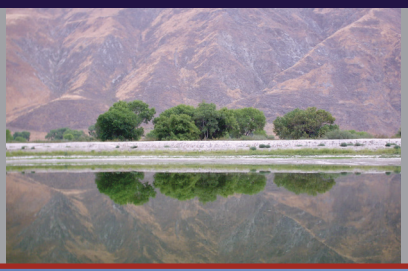
QUALIFICATIONS

Groundwater Sustainability Planning for the Owens Valley Groundwater Basin

Photo credit: inyowater.org

July 31, 2018

Prepared for

County of Inyo Water Department
135 S. Jackson Street
Independence, California 93526

Prepared by

DBS&A
Daniel B. Stephens & Associates, Inc.

3916 State Street, Suite 1A
Santa Barbara, California 93105

July 30, 2018

Mr. Bob Harrington, Director
Inyo County Water Department
135 S. Jackson St.
Independence, California 93526

Re: Statement of Qualifications for Groundwater Sustainability Planning for the Owens Valley Groundwater Basin

Dear Mr. Harrington:

Daniel B. Stephens & Associates, Inc. (DBS&A) enthusiastically proposes to partner with the Owens Valley Groundwater Authority to produce a Groundwater Sustainability Plan (GSP) that will build on existing sustainable practices and effectively lay the groundwork for future groundwater management in the Owens Valley Groundwater Basin in compliance with the Sustainable Groundwater Management Act (SGMA), while also meshing with the Inyo/Los Angeles Agreement.

We are pleased to propose a carefully selected team of experts who have direct water-agency experience in complying with SGMA, possess exceptional knowledge of Owens Valley hydrogeology, and possess SGMA-related communication and consensus-building expertise in Owens Valley, to facilitate development of a stakeholder community that is informed, involved, and supportive. The DBS&A team also provides geographic proximity, local organizational and logistical knowledge, and can be responsive to local needs on short notice.

Prior to joining DBS&A, our proposed Project Manager, Tony Morgan, C.HG., was the Deputy General Manager for United Water Conservation District, where he led the District's SGMA compliance activities, including formation of groundwater sustainability agencies (GSAs), creation of GSPs, and conducting groundwater basin studies. While some consultants with SGMA expertise have multiple GSP projects demanding their time, Mr. Morgan has the availability to make your GSP development process his primary focus over the next several years. He also has unique experience from the agency point of view that will enable him to anticipate and avoid challenges and pitfalls inherent in the SGMA process. Mr. Morgan will work closely with Dr. Stephen (Steve) J. Cullen, Ph.D., P.G., Principal Hydrogeologist and Senior Vice President, California Operations Manager for DBS&A. Dr. Cullen is a 14-year veteran of DBS&A, and he has led and provided oversight for dozens of water resources projects in California. Dr. Cullen was the project principal, quality assurance reviewer, and signing California Professional Geologist for DBS&A's update of the Rose Valley groundwater model conducted for the Inyo County Water Department (ICWD).

Dr. Cullen and Mr. Morgan have worked together on several groundwater modeling projects, including DBS&A's performance of water balance modeling for the Fox Canyon Groundwater Management Agency, where Mr. Morgan was a Technical Advisory Group member. Mr.

Morgan and Dr. Cullen also recently updated the safe yield for the adjudicated Santa Paula Groundwater Basin — a basin characterized by multiple stakeholders with conflicting water-related interests. Mr. Neil Blandford, P.G. (TX) is our proposed hydrogeologic lead for the DBS&A team. Neil specializes in quantitative groundwater resource analysis, groundwater modeling, and groundwater planning. Working with Dr. Cullen, Mr. Blandford was the Principal Technical Investigator for ICWD's update of the Rose Valley groundwater model.

The remaining proposed technical staff on DBS&A's team has an average of 10 years of experience with DBS&A. The DBS&A team has broad expertise in the issues pertinent to groundwater planning, including surface and groundwater resources assessments, conjunctive use, groundwater and surface water studies, water supply development, feasibility studies, water system engineering, water rights acquisition, agricultural water conservation, watershed management, funding for water resource projects, stakeholder participation, and community planning. Our team also has local experience through work on the Rose Valley model, experience with the Inyo/LADWP history, and company experience in implementation of groundwater monitoring programs. Through this experience and the involvement of subcontractor TEAM Engineering, we are familiar with many of your stakeholders (Los Angeles, tribes, federal agencies, etc.).

Our team will be led by DBS&A, with support from the following subcontractors:

- Consensus and Collaboration Program (CCP) will lead the public engagement and stakeholder processes
- TEAM Engineering & Management, Inc. will provide local field and engineering staff for monitoring and local data collection
- Stillwater Sciences (Stillwater) will provide expertise in biology and aquatic ecology to assist in addressing sustainability of Fish Slough and to lead California Environmental Quality Act (CEQA) permitting.
- Lechowicz & Tseng Municipal Consultants (L&T) brings expertise in financial planning, utility rate and fee studies, and impact fee/capacity charge studies.

We invite the opportunity to further discuss how the DBS&A team can provide quality assistance to the Inyo County Water Department. Dr. Cullen and Mr. Morgan can be reached at 805-683-2409, if you have any questions or need additional information. Thank you.

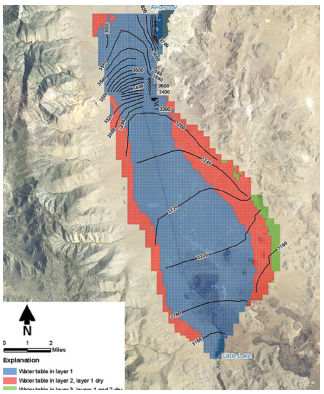
Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.

Tony Morgan, PG, CHG
Vice President
Principal Hydrogeologist

Stephen J. Cullen, Ph.D., P.G.
Principal Hydrogeologist
Senior Vice President, California Operations

CONTENTS



ACRONYMS

AET - actual evapotranspiration

BLM - Bureau of Land Management

CASGEM - California Statewide Groundwater Elevation Monitoring

CCP - Consensus and Collaboration Program

CDFW - California Department of Fish and Wildlife

CEQA - California Environmental Quality Act

CSD - Community Services District

DBMS - database management system

DBS&A - Daniel B. Stephens & Associates, Inc.

DPWM - Distributed Parameters Watershed Model

DWR - California Department of Water Resources

ET0 - reference evapotranspiration

GDE - Groundwater Dependent Ecosystem

GIS - geographic information system

GSA - Groundwater Sustainability Agency

GSP - Groundwater Sustainability Plan

ICWD - Inyo County Water District

LADWP - Los Angeles Department of Water and Power

LTA - Long-term Agreement

OVGA - Owens Valley Groundwater Authority

OVGB - Owens Valley Groundwater Basin

SGMA - Sustainable Groundwater Management Act

SWRCB - State Water Resources Control Board

TCEQ - Texas Commission on Environmental Quality

TNC - the Nature Conservancy

TWDB - Texas Water Development Board

USFWS - US Fish and Wildlife Service

USGS - US Geological Survey

Executive Summary

DBS&A is a water resources, environmental, and engineering consulting firm founded in 1984 with offices throughout California. As a wholly owned subsidiary of Geo-Logic Associates (GLA), based in Ontario, California, we have access to 245 professionals in 25 offices in total, including 80 professionals and 11 offices in California (Anaheim, Costa Mesa, Grass Valley, Morgan Hill, Oakland, Ontario, Petaluma, Roseville, San Bernardino, San Diego, and Santa Barbara).

DBS&A's water resource professionals have groundwater management planning expertise to assist Inyo County and Owens Valley Groundwater Authority (OVGA) with complying with California's Sustainable Groundwater Management Act (SGMA). Our team has broad expertise in the issues pertinent to groundwater sustainability planning, including groundwater resources assessments and safe yield evaluations, conjunctive use, water supply development, feasibility studies, water system engineering, water rights acquisition, agricultural water conservation, watershed management, funding for water resource projects, stakeholder participation, and community planning.

The DBS&A team provides several key benefits to Inyo County and OVGA.

- **The DBS&A team has the scientific expertise and bench strength to expertly develop an accurate hydrogeologic conceptual model and water budget for the Basin.** Our hydrogeologists and modelers have leveraged their experience in developing groundwater budgets and numerical models, and estimating sustainable yield; the technical underpinning for Groundwater Sustainability Agencies (GSAs) working toward compliance with SGMA.
- **In addition to its SGMA experience, DBS&A has developed groundwater plans for stakeholder groups in compliance with SGMA-type regulations in other states for many years.** DBS&A staff have been supporting Groundwater Conservations Districts and Groundwater Management Areas in Texas, for example, for over a decade providing strategic direction and technical analysis for development of their Desired Future Conditions (DFCs), which are analogous to California's Groundwater Sustainability Plans (GSPs). As a result of this experience, we have built strong in-house capabilites to the perform planning and technical studies required by SGMA.
- **Our proposed Project Manager, Tony Morgan, P.G., C.HG., has exceptional knowledge of SGMA from both the consultant's and the GSA's point of view to anticipate and guide the OVGA through technical and administrative challenges inherent in SGMA compliance.**

  As the former Deputy General Manager for the United Water Conservation District (UWCD), he has been involved in forming GSAs, creating GSPs, and conducting groundwater basin studies.
  Mr. Morgan's key roles and accomplishments related to SGMA have included:

  » Serving on the GSA Joint Powers Authority (JPA) Formation Negotiation Committee that negotiated with County of Ventura, City of Ventura, Mound Basin Ag Water Group, and environmental stakeholders to form the JPA, which later became the GSA, in the Mound Basin and was chief negotiator with representatives from the County of Ventura, City of Fillmore, Fillmore Basin Pumpers Association, Piru Basin Pumpers Association, and environmental stakeholders, for creation of JPA that became the GSA for the Fillmore and Piru Basins (FPBGSA)

  » Serving as Lead Technical Representative to FPBGSA on issues dealing with agency formation, GSA compliance requirements, identification and selection of legal counsel, basin boundary modifications, fiscal strategies/cash flow projections, and GSP development strategies

"[Tony] has a clear and detailed understanding of the intricacies of SGMA and the technical knowledge to back that up....."

