create a master plan for air pollution control in Abadan City, southern Iran.

Water Quality and Pollution Source Analysis

Statistical Analysis of Irrigation Ditch Agricultural Contaminant Contribution, Weld County, CO. 2009

To identify how antibiotics from animal feeding operations may be spread through precipitation, located water quality sampling points along the river through GIS analysis. Used an inverse distance weighting approach to perform a geospatial analysis of the number of animals and the amount of domestic wastewater flow upstream of each sampling point. Created GIS maps that illustrated spatial variation of antibiotic concentrations in the study area and the main sources of antibiotic pollution. Performed a statistical analysis to determine the correlation between precipitation and measured antibiotic concentration.

Environmental Impacts Assessment of the Takestan Irrigation and Drainage System, Iran. 2008

Acquired and prepared GIS data, investigated the site, and conducted GIS analysis to determine key water quality sampling locations in the aquifer.

Design of the Karoon Water Quality Monitoring System and Bid Evaluation Assistance, Iran. 2005

This project was conducted for the World Bank. Prepared a review of the existing monitoring program, helped determine potential sites and specifications of local recording options, determined data processing options and hardware requirements, and identified the equipment that was required for continuous monitoring and sampling equipment for physical, chemical, and biological quantities.

Assessment of Water Quality Management in Khuzestan Province, Iran. 2004

This project was also conducted for the World Bank. Diagnosed water quality issues, reviewed existing legislation, and identified gaps in water quality management in the Khuzestan Province in Iran. Performed a literature review to identify water quality issues and provided a review of the existing legislation.

Statistical Analysis of Water Quality Variation in Karoon River and Selection of Water Quality Indicators for the Monitoring System, Iran. 2004

Evaluated the spatial and temporal variations of different water quality variables, calculated the correlation between concentrations of different water quality variables in order to decrease the number of sampling variables, and determined the correlation between river flow rate and concentrations of water quality variables. In addition, estimated the spatial correlation of concentrations of water quality variables to remove redundant stations from the monitoring network, analyzed the results.

Professional Services

Co-advisor, Colorado Water Institute, Co-advised multiple master's and Ph.D. students on their theses and dissertations, 2014-2017.

Review Panelist, Graduate Research Fellowship Program, National Science Foundation, 2017.

Session Chair and Convener, "Global and regional water-food-energy security under changing environments," American Geophysical Union, Fall Meeting, San Francisco, CA, 2015.

Discussion Panelist, "Colorado River Basin Shortage," AWRA Annual Water Resources Management Conference, Denver, CO, 2015.

Facilitator, Short-term Course, "Students in Water Dialogue," Colorado Water Institute, Colorado State University, 2015.

Reviewer, Journal of Water Resources Management (ASCE), Irrigation and Drainage Eng. (ASCE), Hydrologic Engineering (ASCE), American Water Resources Association, Ecology and Society, PLOS ONE, British Journal of Environment and Climate Change

Judge, Outstanding Student Paper Awards, American Geophysical Union, Fall Meeting, San Francisco, CA, 2014.

Organizer, Webinar, "Moving Forward on Agricultural Water Conservation in the Colorado River Basin," Colorado State University, September 3, 2014.

Facilitator, "U.S. Lessons Learned," The Nexus Dialogue on Water Infrastructure Solutions Meeting, Golden, Colorado, June 23-24, 2014.

Publications & Presentations

Books

Karamouz, M., A. Ahmadi, and M. Akhbari, 2011. "Groundwater Hydrology: Engineering, Planning, and Management," CRC Publishing, Boca Raton, FL.

Karamouz, M., A. Ahmadi, and M. Akhbari, 2011. "Solution Manual - Groundwater Hydrology: Engineering, Planning, and Management," CRC Publishing, Boca Raton, FL.

Peer Reviewed Publications

Islami, I., Sadoddin, A., Barani, H., Asgharpour Masoule, A., and M. Akhbari 2018, Analytical Network Process to Prioritize the Influencing Parameters on Local Participation," Industrial Engineering & Management Systems, Vol. 17, Issue 2, Pages 318-326, DOI: 10.7232/iems.2018.17.2.318.

Khaksar, M.A., Monghasemi, S., Akhabri, M., and M. Nikoo (In Review), "Bargaining and Voting in an Agent-based Modeling Framework for Water Resources Conflict Management", Journal of Hydroinformatics.

Islami, I., Sadoddin, A., Asgharpour Masoule, A., and M. Akhbari 2017, "Modeling socio-ecological structure of stakeholders' participation in managing livestock drinking water using the agent-based approach," Applied Ecology and Environmental Research, DOI: http://dx.doi.org/10.15666/aeer/1503_11731192.

Islami, I., Sadoddin, A., Barani, H., Asgharpour Masoule, A., and M. Akhbari 2016 "investigating seasonal changes of proline, soluble sugars and ion contents in

hammada salicornica habitats with various soil conditions in Bafgh area, Yazd Province," Journal of Rangeland, Vol.10, Issue 3—in Farsi.

Farhadi, S., Nikoo, M., Rakhshanderoo, G., Akhbari, M., and M.R. Alizadeh 2016, "An Agent-based-Nash Modeling Framework for Sustainable Groundwater Management: A Case Study," Journal of Agricultural Water Management, DOI: 10.1016/j.agwat.2016.08.018

Akhbari, M. and N. S. Grigg 2015, "Managing Water Resources Conflicts: Modelling Behavior in a Decision Tool," Journal of Water Resources Management, Springer, Volume 29, Issue 14, Page 5201-5216 DOI: 10.1007/s11269-015-1113-9.

Akhbari, M. and N. S. Grigg 2014. "Water Management Tradeoffs between Agriculture and the Environment: A Multiobjective Approach and Application," J. of Irrig. and Drainage Eng., ASCE, Vol. 140, Issue 8, DOI: 10.1061/(ASCE)IR.1943-4774.0000737.

Akhbari, M. and N. S. Grigg 2013. "A Framework for an Agent-Based Model to Manage Water Resources Conflicts," Journal of Water Resources Management, Springer, Vol. 27, Issue 11, pp. 4039-4052, DOI: 10.1007/s11269-013-0394-0.

Karamouz, M., M. Akhbari, and A. Moridi 2011. "Resolving Disputes over Reservoir-River Operation," J. of Irrigation and Drainage Engineering, ASCE, Vol. 137, No. 5, pp. 327-339, DOI: 10.1061/(ASCE)IR.1943-4774.0000292.

Karamouz, M., Kerachian, R., M. Akhbari, and B. Haafez 2009. "Design of river water quality monitoring networks: a case study," J. of Env. Modeling and Assessment, Springers, 14(6), pp. 705-714, DOI: 10.1007/s10666-008-9172-4

Karamouz, M., Kerachian, R., Nikpanah, A. and M. Akhbari 2008. "Management Information System for River Quality Data Analysis, Case Study: Karoon and Dez Rivers," Journal of Iran Water Resources Research, Vol. 4, No. 1, 9-27 (in Farsi).

Karamouz, M., M. Akhbari, R. Kerachian, and A. Moridi 2006. "A System Dynamics-Based Conflict Resolution Model for River Water Quality Management," Iranian Journal of Environmental Health Science and Engineering, Vol 3, No. 3, pages 147-160.

Reports

Akhbari, M., Smith, MLou 2016. "Case Studies Highlighting Challenges and Opportunities for Agricultural Water Conservation in the Colorado River Basin," Colorado Water Institute, Special Report No. 27. Available at: http://cwi.colostate.edu/publications/SR/27.pdf

Akhbari, M., Grigg, N. S., and R. Waskom 2014. "Background Paper for the Nexus Workshop: U.S. Perspective on the Water-Energy-Food Nexus," The Nexus Dialogue on Water Infrastructure Solutions Meeting, Golden, CO, June 23-24, 2014. Available at http://www.cwi.colostate.edu/workshops/NEXUS2014/Background.aspx

Akhbari, M., Childress, A. Averyt, K., Barton, J., Bellamy, B., Belt, R., Chartrand, L., Cohen, M., Gilroy, K., Grigg, N., Harto, C., Holzfaster, J., Kryc, K., Laituri, M., Lineberger, J., MacDonnell, L., Macknick, J., Marshall, Z., Radtke, J., Spang, E., Tellenhuisen, S., Tidwell, V., Waskom, R. 2014. "Report from the U.S. Nexus Workshop — Water, Energy, and Food: Mutual Security through a Nexus Approach," in U.S. Perspective on the Water-Energy-Food Nexus, Colorado Water

Institute, Information Series No. 116. Available at: http://www.cwi.colostate.edu/workshops/NEXUS2014/Report.aspx

Waskom R., Akhbari, M., and Grigg, N. S. 2014. "U.S. Perspective on the Water-Energy-Food Nexus," Colorado Water Institute, Information Series No. 116. Available at: http://www.cwi.colostate.edu/workshops/NEXUS2014/Proceedings.aspx

Viers, JH, Rheinheimer, D., Akhbari, M., Peek, R., Yarnell, S., Null, S. 2013. "Considering climate change for hydropower relicensing." Public Interest Energy Research (PIER) Program White Paper. Prepared for the California Energy Commission.

Talks and Presentations (* denotes the presenter)

Akhbari*, M. 2015, "Co-management of Water, Energy, and Food Systems: Where Are We and What Does it Take for Implementation?" 2015 American Geophysical Union Fall Meeting, San Francisco, California. (poster)

Akhbari*, M. and R. Waskom 2015, "Enhancing Water-Energy-Food Security: Primary Challenges and Opportunities," American Water Resources Association (AWRA) Annual Conference on Water Resources.

Akhbari*, M., Smith, MLou and R. Waskom 2015, "Saving Agricultural Water in the Colorado River Basin: Drivers and Challenges," American Water Res. Association (AWRA) Annual Conference on Water Resources.

Akhbari*, M. 2015 (Invited), Systemic Approaches in Planning and Management of Water, Energy, and Food Resources: Employing Agent-Based Modeling as a Supporting Tool, Shiraz University, Shiraz, Iran.

Akhbari*, M., Grigg, N. S., and R. Waskom 2014. "Water-Energy-Food Nexus: Compelling Issues for Geophysical Research," 2014 American Geophysical Union Fall Meeting, San Francisco, California.

Macknick*, J., Waskom, R., Grigg, N.S., Akhbari, M. 2014. "Case Studies and Perspectives on the Water-Energy-Food Nexus in the United States," Symposium on Infrastructure Solutions in the Water-Energy-Food Nexus, Beijing, China.

Waskom*, R., Taylor, P.L., Eckhardt, L., Cabot, P., Smith, MLou, Macilroy, K., Love, H., Akhbari, M., and Kallenberger, J. 2014. "Moving Forward on Agricultural Water Conservation in the Colorado River Basin," National Integrated Water Quality and Agriculture and Food Research Initiative Project Director's Meeting, Washington D.C (poster).