~Gordon Kimball, Rancher

- » Serving as Local Agency Representative to FPBGSA and Mound Basin GSA for issues dealing with mutual, in-kind support, data sharing, water-supply augmentation projects, and regional groundwater management strategies
- » Serving as the Local Agency Representative to a multi-agency team that successfully negotiated the removal of Piru, Fillmore, Mound, and Las Posas basins from "overdrafted" condition classification with California Department of Water Resources (DWR)
- » Serving on the SGMA Technical Advisory Group (TAG) for the Fox Canyon Groundwater Management Agency (FCGMA) to advise the Board of Directors on technical aspects of the four GSPs (Oxnard Basin, Pleasant Valley, Las Posas, and Arroyo Santa Rosa basins) currently under development
- » Served on a subcommittee of the FCGMA SGMA TAG that worked with The Nature Conservancy and DWR to develop a Groundwater Dependent Ecosystems (GDEs) Guidance Framework manual for the identification, evaluation, and consideration of GDEs

Because of his experience, Mr. Morgan will be a great resource to the OVGA in navigating through the administrative functions of a new GSA, including identification of management areas, development of sustainability criteria, development of an annual GSP reporting system, submittal of the GSP to DWR, and putting into place and implementing a process for GSP revisions based on DWR's review.

- ♦ **Our team members have considerable knowledge and experience of the Owens Valley Groundwater Basin (OVGB).**
  - » Our project principal has worked with the Green Book and developed a strategic approach that facilitated Inyo County Water Department/Los Angeles Department of Water and Power (ICWD/LADWP) interaction on groundwater management planning.
  - » Our lead hydrogeologist updated the groundwater flow model of Rose Valley, just south of Owens Valley.
  - » Our teaming partner, Consensus and Collaboration Program (CCP), has already lead stakeholders discussions which have facilitated, in part, the formation of the OVGA.
  - » Subcontractor, TEAM Engineering & Management, Inc. (TEAM) brings extensive experience with groundwater monitoring projects and land use in the Owens Valley to play a key role in refinement and consolidation of your existing groundwater monitoring programs. TEAM also provides the DBS&A team with geographic proximity, local organizational and logistical knowledge, and allows the DBS&A team to be responsive to local needs on short notice.
- ♦ **DBS&A has 30 years of experience developing water resource management plans of all sorts.** In addition to providing SGMA support, our California staff have developed Urban Water Management Plans, Groundwater Management Plans, and contributed to Integrated Regional Water Plans. DBS&A performed a 21-county regional water plan update in Texas, which was led by proposed key team members Amy Ewing, P.G., and Neil Blandford, P.G. In the State of New Mexico, DBS&A has completed regional water plans for 8 regions covering more than 50 percent of the state.

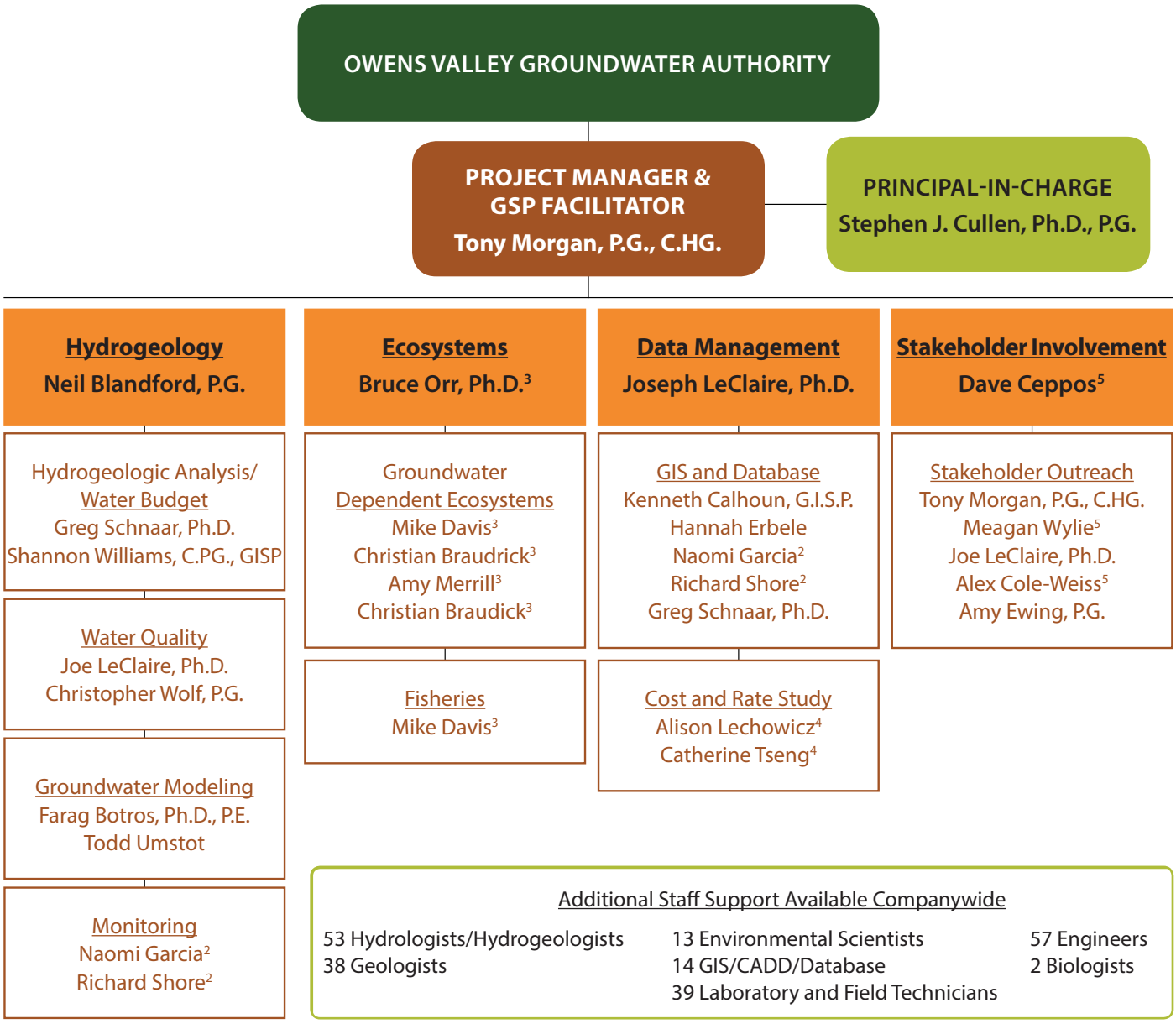
Our team will be led by DBS&A with support from:

- ♦ CCP (formerly known as Center for Collaborative Policy) at Sacramento State which will lead public engagement and stakeholder processes
- ♦ TEAM will provide local field and engineering staff for monitoring and local data collection This woman-owned business will also provide a local base of operations for the DBS&A team members working in the Basin.
- ♦ Stillwater Sciences (Stillwater), who will provide expertise in biology and aquatic ecology to assist in addressing sustainability of Fish Slough and to lead California Environmental Quality Act (CEQA) permitting.
- ♦ Lechowicz & Tseng Municipal Consultants (L&T) brings expertise in financial planning, utility rate and fee studies, and impact fee/capacity charge studies.

1. Staff Capabilities

As depicted in the organizational chart below, DBS&A has assembled a team of professionals that will work under the leadership of Mr. Tony Morgan, P.G., C.HG., as Project Manager, and Dr. Stephen J. Cullen, P.G., as Principal-in-Charge.

The qualifications and depth of our team's expertise is shown at-a-glance in the matrix following the organizational chart. Brief biosketches for key DBS&A team members follow the matrix and detailed resumes are provided in Appendix A.



Team Member	Role	Location	Degrees	Professional Registrations	Total Years of Experience	Hydrogeology	Conceptual Model and Water Balance Development	Monitoring	Ecosystems	GDE	Fisheries	Data Management	Database and GIS	Stakeholder Involvement	Tribal Group Coordination
Tony Morgan	**Project Manager**	Santa Barbara	M.A., Geology, Indiana University, 1984; B.S., Geology, Indiana University, 1979	PG, CA #4178; CHG, CA #159	39	●	●	●	○	●	○	●	○	●	
Stephen J. Cullen	**Principal-in-Charge**	Santa Barbara	Ph.D. Geography, University of California-Santa Barbara, 1996; M.S., Soil Physics, Montana State University, 1981; B.S.,University of California-Davis, 1977	PG, CA #7399; CPSS #03169	40	●	●	●	○	○	○	●	○	●	○
Neil Blandford	**Hydroeology Task Leader**	Albuquerque	M.S., Hydrology, NM Institute of Mining and Technology, 1987; B.A., Environmental Science, University of Virginia, 1984	PG, TX #1034	31	●	●	●		○		●	●	●	○
Farag Botros	**Groundwater Modeling**	Ontario	Ph.D., Hydrogeology, University of Nevada-Reno, 2007; M.S., Civil Engineering, Cairo University, Egypt, 2004; B.S., Civil Engineering, Cairo University, Egypt, 2000	PE, CA #76531	14	●	●	○		○		●	●		
Todd Umstot	**Groundwater Modeling**	Albuquerque	M.S., Hydrogeology, University of Nevada-Reno, 2002; B.S., Geology / Environmental Science, University of Massachusetts, 1993	N/A	25	●	●	●	○	○		●	●		
Christopher Wolf	**Water Quality**	Albuquerque	M.S., Geochemistry, New Mexico Institute of Mining and Technology, 1998; B.S., Geology, New Mexico Institute of Mining and Technology, 1992	PG, TX #6230	22	●	○	●		○		○	○	●	●
Gregory Schnaar	**Hydrogeologic Analysis/Water Budget**	Silver Spring	Ph.D., Soil, Water, and Environmental Science, University of Arizona, 2006; B.S., Environmental Science and Policy, University of Maryland, 2002	N/A	12	●	●	○		○		●	○	●	
Shannon Williams	**Hydrogeologic Analysis/Water Budget**	Albuquerque	M.S., Hydrology, University of Nevada-Reno, 2010; B.S., Earth and Environmental Science, New Mexico Institute of Mining and Technology, 2006	PG # 11818; GISP# 91354	9	●	●	●				●	●		○
Naomi Garcia[2]	**Monitoring**	Bishop	B.S., Environmental Science, University of California-Santa Barbara, 1997		19			○			●	○	●	●	
Richard Shore[2]	**Monitoring**	Bishop	B.S., Geologic Sciences, University of California-Santa Barbara, 2008	PGIT, CA 2018	10	●					●	●			
Bruce Orr[3]	**Ecosystems Task Leader**	Berkeley	Ph.D., Aquatic Entomology, University of California-Berkeley, 1991; B.A., Biological Sciences and Environmental Studies, University of California-Santa Barbara,1979		39			●	●	○			○	○	
Christian Braudrick[3]	**GDE**	Berkeley	Ph.D., Earth and Planetary Science, University of California-Berkeley, 2013; M.S., Geology, Oregon State University, 1997; B.A., Earth Science, University of California-Berkeley, 1993		20	○	●	●	●				○	○	

● Primary area of expertise ○ Secondary area of expertise

Subconsultants
2 TEAM 3 SWS 4 L&T 5 CCP

Team Member	Role	Location	Degrees	Professional Registrations	Total Years of Experience	Hydrogeology	Conceptual Model and Water Balance Development	Monitoring	Ecosystems	GDE	Fisheries	Data Management	Database and GIS	Stakeholder Involvement	Tribal Group Coordination
Amy Merrill[3]	**GDE**	Berkeley	Ph.D., Wildland Resource Management, University of California-Berkeley, 2001; M.S., Natural Resource Management, University of Michigan, 1991; B.A., Biology, Hamilton College, 1983		25			●	●				○	○	
Mike Davis[3]	**Fisheries**	Davis	M.S., Fish and Wildlife Management, Montana State University, 2016; B.S., Biology, California State University-East Bay, 2010; B.A., Geography, University of Colorado, 2010		10			●	●	●	●		○	○	
Joe LeClaire	**Data Management Task Leader**	Costa Mesa	Ph.D., Soil Science/Chemistry, University of California-Riverside, 1985; B.A., Soil Science/Chemistry, University of California-San Diego,1980	N/A	33	○	○	○		○		●	○	●	
Kenneth Calhoun	**GIS and Database**	Albuquerque	M.A., Geography, University of New Mexico, 1997; B.A, Geography, University of New Mexico, 1993	GISP #46134	21							●	●		
Hannah Erbele	**GIS and Database**	Costa Mesa	B.A., Earth and Environmental Science, University of California-Irvine, 2010	N/A	8	○	○	○				●	●	○	
Alison Lechowicz[4]	**Cost and Rate Study**	Oakland	M.P.A., Public Administration, Columbia University, 2007; B.S. Conservation and Resource Studies, University of California-Berkeley, 2006	MSRB Series 50	11								○		
Catherine Tseng[4]	**Cost and Rate Study**	Oakland	M.S. Urban Planning, Columbia University, 2006; B.A. Architecture, University of California-Berkeley, 2002	N/A	12								○		
Dave Ceppos[5]	**Stakeholder Involvement Task Leader**	Sacramento	B.LA., Landscape Architecture, University of Florida, 1985	N/A	33	○			○				○	●	●
Meagan Wylie[5]	**Public Involvement**	San Diego	B.S. Marine Biology and Oceanography, Hawai'i Pacific University, 2006	N/A	13				○		○			●	●
Alex Cole-Weiss[5]	**Public Involvement**	Sacramento	M.S., Community Development, University of California-Davis, 2016; B.A., Geography, University of California-Berkeley, 2010	N/A	4				○		○			●	●
Amy Ewing	**Public Involvement**	Albuquerque	M.W.R., Water Resources, University of New Mexico, 2003; B.S., Earth Sciences, University of California-Santa Cruz, 1998	PG, TX # 10413	19	●		○		○		●	○	●	

● Primary area of expertise ○ Secondary area of expertise

Subconsultants
2 TEAM 3 SWS 4 L&T 5 CCP

TEAM LEADERSHIP

Mr. Tony Morgan will be your primary point of contact and will be responsible for management of the project scope, schedule, and budget. He will direct and oversee work conducted by DBS&A and subcontractor task leaders. As depicted in the organizational chart above, task leaders have been assigned to manage tasks associated with hydrogeology, ecosystems, data management, and stakeholder involvement, and will coordinate with team members with relevant skill sets. Task leaders will direct most day-to-day work within their specified discipline, with input from Mr. Morgan. As principal-in-charge, Dr. Cullen will be responsible for your ultimate satisfaction with our work. He will provide review and senior oversight of the work and will ensure that appropriate resources are made available to successfully develop the GSP.

Tony Morgan, P.G., C.HG.—Project Manager

Mr. Morgan has nearly 40 years of experience in water supply, water management, and hydrogeological programs for municipal, industrial, and agricultural applications. Over his career as a consultant and, recently the Deputy General Manager of a California water district, he has been involved in a broad range of projects related to groundwater supply development and management. In recent years, Mr. Morgan has gained expertise in SGMA compliance, including formation of GSAs, creation of GSPs, and conducting groundwater basin studies.

He has had direct involvement in the operation of a public agency intimately engaged in the SGMA process for eight groundwater basins and has served as lead person for compliance with SGMA and directing the United Water Conservation District's (UWCD) role in the formation of GSAs in three groundwater basins and coordination of UCWD's role with the FCGMA. He served as the UWCD's representative on groundwater and water resource matters before multiple entities, including the Fox Canyon Groundwater Management Agency, the Ventura County Farm Bureau, DWR, the Association of California Water Agencies (ACWA), the Groundwater Resources Association of California (GRAC), and local municipalities, agricultural groups and other stakeholders. He is also on the Board of Directors of the American Groundwater Trust. Other particularly relevant assignments include serving:

- On the GSA JPA Formation Negotiation Committee in Ventura County
- As Lead Technical Representative to FPBGSA in Ventura County
- As Local Agency Representative to FPB GSA and Mound Basin GSA in Ventura County
- As Local Agency Representative to Multi-Agency Team in Ventura County for reclassification of "critically overdrafted" basins in Ventura County
- On GMA FCGMA TAG
- As a Technical Advisor on SGMA GDEs Guidance Framework prepared by The Nature Conservancy
- On Water Supply Augmentation Project Ad Hoc Committee for FCGMA

"I needed someone I could trust and rely on to represent the district with our constituents and other government leaders in continuing our primary mission. In addition to focusing on groundwater overdraft information to inform the community on the seriousness of the problem Tony also was innovative in developing ideas for solutions so we just didn't talk about the problem. His efforts went a long way in maintaining the district's credibility and leadership standing in the area."

~E. Michael Solomon, General Manager (ret.), United Water Conservation District

Mr. Morgan has developed, performed or provided oversight for: basin-wide groundwater elevation and water-quality monitoring programs; basin-scale hydrostratigraphic models; surface geophysical (e.g., CSAMT, TDEM, resistivity, and gravity) exploration programs; acquisition and interpretation of borehole geophysical logs; basin-scale groundwater flow models; evaluation of water-quality data for potable and irrigation suitability; siting and design of new potable and irrigation water supply wells; and aquifer replenishment activities (i.e., surface water diversions, spreading basins).