Waskom*, R., Grigg, N.S., Akhbari, M. 2014. "Report from the U.S. — Water Energy Food Nexus Workshop," 2014 World Water Week, Stockholm, Sweden.

Akhbari*, M. (2014), "California Bay-Delta Program," The Nexus Dialogue on Water Infrastructure Solutions Meeting, Golden, Colorado, June 23-24, 2014.

Null*, S.E., Akhbari, M., Ligare, S.T., D. Rheinheimer, D., Peek, R., Yarnell, S.M., and J.H. Viers 2013. "Modeling Climate Change Effects on Stream Temperatures in Regulated Rivers," 2013 American Geophysical Union Fall Meeting, San Francisco, California (poster).

Rheinheimer*, D.E., Akhbari, M., Peek, R., Yarnell, S.M., Null, S.E., Viers, J.H. 2013. "Incorporating climate change in flow regime alteration studies in hydropower licensing." 2013 American Geophysical Union Fall Meeting. San Francisco, CA.

Akhbari*, M., Null, S.E., Viers J.H., and D. Rheinheimer 2012. “A Framework for Incorporating Hydroclimate Variability in Regulated Rivers: Implications for Hydropower Relicensing in California’s Yuba River,” 2012 American Geophysical Union Fall Meeting, San Francisco, California.

Akhbari*, M. and N. S. Grigg 2011. “Conflicts over Water Quality Management in Sacramento-San Joaquin Delta,” AGU Hydrology Days, Colorado State University, Fort Collins, Colorado.

Cowley*, C.T., Akhbari, M. NegahbanAzar, M. Arabi, M. and K. Carlson 2010. “Geospatial Analysis of the Occurrence and Transport of Antibiotics in Irrigation Ditches and the Poudre River in Weld County,” AGU Hydrology Days, Colorado State University, Fort Collins, Colorado.

Karamouz, M., M. Akhbari*, R. Kerachian, and A. Moridi 2006. “Conflict Resolution in River Water Quality Management: A System Dynamics Approach,” 7th International Conference in Civil Engineering, Tarbiat Modarres University, Tehran, Iran.

Work History

Larry Walker Associates, Inc., July 2018-Present

RTI International (formerly Riverside Technology), 2015-2018

Colorado Water Institute, 2014-2015

Center for Watershed Sciences, UC Davis, 2012-2013

Colorado State University, 2008-2012

Yekom Consulting Engineers, 2007-2008

Water and Environment Research and Development, 2004-2008

Nima Jabbari, Ph.D., P.E.

Project Engineer

EDUCATION

Ph.D. Civil and Environmental Engineering, 2016, University of Southern California, Los Angeles

M.S., Environmental Engineering, 2014, University of Southern California, Los Angeles

B.S., Civil Engineering, 2009, University of Tehran

REGISTRATIONS

Professional Engineer, License Number 88147, December 2017

CERTIFICATIONS

OSHA 40 Hour HAZWOPER Training, No. 1507051144039, July 2015

YEARS OF EXPERIENCE

With LWA: 2.5 years
With CA State Lands Commission: 1 year

SPECIALIZED TOOLS

MODFLOW, MODFLOW-OWHM, C2VSIM, CVHM

MATLAB, GNU-Octave, R

HSPF, LSPC, HEC-HMS

HEC-RAS

ESRI ArcGIS, Spatial Analyst,

SGEMS

Dr. Nima Jabbari is a Project Engineer with LWA and has expertise in surface and ground water quality analysis, modelling and monitoring. Dr. Jabbari's projects with LWA address surface and ground water data analysis as a tool to develop WQIPs and to comply with land discharge requirements. He has extensive background in application of spatial analysis software packages in water quality and energy service areas. Mr. Jabbari has also developed stochastic models to investigate fate and transport of contaminants and to characterize aquifer contamination risk from subsurface spill of contaminants.

Ground Water

Waterfix Ground Water Impact Assessment Support, Sacramento County, CA. 2016-present

Drafted maps, conducted analytical calculations, performed numerical simulations, and data processing to determine the impact of diverting water from Sacramento River on the nearby ground water level using data and information from the Central Valley Hydrologic Model (CVHM).

Watershed Management/TMDLs/ Ground Water

Calleguas Creek Watershed Salt and Nutrient Management Plan, Ventura County, CA. 2016-present

Contributed to drafting the Salt and Nutrient Management Plan. Compiled main sections of the document including basin settings, background geology, analysis of water quality, and calculation of assimilative capacity for various analytes using spatial analyses.

Calleguas Creek Watershed TMDL Implementation Plan, Ventura County, CA. 2016

Drafted a work plan for Se natural sources exclusion in Calleguas Creek Watershed.

Santa Margarita River Watershed WQIP, Riverside County, CA. 2016

Analyzed historical and recent data to find general trends and water quality objective exceedances to help assessing receiving water conditions and impacts from MS4 outfalls, and also identifying priority water quality conditions.

Coordinated Integrated Monitoring Plan (CIMP) Annual Report, City of Los Angeles, CA. 2016

Analyzed water chemistry data to find general trends and water quality objective exceedances in Los Angeles River, Ballona Creek, Dominguez Channel, and Santa Monica Bay watersheds to address the requirements of the MS4 permit.

Wastewater/Regulatory Assistance/ Waste Discharge

Waste Discharge Requirement, Wastewater Treatment and Reclamation Plant, City of St. Helena, CA, 2016-present

Helped reviewing the documents and data and proposed actions to ensure groundwater and river adjacent to the wastewater and reclamation plant are protected from water quality degradation. Conducted geostatistical modeling for groundwater simulation.

Russian River County Sanitation District, 2016

Analyzed historical and recent water quality data to determine if land discharge effluent quality is in compliance with the order on Waste Discharge Requirements for Land Application and also whether groundwater quality is remaining unaffected. Groundwater quality changes were assessed through application of statistical analysis for data from a pair of up and down-gradient wells to determine if the results are statistically significant.

Ambient Water Quality Monitoring

Ballona Creek CIMP Screening, City of Los Angeles, CA. 2016

Conducted dry weather screening of outfalls and sampling of all flowing outfalls discharging into Ballona Creek, Sepulveda Channel, and Centinela Creek for *E. coli* to identify priority storm drains under the Coordinated Integrated Monitoring Plan.

Los Angeles River CIMP Screening, City of Los Angeles, CA. 2016

Conducted dry weather sampling of flowing outfalls discharging into the Los Angeles River Segment E for E. coli as part of a Load Reduction Strategy project to address the Los Angeles River Bacteria TMDL.

Experience Prior To Larry Walker Associates

Environmental Engineer Intern, CA State Lands Commission – Mineral Resources Management, Long Beach, October 2014-January 2015, June 2015-December 2015

- Performed data analysis using customized computer codes (MATLAB scripts).
- Verified that casing setting depths are at sufficient depth to provide maximum protection to fresh water bearing formations and protection against known pressure anomaly formations.
- Conducted engineering calculations to verify the adequacy of proposed well casing strength.

Doctoral Student, University of Southern California, Los Angeles, 2009-2016

- Researched Environmental safety of subsurface fluid injection processes (e.g. Hydraulic Fracturing and Waste Injection) with risk characterization of groundwater contamination as one of the main goals (using USEPA's risk assessment methods).

Selected Publications and Presentations

Jabbari, N., Aminzadeh, F., & de Barros, F. P. J. Hydraulic Fracturing and the Environment: Risk Assessment for Groundwater Contamination from Well Casing Failure (2016). Stochastic Environmental Research and Risk Assessment, 1-16

Jabbari, N., Aminzadeh, F., & de Barros, F. P. J. Assessing the Groundwater Contamination Potential from a Well in a Hydraulic Fracturing Operation (2015). Journal of Sustainable Energy Engineering, 3(1), 66-79.

Work History

Larry Walker Associates, Inc., 2016-present

CA State Lands Commission, 2015

University of Southern California , 2009-2016

Amir Mani, Ph.D.

Project Engineer

EDUCATION

Ph.D. Civil and Environmental Engineering, 2016, Louisiana State University, Baton Rouge

M.S., Civil and Environmental Engineering, 2011, University of Tehran

B.S., Civil Engineering, 2009, University of Tehran

YEARS OF EXPERIENCE

With LWA: 2 years
With other Firms: 3 years

PROFESSIONAL AFFILIATIONS

Member, American Society of Civil Engineers

Member, American Geophysical Union

Member, Environmental and Water Resources Institute

Member, Groundwater Resources Association of California

SPECIALIZED TOOLS

IWFM, MODFLOW, MODFLOW-OWHM, C2VSIM, CVHM

MATLAB, GNU-Octave, C++, Python, VBA, R

HSPF, LSPC, HEC-HMS

HEC-RAS, VIC, HELP3

ESRI ArcGIS, Spatial Analyst, 3D Analyst, Geostatistical Analyst

Dr. Amir Mani is a Project Engineer with LWA and has expertise in a wide array of water resources engineering services including integrated water resources management, hydrology, groundwater management and modeling, climate change adaptation and mitigation strategies, water distribution networks, and urban supply. Since joining LWA, he has been involved in groundwater management and modeling, surface and groundwater quality data analysis, TMDL compliance analysis, watershed modeling, and development of WQIPs.

Dr. Mani is a recognized and published researcher in hydrological and hydrogeological modeling, conjunctive use, climate change impact assessment, and uncertainty estimation. During his work as a research assistant at Louisiana State University, Dr. Mani developed a high-resolution groundwater model for an interstate basin and proposed a 25-year sustainable plan to restore the aquifer by developing a high-performance computing conjunctive use model. He has been responsible for multiple large-scale hydrogeological modeling projects, runoff and recharge estimations and projections, and climate change impact assessment and mitigation. He is currently involved in LWA's groundwater market section working for SGMA compliance.

Groundwater

City of St. Helena Groundwater Modelling, Napa County, CA. 2017-Present

Responsible for groundwater fate and transport modeling using USGS MODFLOW and MODPATH to assess the effects of recycled water recharge through storage basins and irrigation on the underlying aquifer and Napa river.

Waterfix Ground Water Impact Assessment Support, Sacramento County, CA. 2016-Present

Assisted in preparing testimonies with respect to aquifer response time estimation using CVHM model and assessed the response of the aquifers to the changes in the river elevations and its impacts on the South American Subbasin.

Salt and Nutrient Management Plan, Ventura County, CA. 2017

Performed analytical evaluation of the water quality in the groundwater wells of the county to estimate existing trends and asses causes and contributing sources.

Salts Compliance Strategy, Ventura County, CA. 2017

Proposed Groundwater Monitoring Workplan for Piru Wastewater Treatment Plant and prepared the related memorandum to address the Los Angeles Regional Water Quality Board's requirements.

Northeast Pleasant Valley Groundwater Desalter SEP, Camarillo Sanitary District, CA. 2017

Completed a special study for the Septic to Sewer Conversion Project for the City of Victorville as part of the Groundwater Desalter SEP proposed by the district.

Watershed Management and Modeling

Calleguas Creek Watershed Implementation Plan, Ventura County, CA. 2016-Present

Responsible for migration of the existing Hydrologic Simulation Fortran (HSPF) model to a Load Simulation Program in C++ (LSPC) to simulate hydrology and the fate and transport of pollutants through the watershed.

CIMP Annual Report, City of Los Angeles, CA. 2016-Present

Developed and conducted the trend analysis and exceedance analysis of water quality data for the Upper Los Angeles River, Ballona Creek, Dominguez Channel, and Santa Monica Bay watersheds as part of the MS4 permit requirement for effectiveness assessment of non-storm water control measures. Assisted in the revision of the annual reports and their respective presentations.

Malibu Creek Watershed CIMP, City of Malibu, CA. 2016-Present

Responsible for data analysis and data management of water chemistry data, including assessment of general trends and water quality objective exceedances.

Experience Prior To Larry Walker Associates

Research Assistant, Louisiana State University, LA. 2011-2016

- Developed a high-performance computing framework to assess the impact of conjunctive use of water resources in restoring stressed aquifers under climate change projection uncertainty.
- Expanded a regional groundwater model to project future states of Sparta aquifer under climate change impacts and increased demands in northern Louisiana using MODFLOW and USGS observation records.
- Performed hydrological modeling and runoff estimation of large-scale regions from USGS records and NRCS data, using HEC-HMS, HELP3, Hec-GeoHMS, and ArcGIS. Calibrated and verified HELP3 for northern Louisiana and southern Arkansas using CMA-ES optimization method.
- Performed runoff projection from hybrid downscaled CMIP5 climate data and VIC hydrologic model. Quantified runoff projection uncertainty using Bayesian model averaging for ensemble averaging and scenario generation.
- Assessed projection uncertainty of frequently utilized ensemble averaging methods using statistically downscaled CMIP5 climate data.

Selected Publications

Mani, A., Tsai, F.T.-C., (2016.) "Ensemble averaging methods for quantifying uncertainty sources in modeling climate change impact on runoff projection." Journal of Hydrological Engineering. *10.1061/(ASCE)HE.1943-5584.0001487.*

Mani, A., Tsai, F.T.-C., Kao, S. C., Naz, B. S., Ashfaq, M., and Rastogi, D., (2016). "Conjunctive management of water resources under climate change projection uncertainty." Journal of Hydrology, Volume 540, 397-411, ISSN 0022-1694, *http://dx.doi.org/10.1016/j.jhydrol.2016.06.021*.

Mani, A., Tsai, F.T.-C., Paudel, K., (2016). "Mixed integer linear fractional programming for conjunctive use of surface water and groundwater." Journal of Water Resources Planning and Management, *10.1061/(ASCE)WR.1943-5452.0000676.*

Work History

Larry Walker Associates, Inc., 2016-Present

Louisiana State University, 2011-2016

Farnahad Architecture and Urban Planning, 2008-2011

Michael Marson

Project Scientist

EDUCATION
B.S., Computer Science, College of Engineering, 1988, University of California, Santa Barbara

YEARS OF EXPERIENCE
With LWA: 10
With other Firms: 15

SPECIALIZED TOOLS
VB programming in MS Access

ADDITIONAL TRAINING
HP Unix (HPUX-10) Admin Classes (total 3 weeks), 1997

Siebel Sales Force Development Classes, 2001

Actuate Report Writer classes, 2001

Many on-line Computer Based Training (CBT) classes offered by Microsoft

Mr. Marson is a Project Scientist II and serves as a database administrator and software developer for LWA. He has extensive experience in the design, development, implementation, and management of databases in Microsoft Access and Oracle. He has over 25 years of computer programming experience in both government and commercial fields.

Data Management

Malibu Creek Watershed CIMP Implementation, Agoura, CA 2016 – Present

Worked independently to design and implement a MS Access database to house the data currently collected under this contract. It has a user friendly interface that allows the user to build and run ad-hoc queries of the data. They could then export the data into a CEDEN compatible Excel file. The database also has the ability to import electronic data deliverable (EDD) files from several different laboratories and many pre-defined queries that are used to quickly run completeness and QA/QC checks of the data.

Calleguas Creek Watershed (TMDL program), Camarillo, CA 2005 – Present

Worked independently to design and implement a MS Access database to house the ever growing amount of data the current program collects. The database houses over 300,000 data records and has the ability to import electronic data deliverable (EDD) files from several different laboratories. Each of these import interfaces were custom made for that particular lab. The database features a suite of pre-defined queries that are used to quickly run completeness and QA/QC checks.

Farm Bureau of Ventura (VCAILG), Ventura, CA 2008 – Present

Designed, developed, and implemented three MS Access databases used to store water quality data, membership information, and agricultural best management practices (BMPs) survey results for the Ventura County Agriculture Irrigated Lands Group (VCAILG). The first database was designed and developed by LWA to accommodate the growing number of water quality data records collected by VCAILG. The database was designed to allow the user to import electronic data deliverable (EDD) files from various laboratories and then review and archive the data according to the requirements of a comprehensive Data Quality Evaluation Plan (DQEP).

The second database developed by LWA is a membership database of over 1,600 landowners that collectively own over 3,000 parcels throughout Ventura County. This database allows for ongoing updating of the group's members, their membership status, and the parcels under their ownership. It also tracks the grower/operator, types of irrigation, types of crops being grown, and organic vs. conventional farming practices. Several database reports were designed to provide the VCAILG committee with up-to-date information regarding membership, amount of currently irrigated acreage, and the types of crops being grown across the three watersheds under VCAILG's purview. The database also tracks educational hours logged by landowners and growers who receive training on water quality BMPs. With the new waiver (2011 – 2016), Mr. Marson has further developed the landowner's database to include a full user interface so that the new membership information and education hours can be entered by a VACILG employee or an administrative person.

The third database was developed as the result of collaboration between LWA and

the University of California Cooperative Extension to develop a survey of agricultural BMPs that was given to the group's members. Mr. Marson designed a user interface to allow the entry of the survey results into a database. The data input screens were designed to match the format of the survey to help limit key-entry errors and speed data entry. This database is linked to the membership database to join survey results with particular parcels and land owners. This database has now been replaced with a website that allows the owners/growers to login and fill-out the BMP survey. An outside firm has done the website programming, but Mr. Marson was instrumental in the design of the look and feel and the importing of the membership data to the website. Now that the survey is completed online, there is no need for a survey entry database. The owners/growers all do their own data entry.

Sacramento Valley Water Quality Coalition (SVWQC), Sacramento, CA 2013 – 2015

Mr. Marson used the basic structure from the VCAILG membership database to customize a new membership database for SVWQC. This membership database is actually two databases that are linked together. A front-end database that links to a back-end that houses each of the 13 subwatersheds member data. Each subwatershed has their own specific back-end database for their members. The front-end only contains the code for the user interface that allows for LWA to make requested changes and push new versions out to everyone. Each of the subwatersheds manages their own data, but when the coalition needs to submit their membership list, the coalition manager can request everyone's membership data. Since it is all in the same format, they can easily compile the data into one file.

This database allows for ongoing updating of the members, their membership status, the parcel they own, who grower/operator on each parcel, types of crops being grown, and location information for each parcel. Several database reports were designed into the interface along with basic invoicing and payment tracking.

Sacramento Regional County Sanitation District Delta Database, Sacramento, CA 2013

Developed and administers a MS Access database that houses over 700,000 water quality data records from the Sacramento-San Joaquin Delta. The database features complex querying functionality that allows for the simultaneous cross-referencing of multiple constituents to identify trends and inter-parameter effects. All the data housed in this database we originally stored in several different formats of MS Excel files. Each file had to be normalized and imported into the database.

Calleguas Municipal Water District, Oxnard, CA 2009 – 2012

Mr. Marson created a new MS Access database to store water quality data collected for the Phase 1E and Phase 2A Dewatering Assistance Program. Mr. Marson took over management of the monitoring portion of this contract, which involved setting up the next events paperwork, coordinating with the labs for sample pickups, bottle ordering and data deliverables, coordinating with the client to schedule monitoring efforts, and managing the field monitoring crew. This contract required monthly monitoring for the duration of the construction process.

Central Coast Ambient Monitoring Program (CCAMP), Santa Maria, CA 2005 – 2011

Mr. Marson oversaw all aspects of data management for the Central Coast Phase I Conditional Waiver Cooperative Monitoring Program. He created a MS Excel application that used macros to format monthly water quality data and performed

minor QA checks that were required prior to uploading data to the CCAMP website. He also participated in monthly water quality monitoring events, during dry and wet weather monitoring, and prepared samples for submittal to analytical laboratories.

The County Sanitation Districts of Los Angeles County and the City of Los Angeles, Los Angeles, CA 2005 – 2007

Developed and administered a listing/delisting application for California's 303(d) list on impaired waterbodies. The MS Access application was developed to help agency staff quickly evaluate data and determine if specific waterbodies exceeded relevant water quality objectives and should be 'listed' on the 303(d) list, or do not exceed objectives and should be 'delisted' from the list. The application was enhanced over time to meet the clients' needs. Graphing of water quality data within the Access environment was in the finishing stages of development when the contract ended.

Calleguas Creek Watershed, Camarillo, CA 2005 – 2006

Worked independently to design and implement a MS Access database to house approximately 700,000 data records that were originally stored across multiple MS Excel files. All data were transferred to the MS Access database that features a suite of pre-defined queries that were used to quickly accommodate data extraction for the initial phases of TMDL development.

Water Quality Monitoring

Malibu Creek Watershed CIMP Implementation, Agoura, CA 2016 – Present

Mr. Marson leads all the monitoring activities for the Malibu Creek Watershed CIMP program. This includes all elements of the monitoring process from autosampler installations, event preparation, both scheduling crews and paperwork generation. He oversees the field crews and laboratory scheduling of bottle delivery and pickups. Mr. Marson is the project manager and oversees sub-contractor and laboratory invoicing, company invoicing, and post-event reporting. Mr. Marson uses a custom Field Monitoring Preparation Application for this project to efficiently produce all the monitoring paperwork for the sampling crews. This includes the bottle orders prior to any event and the COCs and field logs that are used during the event.