He is also experienced with administrative/management activities, including the development of scopes, specifications, and budgets; contract negotiations with subcontractors and clients; management of multi-disciplinary teams; project management to accomplish technical, schedule, and fiscal guidelines; and administrative/personnel management.

Stephen J. Cullen, Ph.D., P.G.—Principal-in-Charge

Dr. Cullen is a Principal Hydrogeologist with more than 40 years of experience. He will provide overall project oversight and contract coordination with OVGA as DBS&A's Project Principal-in-Charge. Dr. Cullen is DBS&A's Director of California Operations and a Senior Vice President with the firm. He has over 40 years of experience in environmental geology, groundwater hydrology, agricultural consulting, irrigation management, watershed studies, safe yield studies, and groundwater studies that comply with SGMA, groundwater and vadose zone modeling, conjunctive use of water, research, and directing large complex groundwater investigations. He has conducted and directed hydrogeologic studies for municipal water districts, water authorities, county and city public works departments, and private enterprises. Dr. Cullen has significant experience in numerous agricultural, industrial, and municipal settings, and he has provided hydrogeologic consultation, litigation support, and interaction with the regulatory community and public on behalf of farmers, ranchers, private industry, water and wastewater agencies, and municipalities. He continuously maintains direct involvement with project work to hone and maintain his experience credentials, and he has served as a faculty member at major academic institutions, has an extensive publication record, has provided expert testimony at trial in state and federal court, and has served on expert panels at the state and national levels. He is currently a member of the Board of Directors of the American Groundwater Trust. He has an established ability to convey complex technical information in terms that are readily understood by diverse stakeholder groups.

> **"Their professionalism and the superb technical work accomplished by Drs. Cullen and Botros contributed significantly to the understanding of the hydrology issues in the case, allowing the judge and jury to arrive at a judgement favorable to our farmer client group."**
>
> **~Steve Andersen, Attorney**
> **Andersen Schwartzman Woodard Brailsford**

Dr. Stephen J. Cullen conducted a study of the Owens Valley "Green Book," a technical groundwater management guidance document created as the result of decades of litigation between the City of Los Angeles and Inyo County over the groundwater resources of Owens Valley. The goal of the parties was twofold: (1) to produce an adequate water supply to the City of Los Angeles, and (2) protect the integrity of the ecosystems of Owens Valley. An evaluation of a proposed methodology to calculate the evapotranspiration coefficient was conducted, along with an evaluation of proposed research programs designed to improve the groundwater and ecosystem database. Over a period of one year, Dr. Cullen directed a team in a detailed analysis of the instrumentation and methodologies used to make measurements affecting

the water balance in the Owens Valley, conducted a mathematical analysis of the algorithms used to make groundwater pumping decisions, and evaluated the scenarios that would result from following the directives of the Green Book. Dr. Cullen also evaluated the state-of-the-art methodologies for measuring and estimating evapotranspiration and compared them to the methodologies historically used in the Owens Valley and at other similar sites. To augment his evaluation of the proposed research programs, Dr. Cullen empaneled a team of experienced hydrogeologists to form an evaluation committee. Lastly, Dr. Cullen wrote a proposed approach to the strategic management of groundwater in the Owens Valley. The findings and conclusions were reported in a four-volume report to the LADWP and the Los Angeles City Attorney. Subsequent to that submittal, LADWP embarked on a large-scale program to reevaluate and reconstruct, as appropriate, the approach to groundwater and ecosystem management in the Owens Valley, based, in part, on the concepts recommended in Dr. Cullen's team report.

Dr. Cullen served as Principal Hydrogeologist and Technical Reviewer on the sustainable safe yield study for the Santa Paula Groundwater Subbasin for the UWCD in the Santa Clara River Watershed, groundwater budget and groundwater management plan for the Upper and Lower Ventura River Basin for the Ventura County Watershed Protection District, and coupled watershed/surface water/groundwater/water quality numerical model for the Ventura River Watershed and Groundwater Basin for the California State Water Resources Control Board. He is also a hydrogeologist working on the GSP groundwater balances for FCGMA.

KEY TEAM MEMBERS

Neil Blandford, P.G.—Hydrogeology Task Leader

Mr. Blandford specializes in water planning and sustainability analysis, water supply investigations and water rights analysis, numerical simulation of groundwater flow and contaminant transport, computation of the effects of groundwater pumping on surface water, source water determinations, well field design, and expert testimony. He is an expert in groundwater flow and solute transport modeling, estimation of the effects of groundwater pumping on surface water, and aquifer exploration and characterization. Mr. Blandford has served as an expert witness in numerous water rights cases.

Mr. Blandford served as Principal Investigator for the comprehensive update and recalibration of the County of Inyo's Rose Valley Groundwater Model in accordance with Mitigation Monitoring and Reporting Program of Conditional Use Permit 2007 003. He gained familiarity of the groundwater resources and local hydrogeological conditions through conducting a basin-wide recharge estimate, refinement of the model grid and boundary conditions, improved calibration to historical water levels, and consideration of historical stresses on the basin (Haiwee Reservoir construction and pumping for irrigation) from 1915 through 2010.

> **"[Neil is] ...extremely effective in communicating very technical scientific information and data to non-technical persons... [DBS&A] has some of the brightest minds I've met in the field of hydrology and water resources any where in the western United States..."**
>
> **~Greg L. Bushner, R.G.**
> **Vice President of Water Resource Development**
> **Vidler Water Company**

Mr. Blandford also served as Principal Investigator for the hydrogeologic evaluation and feasibility modeling of indirect potable reuse (IPR) project, Santee Basin Groundwater Recharge and Replenishment Project for Padre Dam Municipal Water District. The effort included development and evaluation of multiple implementation scenarios, simulation of IPR water injection and extraction, interaction of surface water and groundwater, computation of residence time to meet state regulations and identification of critical flaws.

Joseph LeClaire, Ph.D.—Data Management Task Leader, Water Quality, Stakeholder Outreach

Dr. LeClaire has over 34 years of professional experience in water resources and environmental engineering. He has demonstrated success in managing large, multi-disciplinary projects and in working with stakeholder groups with disparate and often conflicting objectives. Dr. LeClaire's substantial experience spans numerous water resources, groundwater basin management, and environmental studies and projects. His technical expertise is in the area of groundwater quality and sustainability, equilibrium chemistry, and the mobility of trace metals and organics in groundwater.

> **"By all accounts, the SCSC members are happy with the study and have been distributing it to their stakeholders. On behalf of both SCSC and NWRI, I'd like to thank you for all the work you [Dr. LeClaire] and Hannah did. You both navigated the management challenges with grace and we appreciate your professionalism and attention to detail."**
>
> **~ Suzanne Sharkey**
> **National Water Research Institute**

Dr. LeClaire has completed several technical studies that provided the framework for the Salt and Nitrate Management Program (SNMP) for the Central Valley and recently presented an invited paper entitled: "Groundwater Sustainability, Salinity, and Nitrate: The Central Valley" at the Association of Ground Water Agencies - American Ground Water Trust Annual Conference. He was the technical lead on critical components of the Nitrogen / Total Dissolved Solids study in the Santa Ana River Watershed which was the first functionally-equivalent comprehensive Salt and Nutrient Management Plan in California. Dr. LeClaire also played a key role in the development and implementation of the Optimum Basin Management Program for the Chino Groundwater Basin.

SUPPORT STAFF

Farag Botros, Ph.D., P.E.—Hydrogeology, Groundwater Modeling

Dr. Botros is a Senior Hydrogeologist/Water Resources Engineer with more than 14 years of experience in numerical simulation of groundwater flow and contaminant transport through saturated and unsaturated media. His expertise includes optimization and uncertainty assessment of hydrologic parameters and conceptual models, statistical and geostatistical analysis of field and laboratory data, and site characterization. He is proficient in multiple commercial software programs such as MODFLOW, MODPATH, MT3D, PHT3D, HYDRUS, SEAWAT, and PEST. He is also proficient in programming using FORTRAN and MATLAB and has an advanced experience with the ArcGIS mapping software and with watershed hydrology. Dr. Botros' combined skill set will enable him to address the County's groundwater planning challenges from a holistic perspective, understanding what is happening in the subsurface from a water quality standpoint and how that influences the ultimate selection of optimal conjunctive management projects.

Dr. Botros has in-depth understanding of watershed hydrology and has assisted in developing water

budgets in many groundwater basins, including within Inyo County. Dr. Botros served as the technical lead for the substantial update and recalibration of the Rose Valley Groundwater Model. Updates included developing a watershed model to estimate groundwater recharge in the basin, refinement of the model grid and boundary conditions, and improved calibration to historical water levels. He performed predictive simulations that were used to maximize future pumping amounts without exceeding the allowable reduction in groundwater outflow to a terminal lake at the southern end of the valley. The model was updated multiple times to take into consideration actual climatic conditions and recorded pumping.