Calleguas Creek Watershed (TMDL program), Camarillo, CA 2005 – Present

Mr. Marson leads all the monitoring activities for the Calleguas Creek Watershed TMDL program. This includes all elements of the monitoring process from database design and upkeep, equipment installation and maintenance, event preparation and paperwork, field crew and laboratory oversight, data quality review, sub invoicing, and post-event reporting. He coordinates with the subcontractors and the labs to ensure samples are picked up/delivered in a timely manner. Mr. Marson is the sole contact for the field crews in case of any questions may arise. Mr. Marson uses a custom Field Monitoring Preparation Application for this project to efficiently produce all the monitoring paperwork for the sampling crews. This includes the bottle orders prior to any event and the COCs and field logs that are used during the event.

Farm Bureau of Ventura (VCAILG), Ventura, CA 2008 – Present

Mr. Marson leads all the monitoring activities for the Ventura County Agriculture Irrigated Lands Group (VCAILG) monitoring program. This project is unique in that two teams of one LWA person and one subcontractor are used to monitor the

sites. Mr. Marson is in charge of coordinating the subcontractor, LWA employees, and two laboratories (to ensure samples are picked up/delivered on time) for both wet and dry monitoring events. He produces all the paperwork used during the events from the Field Monitoring Preparation Application. He also is in charge of the water quality database design and upkeep, equipment maintenance, data quality review, sub invoicing, and post-event reporting.

Field Monitoring Preparation Application, Ventura, CA 2008 – Present

Designed, developed, and implemented a database application that significantly reduces field preparation time prior to carrying out a field monitoring event. The "Field Prep" application is/was used in several LWA projects, including Malibu CIMP, Victor Valley Wastewater Reclamation Authority; Mojave River Characterization Study; Calleguas Creek – TMDL and Salts programs; Calleguas Municipal Water District – Phase 1E and 2A Dewatering Assistance Programs; and VCAILG – Ag Waiver Program. The application produces all the required field logs, bottle labels, bottle orders, field reports, and COC documents for any given monitoring event. Once the required data are input into the application, the user can produce all the materials for the event with the click of a button. Typical errors encountered when creating COCs, bottle labels, field logbooks, etc., are considerably decreased because all monitoring materials are produced from a single database table. The application has saved many hours of staff time when preparing for monitoring events.

LWA tools designed for data manipulation

Mr. Marson has written several MS Excel macros that perform complicated tasks. They range from calculating transect flow measurements, to file concatenation, to reformatting of data. The "Flow Calculator" was written to take the transect data recorded in the field and the USGS method of computing flow to calculate a stream volume. One could enter all the field measurements from a sampling event and run the calculation on all the data at once. The "Concatenation" tool was used when we needed to process over 200 Excel files into a database. Instead of importing all the files separately, the tool generated one large file that could then be imported. The "Data Reformatting Tool" (DART) allows the user to quickly reformat data from a table format into a more standard database format, which can then be imported into a database table. Development and use of these macros has saved many hours of work for our clients.

Relevant Experience Prior To Larry Walker Associates

Harris Back-office programming

Harris corporation had an MRP back-office program (ROI-2000) that ran on a UNIX platform. Mr. Marson performed user requests to customize the ROI program to meet the needs of the Purchasing, Shipping, and Engineering departments. He worked on a team of three employees that modified the program per the user's requests. Mr. Marson also served as the backup UNIX administrator.

Work History

Larry Walker Associates, Inc., 2005 – Present

Manpower (Consulted to Harris Corp.), 2004 – 2005

Harris Corporation, Dracon Division, 1996 - 2004

International Computers and Telecommunications (ICT), 1988 – 1996

Derrik Williams, P.G., C.Hg., Principal Hydrogeologist

Office: PASO ROBLES

Years Experience

Total: 30

Education

M.S., Hydrology, University of Arizona (1987)

B.S., Geology, University of California at Davis (1982)

Key Areas of Expertise

Groundwater basin management

3D groundwater flow and transport models

Groundwater recharge

Conjunctive water management

Aquifer test analysis

Interagency negotiation and coordination

Independent technical review

Derrik has more than 30 years of experience in applied geology and hydrogeology and excels at assisting clients with integrating technical analyses and institutional challenges to manage their water resources. His project experience includes managing, reviewing, and assisting on water supply, groundwater recharge, wastewater disposal, and hazardous waste remediation projects. Derrik is accomplished in analytical hydrogeology, with extensive interpretation and application of groundwater flow and transport models. He is an expert in aquifer test design and analysis and is experienced in all aspects of groundwater management.

Representative Projects

SGMA Implementation • California Department of Water Resources •
Assisted DWR develop best management practices (BMP) for implementing SGMA and assist with developing Groundwater Sustainability Plans (GSPs). Met with DWR regularly to formulate statewide SGMA policy and draft policy documents. Helped develop DWR's guidance document for sustainable management criteria which was scheduled for release September 2017. [SACRAMENTO COUNTY, CA]

SGMA Support • SGMA Hydrology Tech Support • Santa Cruz Mid-County Groundwater Agency
Provides senior guidance for technical and policy support to the Groundwater Sustainability Agency (GSA) for the Santa Cruz Mid-County Basin regarding SGMA. This included the GSA formation process and an approved basin boundary modification that combined parts of four basins into a single basin and excluding areas that do not impact groundwater management. Led efforts with the newly formed GSA to finalize a schedule and scope for GSP development. The initial activities include presentations at stakeholder workshops to ensure all stakeholders understand the basin conditions and the requirements of SGMA. [SANTA CRUZ COUNTY, CA]

Groundwater Sustainability Agency Assessment • Butte County GSA Formation • Butte County Department of Water and Resource Conservation
Provided technical assistance regarding GSA development to Butte County as a subconsultant to Kearns and West Inc. Assisted Butte County assess the potential interest and concerns of various agencies and groups regarding GSA formation under SGMA. Helped develop the outreach materials to ensure that relevant information was collected to guide Butte County's GSA development. [BUTTE COUNTY, CA]

Managed Groundwater Model Update • Groundwater Model • Kings River Conservation District
Managed the groundwater model update for the Kings River Conservation District. The model is based on the State of California's Integrated Water Flow Model (IWFM). Important aspects of this model update include a reinterpretation of agricultural water demands throughout the region, and an

Professional Registrations

Registered Professional Geologist #6044, CA

Certified Professional Hydrogeologist #35, CA

update of the geologic structure that underpins the model. In particular, the client requested that the updated model parameters more accurately reflect our understanding of the basin's geologic structure. [FRESNO COUNTY, CA]

Technical Analysis • Regional Groundwater Model • United Water Conservation District

Provided technical oversight for an update of United Water Conservation District's regional groundwater model. The model was providing unrealistic results, and was unable to predict future conditions adequately. Identified simulated water balance problems that, when changed, improved model performance dramatically. Provided technical assistance to staff on using the model to evaluate water management alternatives by implementing various hydrologic scenarios in model runs. [VENTURA COUNTY, CA]

Groundwater Model Support • Groundwater Basin Water Supply Plan and Groundwater Model • Squaw Valley Public Service District (SVPSD)

Provided groundwater support to the SVPSD continuously since 2000, beginning with development of a basin-wide groundwater model that could be used for management and planning. As SVPSD's needs have changed, adapted the initial model to help address new concerns. Under Derrik's direction, the project team has studied groundwater management alternatives as the main option in a plan to increase the water supply. They have used the groundwater flow model to support the water supply analyses. The model has also been used to develop pumping strategies that maximize long-term basin yield, and to identify locations of new wells that the SVPSD may use to increase their water supply. [PLACER COUNTY, CA]

Basin Analysis • Basin Management Plan Analysis • Pajaro Valley Water Management Agency

Led analysis of groundwater management alternatives for Pajaro Valley Water Management Agency's (PVWMA) Basin Management Plan. Directed simulation of alternatives using the Pajaro Valley Hydrologic Model developed by the U.S. Geological Survey that incorporated the Farm Process program, which allows detailed and realistic simulations of agricultural pumping and water transfers. Evaluated and presented model results for the BMP's selected alternative that showed that the alternative will eliminate overdraft in the most productive aquifers and reduce seawater intrusion by more than 90% in those aquifers. [SANTA CRUZ COUNTY, CA]

Developed Groundwater Model • Regional Groundwater Flow Model • Santa Clara Valley Water District

Developed a groundwater flow model of the Northern Santa Clara Valley under a joint contract between the City of San Jose and the Santa Clara Valley Water District. The model is presently used by the SCVWD for future water planning. [SANTA CLARA COUNTY, CA]

Model Analysis • San Francisco Western Basin Groundwater Model • San Francisco Department of Public Works

Provided an independent review of the San Francisco Western Basin groundwater model. Produced a plan for field testing and expanding the groundwater model to include the influence of groundwater pumping in Daly City, Colma, and Burlingame on Lake Merced water levels. [SAN FRANCISCO COUNTY, CA]

Developed Flow Model • Saline Groundwater Intake and Disposal System Modeling and Design • City of Sand City
Developed a two-phase flow model of feedwater extraction and brine injection beneath the beach in Sand City for a planned desalination plant. The groundwater model was used to develop a unique arrangement of feedwater wells and horizontal brine disposal wells that reduced environmental impacts on the National Marine Sanctuary. [MONTEREY COUNTY, CA]

Developed Vadose Zone Model • Vadose Zone Modeling of Recharge with Reclaimed Water • Monterey County Regional Water Pollution Control Agency
Development of a vadose zone model for predicting travel times of water to the water table below a proposed recharge basin. The recharge basin was designed to infiltrate surplus reclaimed water from a regional wastewater treatment plant into a drinking water aquifer. The HYDRUS-2D model tested a series of likely hydraulic conductivity distributions based on field data to estimate a range of travel times. Model results showed that the testing program proposed for the recharge ponds would not result in the anticipated groundwater mounding. [MONTEREY COUNTY, CA]

Transport Model Development • Salinas Valley Reclaimed Water Injection and Recovery Program Modeling • Monterey Regional Water Pollution Control Agency
Employed a series of groundwater flow and contaminant transport models to study the effects of injecting reclaimed water into salt-water intruded aquifers beneath Salinas Valley. Used a local, variable density, contaminant transport model and a three-dimensional flow and transport model to demonstrate the impact of the injected reclaimed water on nearby water supply wells. [MONTEREY COUNTY, CA]

Publications & Presentations

Presentations

Developing Groundwater Elevation Proxies for Surface Water Depletion Rates
Williams, D., 2017, Groundwater Resources Association Tools for SGMA Workshop, Modesto, CA, May 3

Using Cross-Sectional models to Develop Proxy Measurable Thresholds for Seawater Intrusion
Culkin, S., Tana., C., Williams, D., 2017, Groundwater Resources Association Tools for SGMA Workshop, Modesto, CA, May 4

Measuring Recharge from Ephemeral Streams
Williams, D., 2016, American Groundwater Act/American Ground Water Trust Annual Conference, Ontario, CA, Feb 17-18