Dr. Botros also served as lead modeler for the Santee Basin Groundwater Recharge and Replenishment Project for PDMWD. He conducted analytical calculations to evaluate multiple implementation scenarios of indirect potable reuse using different rates and locations of water injection and extraction. The screening computations were followed by development of a three-dimensional groundwater flow model and particle tracking simulations that included aquifer heterogeneity, complex aquifer boundaries and simulation of multiple ponds. Residence time of injected water was considered relative to State of California requirements.

In support of litigation for a confidential client, Dr. Botros reviewed the U.S. Geological Survey (USGS) Central Valley Hydrologic Model (CVHM), including shapefiles, database, and the geostatistical model supporting the hydraulic properties of the CVHM. He performed a model telescope by using customized FORTRAN codes to extract information from the CVHM and build a local model focusing on geological and hydrological details of the investigated site. He also calibrated the local model, concluded results of the modeling efforts, and helped write an expert report, which resulted in a favorable ruling for our client in court.

Todd Umstot—Hydrogeology, Groundwater Modeling

Mr. Umstot is a Senior Hydrogeologist with more than 22 years of experience performing hydrogeologic investigations with a particular focus on quantitative analysis of vadose zone processes, recharge, well hydraulics, and groundwater flow and contaminant fate and transport using numerical, stochastic, geostatistical, inverse, and analytical techniques. He has extensive experience in the development and application of numerical and analytical models and has developed his own Distributed Parameter Watershed Model (DPWM) to provide defensible estimates of recharge boundary condition for groundwater models. In support of his models, Mr. Umstot has managed, designed, and performed many investigations including field programs to measure precipitation and runoff, aquifer testing and analysis, in-situ and laboratory measurement of vadose zone parameters, statistical analysis of water quality and hydrologic data, estimation of evapotranspiration, capture zone analyses, geostatistical analyses, and the design of water supply and remediation wells.

Mr. Umstot provided technical support to assess recharge to the Rose Valley for the County of Inyo using the basin-scale recharge model to estimate the mean annual recharge for a MODFLOW model of the basin. The recharge model provided estimates of the groundwater inflow to the valley from the adjacent mountain block and the quantity of water recharging from ephemeral runoff over the valley floor. The recharge model significantly improved the groundwater model calibration by allowing for an independent estimate of hydraulic conductivity.

Gregory Schnaar, Ph.D.—Hydrogeological Analysis/Water Budget

Dr. Schnaar is a Senior Scientist with 16 years of professional experience. He specializes in watershed-scale hydrologic studies, groundwater and vadose zone modeling, contaminant transport, field sampling and geologic sequestration of carbon dioxide. He has managed a variety of environmental and water resource investigations, including development of rigorous water budgets in support of GSPs and safe-yield determination for an adjudicated basin.

He is the Senior Hydrogeologist for the development of water balances used in the GSPs for the four groundwater basins within the FFGMA jurisdiction. He is also managing development of a watershed-scale distributed parameter watershed model of the Santa Paula Creek subwatershed and comprehensive water balance and safe yield evaluation for the Santa Paula Basin for the UWCD. Relevant project experience also includes development of multiple management of groundwater monitoring programs, and development of a linked watershed/groundwater model of the San Antonio Creek Subwatershed and Ojai groundwater basin. He also developed a GSFLOW-based integrated surface water/groundwater model of the Ventura River and surrounding watershed for evaluation of management options to increase instream flows and reduce nutrient impacts associated with a TMDL regulation for the California State Water Resources Control Board.

Dr. Schnaar has served as an expert technical consultant to the U.S. Environmental Protection Agency (EPA) Office of Ground Water and Drinking Water and the California State Water Resources Control Board, and is an Associate Editor for the peer-reviewed journal Groundwater. He has taught courses in Environmental Science and Water Resources as a faculty member at the University of Maryland, College Park and as an adjunct faculty member at George Washington University. Recent presentations include "Lessons Learned in Developing Defensible Groundwater Budgets and Evaluating Sustainability Indicators" and "Avoiding Undesirable Effects under SGMA and Other Groundwater Regulatory and Management Programs" for the Association of Ground Water Agencies - American Ground Water Trust Annual Conference in February 2017.

Shannon Williams, C.PG., GISP—Hydrogeological Analysis/Water Budget

Ms. Williams is a Hydrogeologist with nine years of experience in hydrogeological applications using GIS. Ms. Williams constructed several cross sections along the Ventura River and Ojai Valley in order to provide the geologic base to be used in developing an integrated surface water/groundwater model for evaluation of management options. For an agricultural site in Santa Barbara, she constructed geologic cross sections to serve as a framework for an integrated surface water/groundwater model to quantify recharge and water budget. She utilized ArcGIS to perform spatial analysis of various watershed parameters, such as precipitation and water chemistry. She also created ArcGIS Collector maps that allow field staff to record accurate sample locations in the field.

Christopher Wolf, P.G.—Water Quality

Mr. Wolf specializes in water resource and hydrogeological studies including the design, installation, and evaluation of water supply wells. He applies his background in geology and geochemistry to his water-related projects, including hydrogeologic conceptual model developments, groundwater evaluation, analysis of water quality issues, well rehabilitation, deep exploratory wells and well field development. He has worked on water resources development and management projects with municipalities and tribes in the southwestern U.S. for more than 23 years.

He has performed geochemical and hydrogeological characterizations for water supply projects throughout the West, including providing expert testimony during New Mexico Office of the State Engineer water right permit hearing and during the appeal in District Court. For a U.S. Bureau of Reclamation feasibility investigation, he evaluated of the potential groundwater and surface water sites for aquifer storage and recovery (ASR). In support of a Hydrogeological and Geochemical Characterization for water supply project for a confidential agricultural client in Santa Barbara, Mr. Wolf evaluated surface water and groundwater resources in the Transverse Range, including preparing a hydrogeological conceptual model based on geology and hydrology at the site.

Hannah Erbele—GIS and Database

As a water resource scientist, Hannah Erbele has been providing hydrogeology and environmental services for the past seven years. She uses ArcGIS and statistics to analyze and interpret data related to water quality, groundwater, environmental, and remediation services. Ms. Erbele is also well versed in field activities and can provide technical, field, and professional support on issues pertaining to groundwater, surface water, water quality, and water conservation. Ms. Erbele is providing technical assistance in support of a project involving modeling groundwater, surface water, groundwater-surface water interaction, and water management in Ventura River. She is also currently involved with the field investigation associated with a hydrogeologic monitoring program in Malibu, California, to better characterize groundwater conditions of the site and to refine the ability to detect abnormalities in data trends.

Kenneth Calhoun, G.I.S.P.—GIS and Database

Mr. Calhoun is the Manager of GIS services at DBS&A and is in charge of all GIS development. Mr. Calhoun specializes in coordination of enterprise-wide geographic information systems (GIS) for well, groundwater, land use, and water resources management, and implementation of various GIS software, global positioning system (GPS), and remote sensing technologies for GIS project management. Mr. Calhoun is currently serving as Senior GIS Specialist and Information Solutions Team Manager for the development of a new comprehensive, web-accessible GIS-based database management system to manage and analyze water quality information for an ongoing groundwater monitoring contract with the County of San Bernardino. Mr. Calhoun has also provided GIS support on multiple litigation support projects throughout California. For one confidential client, he developed a Microsoft Access database to manage site data derived from consultant reports and government databases, which included data from more than 1,000 monitor wells and approximately 250,000 records of chemistry data. He also developed GIS using ArcView to manage and analyze site data, and integrated aerial photographs, Access data, and Arc/Info coverage of facility locations and property ownership, topography, domestic and monitor well locations, and chemistry data. Mr. Calhoun coordinated exhaustive quality assurance/quality control (QA/QC) review of chemistry data. He used GIS to develop groundwater quality and soil chemistry maps and created GIS applications for incorporation in real-time presentations that were used in mediation sessions to communicate technical issues to a non-technical audience. He integrated modeling data (kriged lithology distribution) into GIS cross-section utility to visually verify results.

Amy Ewing, P.G.—Public Involvement

Ms. Ewing is a licensed professional hydrogeologist with 20 years of experience, specializing water planning, hydrogeology, water quality studies, watershed management, water rights planning, and aquifer storage and recovery. She has been instrumental in assisting DBS&A's clients to obtain more than $20 million in grant funding for water reuse, recharge demonstration, watershed restoration, and regionalization projects. She also has extensive experience in public outreach, community engagement, stakeholder involvement, and agency coordination. She was the Project Manager for the 2016 Region O regional water planning project covering a 21 county area in west Texas. The plan quantifies water supply and projects water demand through 2070, and includes evaluations of numerous water supply strategies for meeting drought-of-record demands. Amy has led or played a key role in development of five other regional water plans that involved extensive stakeholder involvement processes. She has led more than 50 public and stakeholder meetings and excels at bringing together agencies with diverse interests to achieve consensus on water management strategies. Ms. Ewing was recently invited to present "Integrating Surface Water and Groundwater through Managed Aquifer Recharge" at the Groundwater Resources Association of California Biennial Symposium on Managed Aquifer Recharge.

SUBCONSULTANT STAFF: CCP

Dave Ceppos—Stakeholder Involvement Task Leader

Dave Ceppos is CCP's SGMA Program Manager and is a Managing Senior Mediator. Mr. Ceppos has a comprehensive background developing and mediating collaborative problem solving, stakeholder-driven, resource management processes. Mr. Ceppos is also CCP's Water Program Manager and supervises numerous water management programs including implementation and DWR's Water Use Efficiency Program and the Water Storage Investment Program. He has supervised CCP's work in 32 GSAs statewide and is viewed as a prominent expert on facilitating SGMA implementation. He often provides strategic advice for implementing SGMA to state and local agencies, speaks regularly and has published articles numerous articles on regional collaboration and capacity building. He has served as the lead facilitator and public engagement specialist for the Colusa Subbasin, Yolo Subbasin, Chowchilla Subbasin and several GSAs in Butte County. For this project, Mr. Ceppos will serve as CCP's Principal in Charge, providing active project engagement throughout the effort.

Meagan Wylie—Stakeholder Involvement

Ms. Wylie is a Lead Mediator and Facilitator with CCP. Working out of CCP's Southern California office, Ms. Wylie provides facilitation, project management, stakeholder outreach and coordination, public engagement, collaborative strategic planning services, and stakeholder assessments to local, state and federal agencies and non-governmental organizations (NGOs). She has focused educational and professional experience on marine and coastal issues, water supply and management, natural resource management, ecosystem dynamics, and climate adaptation planning. Her expertise focuses on community development, policy analysis, facilitation, and mediation on issues involving local governance, natural resources and economic development.

Ms. Wylie served as the Project Manager for SGMA implementation in the San Diego regions for the San Luis Rey Basin, San Diego River Valley Basin, and Borrego Valley Basin. She has also been project coordinator for the following other SGMA cases: Turlock Subbasin, Kaweah Subbasin, Kern Subbasin, and Upper Ventura Basin. She has be facilitator and staff coordinator for numerous SGMA statewide public

engagement efforts sponsored by DWR and SWRCB including the Basin Boundary Modification regulatory public meetings and the State SGMA Fee Assessment public meetings. She has worked on and co-authored SGMA Tribal Statewide guidance and worked specifically in Tribal SGMA issues in the San Luis Rey and San Diego River Valley cases. She has co-authored published articles on SGMA with other CCP colleagues. Ms. Wylie will serve as CCP's Project Manager.

Alex Cole-Weiss—Stakeholder Involvement

Ms. Cole-Weiss has expertise in community development, regional planning, and geography. She draws from a range of experiences with cooperative decision-making structures, political and social organizing groups, urban land use planning initiatives, and community food systems. Alex joined the Center in 2016 and works on projects related to public engagement, tribal outreach, natural resource management, environmental planning, transportation planning, and environmental justice. Her skills include stakeholder assessment, research, writing, conflict resolution, workshop planning, and meeting summaries and facilitation. She works with the Owen's Lake Master Project Cultural Resources Task Force, charged with recommending to the LADWP and Great Basin Unified Air Pollution Control District how to balance dust control mitigation and protection of cultural resources on these four sites. She supports meeting preparation and facilitation, including developing notes to summarize key meeting outcomes.

SUBCONSULTANT STAFF: TEAM

Naomi Garcia—Monitoring Network

Naomi Garcia will be the Project Manager for TEAM as subcontractor to DBS&A for this project. Ms. Garcia is the owner and president of TEAM Engineering & Management, Inc. and has been with the company since 1999. Prior to becoming owner of TEAM in 2015, Naomi was TEAM's Senior Environmental Scientist and Manager at TEAM's Mammoth Lakes office for over 12 years. Naomi has experience in land use planning, surface and groundwater availability assessments, multi-agency permitting, and management of large-scale groundwater monitoring and mitigation programs. Naomi has over 19 years of experience interfacing with local, state and federal agencies related to resource conservation, permitting and regulatory compliance, and is a long-time resident of the Eastern Sierra, currently residing in the Tri-Valley region. Naomi will be the lead on task management, reporting, and quality assurance related to TEAM's services for this project. She also has experience in meeting facilitation and will be serving as a valuable liaison to local stakeholders in the Owens Valley during the GSP process.

Richard Shore—Monitoring Network

TEAM's Project Geologist, will be engaged in groundwater data management and local field reconnaissance for this project. Mr. Shore is currently the project lead for groundwater monitoring and reporting for the Inyo and Mono County Landfills, Crystal Geyser Roxane, and other projects for TEAM. Richard has successfully collaborated with county, state, and federal agencies on multiple projects. Richard is a certified Geologist in Training, is familiar with state and federal guidelines concerning the practice of Geology in California, and has excellent writing and communication skills.

In addition to Naomi Garcia, TEAM's officers include a California Professional Geologist and California Professional Engineer. Although not anticipated to be needed for this project team, J. Tim Hersch, P.G. and Fred Finkbeiner, P.E. are available to assist the project team if needed. Tim Hersch has provided geologic oversight and report reviews for TEAM's groundwater monitoring and reporting projects in the Eastern Sierra for over 10 years, and is familiar with the local hydrogeologic conditions in the area. Fred Finkbeiner has provided support to TEAM for Inyo and Mono County Landfills, after he retired from the Los Angeles Department of Water and Power. TEAM also employs retired LADWP Chief Hydrographer Steve Keef, who is currently assisting with surface water monitoring and SB88 compliance projects for TEAM and could provide

valuable input on data management and development of agreements with LADWP and other key entities in the basin.

TEAM's local staff also includes Biologist Greg Foote, who has unsurpassed knowledge of the geographic setting of the Owens Valley, sensitive biological resources, and experience with large scale groundwater data management systems. TEAM's Archaeologist Mary Farrell, located in Lone Pine, California, brings to the team decades of experience with cultural resources in the Owens Valley and Tribal Consultation.

SUBCONSULTANT STAFF: SWS

Bruce Orr, Ph.D.—Ecosystems Task Leader

Dr. Orr has over 25 years of experience leading complex projects involving natural resource inventories, integrated natural resource management plan development, and federal and state regulatory processes. He has led numerous multi-disciplinary restoration feasibility and planning studies that incorporate hydrologic and water resource management planning, instream flow needs, and groundwater inputs in major watersheds throughout California (Sacramento, San Joaquin, Merced, Napa, and Santa Clara rivers), and is currently leading restoration planning projects on the Virgin and Gila rivers (Nevada and Arizona). He has conducted baseline floral and faunal surveys in the Eastern Sierra, coauthored the Flora of the Valentine Eastern Sierra Reserve, and has worked on numerous river, riparian and wetland ecology and restoration projects throughout many western states (e.g., CA, OR, NV, AZ, UT, MT, CO) over the past 30 years. Dr. Orr provides senior strategic support on many of Stillwater's large-scale regulatory, watershed management, and restoration projects.

Christian Braudrick, Ph.D.—GDE

Dr. Christian Braudrick is a fluvial geomorphologist with over 20 years of experience integrating physical and biological processes in rivers. In particular, he has explored linkages between channel morphology, channel dynamics, vegetation, and aquatic habitat in rivers throughout California. Christian has expertise in geomorphic history, sediment transport models, and hydraulics to better understand channel and floodplain dynamics. He has worked on topics ranging from stream restoration in steep, confined channels to assessing the impacts of dam removal. His Ph.D. dissertation used physical models to explore the conditions required for rivers to meander and how gravel-bed meanders respond to changes in sediment supply.

Amy Merrill—GDE

Dr. Merrill is an ecologist with over 25 years of experience in riparian and wetland monitoring, restoration, and management. Amy is experienced in vegetation classification and mapping, development of site restoration and planting plans, assessing riparian effects on aquatic and terrestrial habitat, and watershed assessments and management planning. She is the Stillwater lead in efforts to develop methods for quantifying ecosystem services for credit in voluntary and regulatory contexts, including credits for carbon, water quality, and habitat, and water credit trading. With expertise in biogeochemistry, Amy is working to develop a carbon sequestration protocol for mountain meadow restoration, in partnership with the Truckee River Watershed Council, CalTrout, Foothill Conservancy, and the South Yuba River Citizen's League.

Mike Davis—GDE

Mr. Davis is an environmental scientist with 10 years of experience in fisheries science, including 4 years focused on watershed management and native fishes recovery in the Owens Valley and Eastern Sierra. Mike is experienced in the design and implementation of fisheries and habitat assessment studies focused on rare or special-status fishes and has led multi-year physical and biological stream restoration projects in a variety of desert ecosystems of California, including Fish Slough. He has worked with key agencies and stakeholders in the Owens Valley to complete fish habitat restoration projects and threatened species monitoring in the context of hydropower, agricultural irrigation, and water conveyance operations. His past research has provided insight to meteorological controls on winter dissolved oxygen dynamics in ice-covered lakes and the population dynamics and habitat use of salmonids in these systems.