First Steps in Inter-Basin Coordination for SGMA: Basin Boundary Modification Requests in Santa Cruz County
Tana, C., Culkin, S., Byler, N., Williams, D., 2016, Groundwater Resources Association of California Annual Conference, Concord, CA, September 28-29

Using Cross-Sectional Models to Develop Measurable Objectives for Seawater Intrusion
Culkin, S., Tana, C., Williams, D., 2016, California Water Environmental Modeling Forum Annual Meeting, Folsom, CA, April 11-13

Using Regional Models to Develop GSA Scale Models
Williams, D., Hundt, S., Bedakar, V., 2016, Groundwater Resources Association Role of Models and Data in Implementing SGMA, Davis, CA, February 8-9

ACWA's Groundwater Data Guidelines and SGMA
Williams, D., 2015, Association of California Water Agencies Legislative Summit, Davis, CA, June 1

Groundwater Analyses and Groundwater Models in the Sustainable Groundwater Management Act
Williams, D., 2015, American Groundwater Act/American Ground Water Trust Annual Conference, Ontario, CA, February 9-10

Eliminating Stream Depletion by Combining Time-Series Thermal Data with Aquifer Test Results
Hundt, S., King, G., Williams, D., 2014, California/Nevada American Water Works Association Whole Water Conference, Monterey, CA, June 24-26

Beyond the Pavement: Groundwater Recharge Benefits from Urbanization
Williams, D., 2011, National Ground Water Association Cities, Suburbs, and Growth Areas Conference, Los Angeles, CA, August 8-9

Managing Saltwater Intrusion with Protective Groundwater Elevation Constraints
Tana, C., King, G., Johnson, R., Lear, J., Williams, D., 2011, Proceedings from the 4th International Perspectives on Water Resources and Environment, Singapore

California Statewide Groundwater Elevation Monitoring (CASGEM) Workshop
Williams, D. (member of presenting team), 2010, California Department of Water Resources in conjunction with Association of California Water Agencies

Using PEST to Efficiently Implement Conceptual Model Changes in a Regional Groundwater Model
Tana, C., Williams, D., 2009, The PEST Conference, Potomac, MD, November 2-4

Publications

Conceptual Modeling of a Well Developed Alluvial Basin, in Subsurface Fluid Flow (Ground Water and Vadose Zone) Modeling
Williams, D., Johnson, N.M., Fowler, A.C., 1996, American Society of Testing and Materials, Philadephia, PA

Cameron Tana, P.E., Principal Hydrologist

Office: OAKLAND

Years' Experience

Total: 19

Education

M.Eng., Civil and Environmental Engineering, Massachusetts Institute of Technology, (1999)

B.S., Civil and Environmental Engineering, Stanford University, (1998)

A.B. Economics, Stanford University, (1998)

Key Areas of Expertise

Three dimensional groundwater flow and transport models

Groundwater basin management

Groundwater recharge

Analysis of pumping impacts

Inverse methods for calibrating numerical models

Estuarine hydrodynamics models

Cameron has 19 years of experience as a hydrologist focused on assisting public agencies in California manage their groundwater resources. Cameron uses analytical tools and numerical models to address his clients' challenges and is particularly adept at selecting and implementing the analytical tools best suited to address specific ground and surface water issues. Cameron is experienced at communicating technical findings to advance groundwater management, taking into account legal, economic, and political challenges.

As a member of the American Water Works Association, Cameron recently completed a two year term as Chair of the California-Nevada Section's Water Well Technology Committee and is now serving as Secretary of the Water Resources Division. He recently began an appointment on the Association of California Water Agencies Groundwater Committee.

Representative Projects

Groundwater Model Revisions • Regional Groundwater Model • United Water Conservation District
Provided technical support to the District helping solve issues generated by unrealistic results from an existing model. Revised the water balance in the groundwater model and calibrated the model with the revised water balance using PEST. Modified software that sets up simulated pumping and recharge for future scenarios to use multiple pumping and recharge sets for different hydrologic conditions. [VENTURA COUNTY, CA]

Groundwater/Surface Water Model Review • Upper Santa Clara River Chloride Total Maximum Daily Load • United Water Conservation District
Reviewed the construction, calibration, and application of a groundwater/surface water interaction MODHMS model developed by the Los Angeles County Sanitation District used to support the TMDL addressing chloride levels in the Upper Santa Clara River as it flows from Los Angeles County into Ventura County. Demonstrated how management decisions could be affected by the non-unique model calibration. [VENTURA COUNTY, CA]

Characterized Groundwater Basin Hydrology and Hydrogeology • Lower Santa Clara River Salt and Nutrient Management Plan • Larry Walker | Ventura County Watershed Protection District
Directed the modeling task to estimate thresholds for future loads based on available assimilative capacity. Estimates were based on a water and salt/nutrient balance approach for fluxes between basin subareas. Presented report to Regional Water Quality Control Board staff to address its concerns to help gain approval of the Plan. [VENTURA COUNTY, CA]

Groundwater Model Review • North Pleasant Valley Desalter Draft Environmental Impact Report Model Peer Review • City of Camarillo
Provided the initial review of relevant sections and appendices of the DEIR and comments on the DEIR, as requested by the Fox Canyon Groundwater

Professional Registrations

Registered Professional Engineer (Civil) #C65822, CA

Management Agency. Based on review, additional modeling and analysis was performed to meet CEQA requirements. [VENTURA COUNTY, CA]

GSFLOW Model Development • Santa Cruz Mid-County Basin Integrated Watershed-Groundwater Model • Santa Cruz Mid-County Groundwater Agency

Project Manager for development of a GSFLOW model of the Santa Cruz Mid-County Basin that integrates groundwater flow with watershed processes. Directed strategy for updates to the basin conceptual model, model construction, estimates of non-metered pumping and return flow, and calibration to streamflows and groundwater levels. The model will be used to evaluate in-lieu recharge, recharge of purified water, and aquifer storage and recovery of excess surface water as well as analyses required by the Basin's Groundwater Sustainability Plan. Led Technical Review Committee meetings and presented to the Agency Board on model development progress. [SANTA CLARA COUNTY, CA]

Groundwater Model Development • Aromas and Purisima Basin Management Groundwater Model • Central Water District

Evaluated groundwater management alternatives that address water quality issues such as Chromium VI and seawater intrusion. Directed the use of Geographical Information System (GIS) to estimate return flow and private pumping based on land use, processing of output from a Precipitation Runoff Watershed Model for areal recharge and upgradient flux, and simulation of boundary conditions based on groundwater level data. This work was funded by a California Prop 84 Integrated Regional Water Management planning grant. [SANTA CRUZ COUNTY, CA]

Groundwater Model Upgrades • Groundwater Model Update • Zone 7 Water Agency

Zone 7 uses its groundwater model to evaluate projects for salts and minerals management. Updated and recalibrated the model to reflect new salinity and groundwater data. Developed and implemented a strategy for calibrating the Zone 7 model with pilot points and regularization using PEST. Provided training and technical consultation to Zone 7 in-house staff regarding optimizing use of the model. As part of a recently completed project to improve simulation of managed recharge and salt transport in the basin, managed development of packages included in the MT3D-USGS release for transport in surface water and its interaction with groundwater. Directed implementation of these packages in the Zone 7 model to use public domain codes. Led re-calibration and oversaw model simulations to evaluate groundwater and salt management strategies under different hydrologic conditions. Provided technical support for the successful application for the California Local Groundwater Assistance grant that funded this recent work. [ALAMEDA COUNTY, CA]

Development of Numerical Groundwater Model • Groundwater Management Alternative Evaluation • Carpinteria Valley Water District

Led construction and development of a groundwater model based on a hydrogeologic update performed under a California local groundwater assistance grant. Directed development of surfaces for model layers based on basin stratigraphy for incorporation in the model and calibrated the model to groundwater level data. The model was designed to assess and compare various groundwater management alternatives for conjunctively managing the Carpinteria Valley Water District's water supplies. Example groundwater

management scenarios investigated with the model included implementing ASR, improving stream recharge through streambed modification, and redistributing pumping. [SANTA BARBARA COUNTY, CA]

Groundwater Model Calibration • Recycled Wastewater Impact Modeling • City of Hollister

Calibrated and used a groundwater model of San Benito County to assess salt loading impacts on the groundwater basin from imported water sources and reclaimed water use. Modified the model preprocessor and performed simulations using a numerical model to evaluate both water level and salinity impacts to groundwater basin of various wastewater disposal scenarios, including crop spraying, for the City of Hollister while accounting for land use changes. [SAN BENITO COUNTY, CA]

SGMA Implementation • Santa Cruz Mid-County Groundwater Basin • Santa Cruz Mid-County Groundwater Agency (MGA)

Presented an overview of the Santa Cruz Mid-County Basin's groundwater hydrology and groundwater management activities to the Santa Cruz Mid-County Stakeholder Advisory Committee, providing important background as the committee discussed stakeholder involvement in formation of a Groundwater Sustainability Agency. Led successful application to the Department of Water Resources to revise basin boundaries to consolidate portion of the four basins into the Santa Cruz Mid-County Basin that will be managed by the Santa Cruz Mid-County Groundwater Agency (MGA). The revision included jurisdictional and scientific modifications of internal and external boundaries. Coordinated between MGA members and neighboring Agencies to ensure all basin boundary modification applications in Santa Cruz County were consistent. Assisted with MGA's notification of its formation as a Groundwater Sustainability Agency to the state and represented the MGA in Central Coast advisory group meetings with the California Department of Water Resources, where he articulated how groundwater conditions on the Central Coast differ from the rest of the State. Guided presentations on basin conditions and groundwater modeling as part of orientation sessions for the Groundwater Sustainability Plan Advisory Committee and provided technical support for development of sustainability management criteria. Presented to the MGA Board on groundwater management ramifications of recently collected airborne geophysical data identifying location of saltwater interface offshore. [SANTA CRUZ COUNTY, CA]

Groundwater Management Plan Development • On-Call Groundwater Hydrologist • Soquel Creek Water District

Revised the Groundwater Management Plan for the Basin, led the compilation of annual reports on the state of the groundwater basin and the status of basin management objectives, and recommended updates to the Plan. Developed plans for conjunctive use of wells and a supplemental supply. The plans varied based on the state of the groundwater basin, future water demand, and the availability of the shared supplemental supply provided by the proposed regional desalination plant. Developed drought curtailment criteria based on multi-year rainfall totals that indicate shortfalls of the groundwater recharge that provides 100% of the District's groundwater supply estimated by Precipitation Runoff Modeling System. [SANTA CRUZ COUNTY, CA]

Groundwater Charge Zone Evaluation • Groundwater Zone of Benefit Study • Santa Clara Valley Water District
Leads a team to evaluate and revise the District's groundwater zones of benefit that provide the basis for its groundwater charges. The team developed the study methodology and draft report to evaluate areas that benefit from the District's in-lieu and managed recharge activities. Planned meetings with stakeholder groups and presented study plans at the meetings. Completed preliminary study report for presentation to stakeholders. [SANTA CLARA COUNTY, CA]

Groundwater Charge Evaluation • Geohydrology Support for Conjunctive Use Benefit Study • Santa Clara Valley Water District
Evaluated the District's groundwater production charges. Estimated the economic benefit of in-lieu recharge to the groundwater basin from including treated surface water in the supply portfolio. Evaluated the groundwater infrastructure required for a groundwater only portfolio and managed the cost estimates for developing the additional groundwater infrastructure. [SANTA CLARA COUNTY, CA]

Publications & Presentations

Modeling Groundwater Sustainability for a Coastal Basin under Climate Change Scenarios
Tana, C., Mejia, J., Adelstein, E., Haeri, H., Mow Schumacher, M., King., G., 2018, American Water Works Association Sustainable Management Conference. Seattle, WA, March 25-28

Sustainable Management Criteria to Manage Seawater Intrusion along the Monterey Bay.
Tana, C., 2017, University of California Cooperative Extension Introduction to Groundwater and Watershed Hydrology Short Course. Davis, CA, November 14-15

First Steps in Inter-Basin Coordination for SGMA: Basin Boundary Modification Requests in Santa Cruz County
Tana, C., Culkin, S., Byler, N. Williams, D., 2016, Groundwater Resources Association of California Annual Conference. Concord, CA, September 28-29

Evaluating Water Quality with Data from Dynamic Tracer and Sampling Techniques Used in Production Wells
Tana, C., Byler, N., Qureshi, H., van Brocklin, D., Williams, D., 2014, American Water Works Association California-Nevada Section Annual Spring Conference, Anaheim, CA, March 26

Addressing Resolution Limitations of the Dynamic Dye Tracer and Sampling Techniques Used in Production Wells.
Tana, C., van Brocklin, D., Byler, N., Williams, D., 2013, Groundwater Resources Association of California Symposium on High Resolution Tools and Techniques for Optimizing Groundwater Extraction for Water Supply. Garden Grove, CA, June 19

Enhancing MT3DMS for Simulating Solute Transport in a Coupled Groundwater-surface Water System
Bedekar, V., Morway, E., Tana, C., Langevin, C., Rooze, T., Tonkin, M., 2013, Modflow and More Conference. Golden, CO, June 2-5

Monitoring Private Wells as an EIR Mitigation Measure for Municipal Wells
Tana, C., King, G., White, K., Dufour, T., 2012, American Water Works Association California-Nevada Section Annual Fall Conference. San Diego, CA, October 11

Applications of Precipitation-Runoff Modeling System (PRMS) in Groundwater Studies
King, G., Tana, C., 2012, Groundwater Resources Association of California 21st Annual Conference and Meeting. Rohnert Park, CA, October 4-5

Developing Drought Curtailment Criteria for a Groundwater Basin on a Model of Deep Recharge
Tana, C., King, G., Duncan, R., Williams, D., 2011, National Ground Water Association Cities, Suburbs, and Growth Areas Conference. Los Angeles, CA, August 8-9

Using PEST to Efficiently Implement Conceptual Model Changes in a Regional Groundwater Model
Tana, C., Williams, D., 2009, The PEST Conference, Potomac, MD, November 2-4

Successful and Unsuccessful Applications of Inverse Methods on a Regional Groundwater Model
Tana, C., Williams, D., 2007, Geological Society of American Annual Meeting, Denver, CO, February 18-21

Georgina King, P.G., C.Hg., Senior Hydrogeologist

Office: OAKLAND

Years' Experience

Total: 25

Education

M.S., Geohydrology, Rhodes University, Grahamstown, South Africa (1987)

B.S., Engineering Geology, University of Natal-Durban, Kwazulu-Natal, South Africa, (1992)

B.S. Geology, University of Natal-Durban, Kwazulu-Natal, South Africa, (1991)

Key Areas of Expertise

Hydrogeologic characterization

Groundwater basin management

Groundwater recharge

Groundwater quality

Geographical Information Systems and database management

Georgina was educated in South Africa and spent her early career years with the South African Department of Water Affairs as Assistant Director of groundwater resources for the province of KwaZulu-Natal. She was responsible for technical aspects of managing groundwater, such as establishing a regional monitoring network, enhancing rural water supply, and developing regional hydrogeological maps. Since 2000, Georgina has worked in California and focused on developing, managing, and protecting groundwater resources. She has extensive experience in developing and managing geographic information systems (GIS) and databases, which she applies to most of her projects. She is experienced in managing and conducting technical studies on basin-wide groundwater management, large-capacity public water supply projects, sustainable yield, and groundwater modeling projects.

Representative Projects

Groundwater Sustainability Planning • Santa Cruz Mid-County Groundwater Basin • Santa Cruz Mid-County Groundwater Agency (MGA)
Assisted MGA staff with scoping, budgeting, and scheduling work required to meet the January 2020 deadline for high priority basin GSPs. Technical lead developing Sustainable Management Criteria for the GSP. [SANTA CRUZ COUNTY, CA]

Basin Boundary Modification • Santa Cruz Mid-County Groundwater Basin • Santa Cruz Mid-County Groundwater Agency
GIS lead in technical work for a basin boundary modification. Preparing required GIS layers and metadata for submission to DWR. The modification requests was approved by the DWR. [SANTA CRUZ COUNTY, CA]

Basin Boundary Modification • Pajaro Basin Alternate GSP Submittal • Pajaro Valley Water Management Agency
Technical lead preparing an alternate GSP submittal for Pajaro Valley Water Management Agency based on previous modeling work, Basin Management Plan, Salt & Nutrient Management Plan, and other agency planning documents. [MONTEREY COUNTY, CA]

Develop Technical Approach • Groundwater Zone of Benefit Study • Santa Clara Valley Water District
Assisted the project team in developing the study methodology to evaluate areas that benefit from the District's in-lieu and managed recharge activities. Worked with the project surveyor to determine metes and bounds for the zones of benefit based on boundaries developed in GIS. [SANTA CLARA COUNTY, CA]

Groundwater Sustainability Planning • Groundwater Sustainability Plans • Fox Canyon Groundwater Management Agency
Served as Project Manager in developing GSPs for four groundwater basins in Ventura County. Served as point of contact for the client, managed subconsultants and managed schedule and budget. Technical work involved

Professional Registrations

Registered Professional Geologist #8023, CA

Certified Professional Hydrogeologist #874, CA

Additional Education

Postbaccalaureate Certificate in GIS, Penn State (2016)

Database Specialist Certification, Cal Poly Pomona (2003)

directing subconsultants on basin characterization and the initial development of sustainable management criteria. [VENTURA COUNTY, CA]

Salt and Nutrient Management Plan • Oxnard & Pleasant Valley Basins • Carollo Engineers
Lead hydrogeologist with the following tasks: basin characterization, defined existing groundwater quality, and estimated assimilative capacity. [VENTURA COUNTY, CA]

Salt and Nutrient Management Plan • Lower Santa Clara River • Larry Walker Associates
Part of a team of consultants who prepared a salt and nutrient management plan for five groundwater basins. Lead hydrogeologist for the following tasks: basin characterization, defined existing groundwater quality, and estimated assimilative capacity, and contributed to the writing of the plan. [VENTURA COUNTY, CA]

Salt and Nutrient Management Plan • Seaside Basin • Monterey Peninsula Water Management District
Project Manager and principal author of the Salt and Nutrient Management Plan for the Seaside Basin. Preparing the Prop 84 grant application that provided funding for the project. [MONTEREY COUNTY, CA]

Groundwater Basin Hydrogeologic Studies • Seaside Basin • Seaside Basin Watermaster
Managed all hydrogeologic studies and annual reports for the Watermaster. Primary author of the following reports: Basin Management Action Plan, annual Seawater Intrusion Analysis Report since 2009, and the Seawater Intrusion Response Plan. [MONTEREY COUNTY, CA]

Private Well Monitoring and Mitigation Reporting • Soquel-Aptos • Soquel Creek Water District
Managed annual analysis and reporting of impacts to groundwater levels and production in private wells that are within 1,000 meters of new District production wells as stipulated in the Well Master Plan EIR. Ongoing since 2012. [SANTA CRUZ COUNTY, CA]

Water Supply and Demand Estimates • Ventura County • Ventura County Watershed Protection District
Project Manager and lead hydrogeologist in developing countywide water supply and demand estimates for 2013. To estimate the amount of undocumented demand by urban and agricultural private users, a demand calculator (IDC) was developed to estimate the countywide demands. The difference between the countywide demand and the documented use was assumed to be the private use. [VENTURA COUNTY, CA]

Groundwater Recharge Capacity Evaluation • Tulare Irrigation District • Tulare Irrigation District, Phase I
Primary analyst and author of a recharge capacity report that estimated the surface and groundwater budgets of the TID service area, identified potential water sources to supplement groundwater recharge, evaluated recharge capacity and required future capacity given the potential sources available. [TULARE, CA]

Stormwater Recharge Feasibility • Aptos • Soquel Creek Water District
Managed and conducted a feasibility study for the capture and use of stormwater as source water for dry wells at several locations at a golf course. Quantified volume of stormwater available and how much can potentially be recharged into the groundwater basin. [SANTA CRUZ COUNTY, CA]

Feasibility of Subsurface Intakes • Monterey Bay • DeepWater Desal
Primary author of a hydrogeologic feasibility study to evaluate five different potential locations for subsurface intakes along the Monterey Bay. Groundwater modeling was used to simulate basin impacts based on various configurations of slant and vertical beach wells. Phase I of the project has been completed and subsequent phases are planned. [MONTEREY COUNTY, CA]

Model Development • Santa Cruz Mid-County Basin Groundwater Model • Santa Cruz Mid-County Groundwater Sustainability Agency
Contributed to the development of an integrated surface water and groundwater flow model for the Santa Cruz Mid-County Groundwater Basin. Assisted with development of the surface water/watershed model PRMS, and provided estimates of private water use in the basin where there is no metering. This included domestic, large-scale non-agricultural irrigation, and agricultural irrigation use. Irrigation estimates are based on evapotranspiration estimates from the PRMS model. Estimated return flow for municipal, agricultural and private water use. [SANTA CRUZ COUNTY, CA]

Model Development • Groundwater Recharge Estimate • Soquel Creek Water District
Developed a Precipitation-Runoff Modeling System (PRMS) model for the Soquel-Aptos area. The model was constructed using GIS data and calibrated to streamflow. The rainfall-recharge established by the model is used to determine criteria for justifying drought curtailment. [SANTA CRUZ COUNTY, CA]

Publications & Presentations

Presentations

Calibrating the Soquel-Aptos PRMS Model to Streamflow Data using PEST
Tana, C., King, G., 2015, California Water Environmental Modeling Forum Annual Meeting, Folsom, CA, March 10

Monitoring Private Wells as an EIR Mitigation Measure for Municipal Wells
Tana, C., King, G., White, K., Dufour, T., 2012, American Water Works Association California-Nevada Section Annual Fall Conference, San Diego, CA, October 11

Applications of Precipitation-Runoff Modeling System (PRMS) in Groundwater Studies
King, G., Tana, C., 2012, Groundwater Resources Association of California 21st Annual Conference and Meeting. California Groundwater: Data, Planning and Opportunities. Rohnert Park, CA, October 4-5

A Tool for Dynamically Estimating Groundwater Recharge
King, G., Tana, C., 2011, National Ground Water Association Cities, Suburbs, and Growth Areas Conference, Los Angeles, CA, August 8-9

Developing Drought Curtailment Criteria for a Groundwater Basin on a Model of Deep Recharge.
Tana, C., King, G., Duncan, R., Williams, D., 2011, National Ground Water Association Cities, Suburbs, and Growth Areas Conference, Los Angeles, CA, August 8-9

Conference Papers

Managing Saltwater Intrusion with Protective Groundwater Elevation Constraints
Tana, C., King, G., Johnson, R., Lear, J. Williams, D., 2011, Proceedings from the 4th International Perspectives on Water Resources and Environment, Singapore.