SUBCONSULTANT STAFF: L&T

Alison Lechowicz—Cost and Rate Study

Ms. Lechowicz has10 years of utility rate consulting experience. She testified as an expert witness at the California Public Utilities Commission in electric rate cases of Pacific Gas & Electric, Southern California Edison, and San Diego Gas & Electric. Ms. Lechowicz serves on the Municipal Securities Rulemaking Board, Series 50 as a Municipal Advisor Representative. Representative experience includes conducting a Proposition 26 groundwater fee study to recover SGMA compliance costs and GSA formation costs over the next three years for the Kings River East Groundwater Sustainability Agency (Fresno County), including estimating water use of growers based on land use and crop type and allocated costs. For the McMullin Area GSA (Fresno County), she worked with the GSA's engineer to draft a five-year budget and rate plan under Proposition 218, which included developing detailed cost estimates for Board administration and GSP development, calculating a $19 per acre fee for parcels within the GSA, and conducting the Prop 218 printing and mailing of public notices. For the Root Creek Water District (Madera County), Ms. Lechowicz completed a financial plan for the District's groundwater basin and agricultural water service, developed an acreage assessment for district overhead, and prepared water, sewer, and storm drain rates, and development fees for the municipal service area.

Catherine Tseng—Cost and Rate Study

Ms. Tseng has 10 years ofconsulting experience. She specializes in utility rates, capacity charge, and financing plans for public works projects, and Proposition 218 compliance. Ms. Tseng is a Certified Independent Professional Municipal Advisor.

Ms. Tseng performed a water financial plan and rate study assessing various conservation-oriented water rate structures for the City of Davis and developed drought surcharge. She worked closely with citizens' advisory committee to develop recommendations to City Council. For the City of Vacaville, she performed a cost of service water rate study to eliminate operating deficit and implemented water conservation surcharge to recover lost revenue. Ms. Tseng completed a raw water rate study to develop rate method for the Valero Refinery in the City of Benicia, including preparing a water rate study and capacity fee study, and developing drought rates to fund additional water supply. For the Town of Yountville, Ms. Tseng completed a long-range financial plan for the water and wastewater enterprise to phase out subsidies from the general fund, and developed recycled water for contract negotiations with customers.

2. Recent Experience

Our proposed Project Manager, Tony Morgan, and DBS&A's team of technical professionals have extensive experience assisting local communities and water agencies with sustainable groundwater management. Below is a snapshot of relevant project experience, followed by more detailed descriptions of the most pertinent projects. Appendix B contains additional relevant project descriptions in further detail.

Groundwater Management Projects	Sustainable Groundwater Management Planning	Collecting and Analyzing Groundwater Data	Groundwater / Surface Water Interaction and Balance Modeling	Groundwater Monitoring	Stakeholder Involvement / Public Engagement	Regulations, Permitting, and Water Rights for Groundwater Recharge	Hydrogeologic Characterization	Water Quality Implications of Groundwater Recharge	Evaluation and Design of Artificial Groundwater Recharge Projects	Cost Estimates for Groundwater Recharge Alternatives	Groundwater Dependent Ecosystems	Evaluating Recharge Rates	Feasibility Studies for Groundwater Recharge Projects	Monitoring Protocols, Standards, and Sites	Monitoring Networks and Identification of Data Gaps	Water Budget	Modeling
Rose Valley Groundwater Model, County of Inyo, Rose Valley, California		●	●	●		●	●				●	●			●		●
Development of Groundwater Budgets for Groundwater Sustainability Planning, Ventura County, California	●	●	●		●	●	●		●		●	●				●	●
Safe Yield Study – Santa Paula Groundwater Subbasin, United Water Conservation District	●	●	●	●	●	●	●		●		●	●			●	●	●
Coastal Groundwater Management Planning, Upper and Lower Ventura River Basin, Ventura County, California	●	●	●	●		●	●					●		●	●	●	●
Hydrogeologic Evaluation, Watershed-Scale Recharge Evaluation, and Groundwater Model Development, Ojai Basin, Ventura County, California	●	●	●	●	●	●	●		●	●	●	●	●				●
Safe Yield Study and Water Master Plan, Big Bear City, California	●	●	●	●	●	●	●	●				●				●	●
Quantification of Aquifer Recharge Enhancement from River Flow and Municipal Water Program Operations, City of Bakersfield	●	●	●	●	●	●	●	●	●	●		●				●	●

Groundwater Management Projects	Sustainable Groundwater Management Planning	Collecting and Analyzing Groundwater Data	Groundwater / Surface Water Interaction and Balance Modeling	Groundwater Monitoring	Stakeholder Involvement / Public Engagement	Regulations, Permitting, and Water Rights for Groundwater Recharge	Hydrogeologic Characterization	Water Quality Implications of Groundwater Recharge	Evaluation and Design of Artificial Groundwater Recharge Projects	Cost Estimates for Groundwater Recharge Alternatives	Groundwater Dependent Ecosystems	Evaluating Recharge Rates	Feasibility Studies for Groundwater Recharge Projects	Monitoring Protocols, Standards, and Sites	Monitoring Networks and Identification of Data Gaps	Water Budget	Modeling
Analysis of Temporal Variability of Recharge and Water Quality for a Deep Spreading Basin, Orange County Water District, Orange County, California			●	●		●	●	●	●			●	●		●		
Hydrogeologic Feasibility of Spreading River Water, United Water Conservation District, Ventura County, California		●		●		●	●	●	●			●	●				
Evaluation of Aquifer Recharge Estimates and Aquifer Storage and Recovery Program, Indio Water Authority, Indio, California		●	●	●	●	●	●		●			●				●	●
Groundwater Recharge and Replenishment, Padre Dam Municipal Water District, California	●	●	●		●	●	●	●	●			●	●		●	●	
Ambient Water Quality Recomputation for Santa Ana Watershed Groundwater Management Zones, Santa Ana Watershed Project Authority, Southern California	●	●		●	●	●		●							●		
Recharge Water Quality Analysis, Eastern Municipal Water District, Riverside County, California		●	●	●		●	●	●	●			●	●				
Comparative Analysis of the AB3030 Groundwater Management Plan, Atascadero, California	●				●	●									●		
ASR Project Planning and Coachella Valley Groundwater Model Review, Indio Water Authority, Coachella Valley, Southern California	●	●	●	●		●	●	●	●	●		●	●				
Quantification of Groundwater Recharge, Stanbery Development, Scotts Valley, California	●	●	●	●	●	●	●		●			●	●		●		
Hydrogeologic Characterization and Recharge Feasibility Study, Sonoma Valley, California	●	●	●	●	●	●	●		●	●		●	●	●	●		

Groundwater Management Projects	Sustainable Groundwater Management Planning	Collecting and Analyzing Groundwater Data	Groundwater / Surface Water Interaction and Balance Modeling	Groundwater Monitoring	Stakeholder Involvement / Public Engagement	Regulations, Permitting, and Water Rights for Groundwater Recharge	Hydrogeologic Characterization	Water Quality Implications of Groundwater Recharge	Evaluation and Design of Artificial Groundwater Recharge Projects	Cost Estimates for Groundwater Recharge Alternatives	Groundwater Dependent Ecosystems	Evaluating Recharge Rates	Feasibility Studies for Groundwater Recharge Projects	Monitoring Protocols, Standards, and Sites	Monitoring Networks and Identification of Data Gaps	Water Budget	Modeling
Evaluation of Natural and Artificial Recharge, City of Glendora, California		●	●	●	●	●	●		●	●		●	●	●	●	●	●
San Antonio Creek Spreading Grounds, Design and Redevelopment, Ventura County, California	●	●	●	●	●	●	●		●	●	●	●	●	●	●		●
Hydrogeologic Characterization & Water Balance Development, Newport Bay Watershed, Swamp of the Frogs, Orange County, California		●	●	●	●	●	●	●	●		●	●		●	●	●	
Hydrologic Monitoring Program, Pepperdine University, Malibu, California	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●
AB 3030 Groundwater Management Plan Fillmore and Piru Basins, California	●	●		●	●		●								●	●	
Preliminary Evaluation of Impacts of Potential Groundwater Sustainability Indicators on Future Groundwater Extraction Rates, California	●	●	●	●	●		●				●				●	●	●
Saline Intrusion Update, Oxnard Plain, California	●	●		●			●							●	●		
Ventura Regional Groundwater Flow Model, Ventura, California	●	●	●	●	●		●				●	●			●	●	●

Complete descriptions of the most relevant experience of our team is provided below. These project descriptions, along with many more examples of our experience, are also provided in Appendix B.