Development of a Groundwater Monitoring System in an Industrial Area
King, G., 1998, National SIDA Seminar, Gothenburg, Sweden.

Lessons learnt in the Geohydrological Mapping of KwaZulu-Natal
Orpen, W.R.G., Tennick, F., King, G., 1995, South African Groundwater '95 Conference, Midrand, South Africa.

Hanieh Haeri, Ph.D., Engineering Hydrologist

Office: OAKLAND

Years of Experience

Total: 4 years

Education

Ph.D., Civil and Environmental Engineering, University of California, Davis (2011)

M.S., Civil and Environmental Engineering, University of California, Davis, (2007)

B.S., Chemical and Petroleum Engineering, Sharif University of Technology, Tehran, Iran (2004)

Key Areas of Expertise

Three dimensional groundwater flow and transport models

Conceptual model development

Model calibration using automatic sensitivity analysis and parameter estimation tools, e.g. PEST, UCODE

Surface water modeling

ArcGIS Geographical Information Systems

MATLAB, Python, Fortran and C++

Professional Registrations

Engineer in Training Certificate (EIT) 14-649-51

Hanieh has four years of experience in water resources and environmental consulting, with an emphasis on groundwater modeling and quantitative hydrogeology. Hanieh uses numerical models to address clients' challenges in specific ground- and surface-water management issues. Hanieh has a Ph.D. in Civil and Environmental Engineering. The research she conducted over several years at University provided applicable surface water and groundwater modeling solutions to real-world issues.

Representative Projects

Develop Flow and Transport Models • Groundwater Model Update • Zone 7 Water Agency
Implemented streams (SFR2) and lakes (LAK3) packages in Zone 7's MODFLOW groundwater model of the Livermore-Amador Valley groundwater basin. Previously, the model used fixed flows for these boundary conditions. Implementation of these packages allow for dynamic calculation of the surface water-groundwater interaction. This is important for conjunctive use planning and facilitates simulation of salt transport between streams, lakes, and groundwater. Worked with Zone 7 staff to identify and evaluate data to define surface water configurations, rating curves, and inflows. Implemented new surface water transport packages and assisted model developers in using the Zone 7 model to test the code before release. [ALAMEDA COUNTY, CA]

Evaluate Groundwater Model Results • Groundwater Zone of Benefit Study • Santa Clara Valley Water District
Evaluated groundwater model results to evaluate the extent of benefits from District recharge activities. Assisted in evaluating and revising the District's groundwater zones of benefit that provide the basis for its groundwater charges. [SANTA CLARA COUNTY, CA]

Update and Recalibrate Model • Groundwater Model Upgrades • Zone 7 Water Agency
Involved in development and implementation of Zone 7 model calibration with pilot points and regularization using PEST. Performed re-calibration and model simulations to evaluate groundwater and salt management strategies under different hydrologic conditions. [SANTA CRUZ COUNTY, CA]

Groundwater Model Calibration • Groundwater Model Calibration of San Joaquin Valley • Dissertation
Used piezometric head and groundwater age in order to improve parameter estimation and calibration of a regional groundwater model located in part of Northeastern San Joaquin Valley. Research focused on the groundwater conceptual model development, model calibration through sensitivity analysis, and parameter estimation. Further research included groundwater flow and transport modeling, hydraulic capture zone analysis, time-series analysis of contaminant trends in extraction wells, subsurface characterization using geostatistical and inverse modeling methods and GIS mapping. [SAN JOAQUIN COUNTY, CA]

Simulation Development • Pure Water Soquel EIR • Soquel Creek Water District
Developed time series for pumping distributions for no-project and project simulations for the Environmental Impact Report evaluating the Pure Water Soquel project providing managed recharge with advanced purified water. The distributions accounted for numerous pumping rules and were applied to both historical and future climate scenarios. [SANTA CRUZ COUNTY, CA]

Updated Groundwater Model • Pure Water Monterey • Monterey Regional Water Pollution Control Agency
This project will recharge the Seaside groundwater basin with high quality purified water, and provide and deliver lesser quality recycled water to the Salinas Valley. Employed the calibrated groundwater model of the Seaside Groundwater Basin to estimate impacts from the Project. The modeled groundwater elevations were used to study the potential for seawater intrusion with the Project. The particle tracking results were used to estimate the impact of the injected Project water to the domestic and agricultural extraction wells. [MONTEREY COUNTY, CA]

Updated Modeling and Design • Saline Groundwater Intake and Disposal System Modeling and Design • City of Sand City
Updated and modified the groundwater model that was previously used to site the intake wells and brine injection beneath the beach in Sand City for a planned desalination plant. The main reason for the model update was to account for coastal erosion and its effect on the expected project life. Furthermore, the updated model was used to properly identify installation location of new intake wells to mitigate high salinities in the existing intake wells, and allow operational flexibility. [MONTEREY COUNTY, CA]

Groundwater Flow Model Development • City of Modesto Groundwater Modeling • Larry Walker Associates
While pursuing Ph.D., collaborated with Larry Walker Associates in performing groundwater modeling that helped the City of Modesto to plan installation of monitoring wells around selected Modesto stormwater rockwells. Developed a refined groundwater flow model to further assess the impact of stormwater rockwells on groundwater nitrate levels. [STANISLAUS COUNTY, CA]

Groundwater Model Review and Analysis • Kern County Models Peer Review • Judicial Arbitration and Mediation Services (JAMS)
Reviewed two groundwater models that cover similar areas in Kern County. Both models address recharge and pumping activities by the Kern Water Bank (KWB) and the Rosedale-Rio Bravo Water Storage District (RRB). Because the models cover similar areas, we were asked to assess whether both models provide reasonable results, and whether both models can be used reliably. Provided technical reviews of the RRB and KWB models in the Kern County to help the two modeler groups understand how they can trust other party's model. Provided recommendations to the two parties about ways they can improve their models to produce similar results that both groups agree on. [KERN COUNTY, CA]

Publications & Presentations

Presentations

The Value of the Groundwater Age Observation in Characterization of Local and Regional Groundwater Systems
Haeri, H., Foglia, L., Ginn, T.R., 2010, American Geophysical Union (AGU), San Francisco, CA, December 13-17

Downscaling from Regional to Local Scales in Groundwater Flow Modeling
Haeri, H., Foglia, L., Ginn, T.R., 2009, 27th Biennial Groundwater Conference, 18th Annual Meeting and Conference of the Groundwater Resources Association of California, Sacramento, CA, October 6-7

Simulation of the Entire Distribution of Groundwater Age
Haeri, H., Foglia, L., Ginn, T.R., 2008, American Geophysical Union (AGU), San Francisco, CA, December 15-19

An Expanded Survey of Groundwater Modeling Practitioners About How They Quantify Uncertainty: Which Tools They Use, Why, and Why Not
Haeri, H., Foglia, L., Ginn, T.R., 2008, American Geophysical Union (AGU), Denver, CO, October 28-31

Comparative Inverse Modeling with Combination of Multiphysics Codes and Parameter Estimation Snap-on Tools
Haeri, H., Foglia, L., Ginn, T.R., 2008, MODFLOW and more: Groundwater and Public Policy, Golden, CO, May 18-21

Comparative Inverse Modeling with Combination of Multiphysics Codes and Parameter Estimation Snap-on Tools
Haeri, H., Foglia, L., Ginn, T.R., 2008, Computational Methods in Water Resources, San Francisco, CA, July 6-10

Comparative Inverse Modeling with Combination of Multiphysics Codes and Parameter Estimation Snap-on Tools
Haeri, H., Foglia, L., Ginn, T.R., 2007, 26th Biennial Groundwater Conference and 16th Annual Meeting, Groundwater Resources Association of California, Sacramento, CA, September 18-19

Comparative Inverse Modeling with Combination of Multiphysics Codes and Parameter Estimation Snap-on Tools
Haeri, H., Foglia, L., Ginn, T.R., 2007, American Geophysical Union (AGU), San Francisco, CA, December 10-14

Model Construction for Dynamics of Striped Bass Population in the Sacramento River and San Francisco Estuary
Haeri, H., Loge, F.J., Ginn, T.R., Ostrach, D.J., 2007, Interagency Ecological Program (IEP) 2007 Annual Workshop, Pacific Grove, CA, March 2

Publications

Downscaling from Regional to Local Sales in Groundwater Flow
Haeri, H., Foglia, L., Ginn, T.R., 2010, HydroVision

Notes on Groundwater Age in Forward and Inverse Modeling
Ginn, T.R., Haeri, H., Massoudieh, A., Foglia, L., 2009, Transport in Porous Media, Vol 79

A Critical Review of the Properties of Forward and Inverse Problems in Groundwater Hydrology
Giudici, M., Ginn, T.R., Vassena, C., Haeri, H., Foglia, L., 2008, Calibration and Reliability in Groundwater Modeling: Credibility of Modeling

RICHARD C. SLADE, PRESIDENT & PRINCIPAL GROUNDWATER GEOLOGIST

Richard C. Slade & Associates LLC Consulting Groundwater Geologists

HIGHLIGHTS

Education

University of California, Los Angeles, B.A., Geology, January 1966

University of Southern California, M.S., Engineering Geology, 1974

Registrations/Certifications

Professional Geologist, State of California

Certified Engineering Geologist, State of California

Professional Experience

Major fields of hydrogeologic emphasis for Mr. Slade include groundwater resource development (basin-wide studies, and water well design and construction), and aquifer analysis. Principal projects have involved, evaluations of entire groundwater basins, aquifer test analyses, assessment of water quality problems and groundwater degradation, design of water wells for municipal supply, well rehabilitation assessments, monitoring of all phases of water well construction, locating and designing groundwater monitoring networks, and providing expert witness testimony for groundwater litigation. Considerable work has also been performed for numerous vineyards and wineries in both the Central Coast and Northern California regions; types of work have included feasibility studies for determining final locations for new wells, designing new wells, monitoring of the construction of new wells, working with drilling contractors, evaluating down-hole problems (such as sanding) in existing wells, and developing protocol for water well rehabilitation.

Hydrogeologic studies have also involved evaluation of hazardous wastes such as acid mine drainage, leachate from sanitary landfills, and groundwater degradation resulting from leaking underground storage tanks containing various chemicals and organic compounds. Numerous groundwater studies and monitoring projects have involved volatile organics (TCE, PCE, etc.) and subsurface gasoline spills. Hydrogeologic assessments and definition of appropriate mitigation measures for environmental impact analyses have been provided also. Important to Mr. Slade's broad background is the experience gained while being a participant with other geologists on international geologic study tours to Europe, Iceland and Scandinavia, the former Soviet Union, South America, the People's Republic of China, Africa, New Zealand and Australia. Local groundwater and surface water features, large faults and landslides, mines, and oilfields were visited in these countries.

In December 2008, based on the recommendation of the Administrative Committee (the water managers for the cities of Burbank, Glendale, Los Angeles and San Fernando, and the Crescenta Valley Water District), the Superior Court of Los Angeles County selected Mr. Slade as the new Watermaster for the entire Upper Los Angeles River Area (ULARA). Mr. Slade represents only the third Watermaster of ULARA since the date of the original adjudication of the region in January 1979.

Employment History

RICHARD C. SLADE & ASSOCIATES LLC, CONSULTING GROUNDWATER GEOLOGISTS: Independent consulting practice established in 1983 to provide technical, professional, and direct personal services to the groundwater industry. Hydrogeologic projects have included groundwater resource development; locating and designing water wells; assessing potential degradation resulting from hazardous waste sites and sanitary landfills; conducting water level and water quality monitoring from monitoring networks; defining aquifer characteristics from long-term aquifer tests in active wells; observation and monitoring of water well construction; providing expert witness testimony for a variety of groundwater cases; and providing hydrogeologic elements and mitigation measures for environmental assessments.

GEOTECHNICAL CONSULTANTS, INC.: 1970-1983. Joined the firm in 1970 as an engineering geologist and hydrogeologist. Advanced to Associate in 1975. Participated in and supervised geotechnical and hydrogeologic projects of various complexities, from the feasibility level through final design. His investigation and reports have analyzed faults and seismicity, earth materials, and groundwater problems for such facilities as dams, reservoirs, treatment plants, tunnels, industrial and residential buildings, sanitary landfills and groundwater basins. Major experience has involved field mapping, logging of bore holes, monitoring of groundwater observation holes, data analyses, and report writing.

Since 1972, Mr. Slade was the responsible hydrogeologist for several major groundwater basin projects including locating and designing of new wells and well redevelopments, calculations of groundwater in storage, determination of aquifer parameters, and evaluation of dewatering criteria. Several studies utilized emplacement of deep exploratory drill holes, analyses of geologic and geophysical data, and monitoring and analyses of groundwater levels, quality and pollution, and assessment of leachate and gases at existing landfills.

In addition, he conducted and supervised groundwater pollution studies and evaluation of several active and proposed sanitary landfill sites; he has supervised geologic and hydrogeologic studies for the evaluation and abatement of acid mine drainage from a large, inactive sulfur mine; and he has participated in assessing groundwater, geologic, and geotechnical parameters which affect sewer infiltration and inflow.

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA: Los Angeles, 1967-1970. Performed hydrologic and hydrogeologic studies along pipeline and tunnel routes for State Water Project, conducted field mapping and exploration along tunnel routes, conducted and supervised aquifer tests for calculations of dewatering parameters for tunnel routes and dam sites. Served as Resident Geologist in charge of tunnel mapping and tunnel conditions for the Newhall and Castaic tunnels, excavated by tunnel boring machines.

ANTHONY HICKE, SENIOR GROUNDWATER GEOLOGIST/PROJECT MANAGER

Richard C. Slade & Associates, LLC Consulting Groundwater Geologists

HIGHLIGHTS

Education

University of California, Los Angeles. B.S.,Geology (Engineering Geology), 2000

California State University, Los Angeles. In-progress M.S. Hydrogeology,

Registrations/Certifications

Certified Hydrologist and Professional Geologist, State of California, 2006

Professional Experience

Major areas of groundwater work for Mr. Hicke while an employee at Richard C. Slade & Associates, LLC, include project management for numerous groundwater development projects, including well construction projects, groundwater basin evaluations, creation of hydrogeologic conceptual models, and aquifer testing studies throughout California. In addition, Mr. Hicke serves as the lead geologist during the creation, management and utilization of large electronic databases of subsurface geologic data for use in preparing Hydrogeologic Evaluations of California Groundwater basins, and calculation of estimates of underflow and groundwater in storage for those basins. Mr. Hicke is also project manager overseeing preparation of groundwater availability studies for various agricultural clients, as well as the preparation of technical documents intended to support the creation of Environmental Impact Reports (EIRs). Mr. Hicke has many years' experience using the Mapinfo GIS software package to create maps from these data sets, for use in the Hydrogeologic Evaluations. Mr. Hicke also provides technical and administrative oversight during well construction and aquifer testing projects.

Since Mr. Richard Slade's appointment as the Upper Los Angeles River Area Watermaster in December 2008, Mr. Hicke has performed the duties of the Assistant ULARA Watermaster. Mr. Hicke helps to collect and analyze data for the various annual reports and review documents prepared by the Watermaster.

Experience History

RICHARD C. SLADE & ASSOCIATES LLC, CONSULTING GROUNDWATER GEOLOGISTS. October 2001 to present. Duties include: project management and technical analysis for the creation of a hydrogeologic conceptual model for a southern California coastal groundwater basin; estimation and calculation of various hydrogeologic aspects of groundwater basins to support the creation of groundwater budgets, including groundwater in storage, and inflow/outflow of groundwater; management during multi-well design and construction projects in the Central Valley and High Desert areas of California; field monitoring of all elements of the drilling and construction of municipal-supply and irrigation-supply water wells; providing technical and administrative oversight of well drilling, construction, development, and testing activities on production well and monitoring well projects; geologic logging of numerous boreholes in the High Desert areas of southern California, including the pilot boreholes for both production and monitoring wells; field monitoring of water quality and water level data during construction and testing of new water wells; planning and administration of long term aquifer tests, including the utilization of pressure transducers in a variety of hydrogeologic settings; preparation of hydrogeologic feasibility reports for sites throughout California; computer analyses of data and considerable computer work on map and data presentation using a Geographic Information System (GIS). Other significant responsibilities include: collection and analyses of basic groundwater data; computerized analyses of data; computerized mapping and graphics work; and troubleshooting problems with computers and/or with field water level/water quality monitoring equipment.

RALPH STONE AND COMPANY, INC. April 2000 to October 2001. Employment position was as a Staff Geologist with responsibilities that included organization of site investigations, geologic logging of boreholes, data collection, preparing maps and cross sections, and lab testing of soil. Prior work includes numerous seismic hazard (seismically induced landslide and liquefaction) analyses for homes in the Santa Monica Mountains, as well as the cities of Los Angeles, Beverly Hills, Culver City, Malibu, and Santa Monica.

EARL F. LAPENSEE, SENIOR GROUNDWATER GEOLOGIST/PROJECT MANAGER

Richard C. Slade & Associates, LLC Consulting Groundwater Geologists

HIGHLIGHTS

Education

University of California, Los Angeles, B.S., Geology, 1983

University of California, Riverside, M.S., Geological Sciences, 1986, Trace-element geochemistry specialty

Registrations/Certifications

Certified Hydrologist and Professional Geologist, State of California,

Registered Professional Hydrologist, American Institute of Hydrology (AIH)

California Community College Instructor, June 1986

Professional Experience

Mr. LaPensee has been a Groundwater Geologist/Hydrogeologist with the firm since 1989. Major projects while with the firm have included the hydrogeologic assessment and analysis of groundwater basins in southern and northern California and the exploration for and development of groundwater in those basins. Mr. LaPensee's current focus has been on projects involving the development of groundwater in southern California groundwater basins encompassing the siting, design and technical oversight of construction for municipal- and irrigation-supply water wells. In addition, Mr. LaPensee has also provided technical oversight in the siting, design and testing of aquifer storage and recovery (ASR) wells and groundwater monitoring wells for hazardous waste sites.

Mr. LaPensee utilizes a number of key data elements (driller's and electric logs, water levels and water quality data) on projects to aid in the selection of suitable well sites and test drilling methods; determine depths of well drilling; outline types of testing to be performed in test hole drilling; select suitable types of well casing and other well construction materials; outline appropriate mechanical, chemical, and pumping development methods; define aquifer testing protocol; formulate groundwater sampling methods using accepted protocol for such contaminants as hydrocarbons, metals, and volatile organic compounds (VOCs), and; estimate key aquifer parameters and production capabilities based on the resulting drilling and testing data.

Employment History

RICHARD C. SLADE & ASSOCIATES LLC, CONSULTING GROUNDWATER GEOLOGISTS: August 1989 to present. Employment position is of Senior Groundwater Geologist with major responsibilities as a project manager directed towards groundwater evaluation, exploration, and development projects. The areas of responsibilities in these projects encompass: preparation of proposals and cost estimates for various types of hydrogeologic projects; preparation of technical specifications for new well projects and well rehabilitation; providing technical and administrative oversight of well drilling and rehabilitation, construction, development, and testing activities on well projects; and the preparation and completion of final project reports.

APPLIED GEOSYSTEMS: 1988 to 1989, Project Geologist. Responsibilities encompassed the overview and management of commercial hazardous waste site investigations, including the installation of vadose-zone and groundwater monitoring wells, aquifer testing, and computer data manipulation and modeling of aquifer test data.

ECOLOGY AND ENVIRONMENT: 1987 to 1988. Associate Geologist. Responsibilities encompassed the assessment and investigation of Federal and California Superfund sites (soil and groundwater), including the installation of groundwater monitoring wells, aquifer testing, geophysical surveying (utilizing ground penetrating radar, electro-magnetic, and resistivity methods), and computer processing and modeling of geophysical data.

McKESSON ENVIRONMENTAL SERVICES: 1986 to 1987. Staff Hydrogeologist. Responsibilities encompassed site assessment and investigation (soil and groundwater) of commercial and industrial hazardous waste sites. This included the installation of vadose-zone and groundwater monitoring wells, aquifer testing, and computer processing of geophysical data.