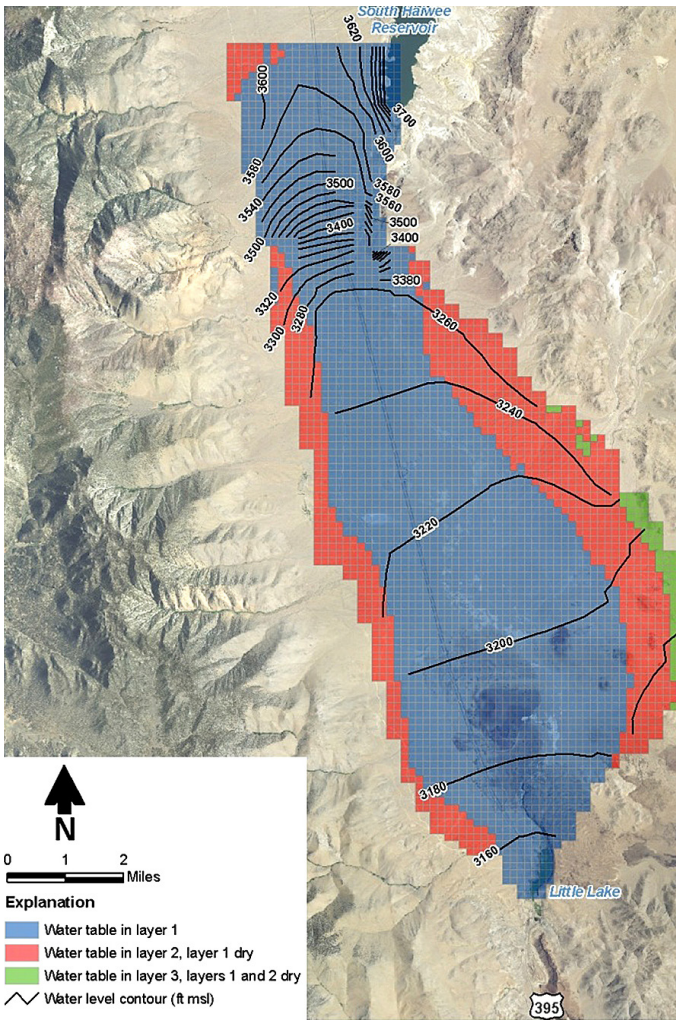
Rose Valley Groundwater Model

For the County of Inyo Water Department, DBS&A made substantial revisions and updates to an existing groundwater flow model of Rose Valley, California, immediately south of Owens Valley. The model was used to assess the impact of proposed groundwater pumping on groundwater discharge to a shallow lake (Little Lake) at the south end of the valley. The model revisions and updates were made in accordance with Mitigation Monitoring and Reporting Program of Conditional Use Permit (CUP) 2007-003, which permits the extraction of groundwater from wells on the Hay Ranch in Rose Valley. The water is extracted by Coso Operating Company (Coso) for injection at the Coso geothermal field in the northwest area of the China Lake Naval Air Weapons Station. DBS&A implemented a number of substantial updates and changes to an existing model, including:

- Review of the conceptual model and adjusting model boundary conditions in the southern end of the valley to improve the simulation of groundwater discharge processes
- The DPWM was applied to estimate groundwater recharge, independent of the groundwater numerical model and helped provide a more accurate basin water budget
- The model grid was refined in the horizontal and vertical dimensions
- The thicknesses of the geologic units were adjusted based on the available well and geophysical logs
- Model hydraulic properties and layering were adjusted to better match the observed water levels in the valley

The model was recalibrated to historical transient conditions beginning in 1915 accounting for seepage from Haiwee Reservoir, previous pumping for irrigation for Hay Ranch and the Los Angeles Department of Water and Power, and project pumping that occurred through 2010.

The model and associated predictions have been updated multiple times as part of the adaptive management approach implemented under the permit.



The updated model was used to reevaluate future Coso pumping amounts and associated drawdown trigger levels at monitor wells that could occur without exceeding a 10 percent reduction in groundwater outflow to Little Lake.

Fish Slough Aquatic Habitat Restoration and Native Species Monitoring

Aquatic habitat in Fish Slough, and the native species that inhabit them are highly dependent on groundwater-fed springs and continue to be limited by a legacy of man-made impoundments, an altered hydrograph and introduction of non-native predatory fishes. Key Stillwater team member Mike Davis led a comprehensive restoration and monitoring program designed to promote recovery of the native aquatic community, including the federally endangered Owens pupfish.

Mr. Davis and his collaborators implemented novel physical and biological restoration approaches in Fish Slough to restore a natural hydrograph, channel morphology and aquatic and riparian community composition. A restoration model developed in Fish Slough now serves as a broadly-applicable model for other groundwater-dependent desert spring and stream ecosystems recovering from non-native species introductions and altered hydrology.

To assess recovery status and detect threats to key biota, Mr. Davis and collaborators completed annual monitoring of all aquatic species and associated habitat in Fish Slough, including focused analysis of spatial distribution, population dynamics, and genetic variability of federally endangered Owens pupfish and Owens speckled dace. This multi-year monitoring included detailed temporal mapping of the highly-dynamic, groundwater-fed aquatic habitat of Fish Slough, and special-status invertebrate and water quality sampling.

GSA Formation Support to Develop OVGA

Under the DWR Facilitation Support Services program, CCP provided GSA formation support and associated Tribal engagement to develop the OVGA. More specifically, CCP worked with the DWR Tribal Policy Advisor and Inyo County to conduct outreach to all California Native American Tribes in the Basin to further explore potential representation issues and provided individual, in-person meetings with the Bishop, Lone Pine, Big Pine, and Fort Independence Tribes, as well as the Owens Valley Indian Water Commission personnel. This effort also included phone meetings with the Benton Tribal Chair and Environmental Coordinator. CCP provided support to joint meetings of the Tribes to confirm decision-making approaches and confirm Tribal perspectives as they relate to the larger GSA formation effort.

Likewise, CCP conducted telephone consultations with LADWP to explore the agency's role and thoughts on coordination related to the SGMA-recognized Settlement Agreement.

CCP facilitated Inyo County-based GSA-eligible entities and GSA Formation Work Group meetings to negotiate GSA governance structure. Thereafter, CCP supported GSA Governance Development including development of agreements and documents outlining GSA structures and governance methods. CCP coordinated and facilitated SGMA Public Meetings to provide outreach and education about SGMA implementation, including GSA formation and GSP development, across the Owens Valley Basin.

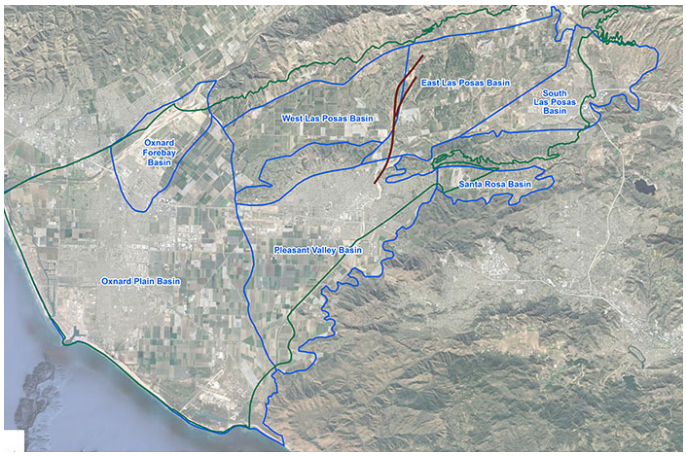
GDE experts implemented novel physical and biological restoration approaches in Fish Slough to restore a natural hydrograph, channel morphology and aquatic and riparian community composition.

Development of Groundwater Budgets for Groundwater Sustainability Planning

The FCGMA (as the GSA) selected DBS&A as part of a team to develop a GSP in compliance with SGMA. DBS&A prepared quantitative groundwater budgets for three groundwater basins within the Agency's jurisdiction: (1) Las Posas (separately for east and west management areas), (2) Pleasant Valley, and (3) Oxnard. The groundwater budgets calculated annual groundwater inflows and outflows and change-in-storage over a 30-year period (1985 to 2015).

Quantitative groundwater balances developed for each basin included accounting for deep percolation of precipitation, deep percolation of irrigation, lateral groundwater inflow including seawater intrusion, percolation of recharge from wastewater treatment plants, artificial recharge, recharge from septic systems, recharge from underground water infrastructure, groundwater extraction, riparian evapotranspiration, lateral groundwater outflow, and groundwater discharge to streams. Each component of the groundwater balances was developed using standard methods based on available data.

Deep percolation of irrigation and precipitation was estimated by use of the DBS&A DPWM. Modifications were made to the DPWM for this project in order to allow for changing land-use over time. Land use and crop-coverage changes during the model run were made based on review of available agricultural surveys, including from the Farmland Mapping and Monitoring Program and the County agricultural commissioner.



Available groundwater-level monitoring data was used to constrain estimates of change-in-storage for each year of the water balances. Available groundwater-level data was compiled to estimate change-in-storage. Available shallow groundwater level data (i.e., well screens less than approximately 500 ft bgs) from all wells were obtained and used in the analysis. Thiessen polygons were generated around each well location in order to estimate the representative area for each well to support change-in-storage calculations.

In support of GSP development, DBS&A has worked collaboratively with the Agency technical advisory committee and stakeholders, which included representatives from water districts and agencies, growers, and conservation-focused non-governmental organizations. DBS&A has iteratively updated the groundwater balances during this process in response to technical feedback, incoming data, and ongoing development of other groundwater modeling tools.

Fillmore-Piru Basin Water Banking Program, Ventura County, California

Mr. Tony Morgan was the project lead for the conceptualization of and feasibility evaluations for enhanced conjunctive use of the Fillmore and Piru groundwater basins as a water bank or water storage and transfer facility to mitigate groundwater level fluctuations in these basins and provide supplemental water supplies to other basins in Ventura County. The project is expected to develop 30,000 to 80,000 acre-feet of storage depending on management strategies.

Additional relevant project descriptions are also located in Appendix B.

Implementing the DPWM will address hydrologic data limitations by estimating key components of the groundwater/surface water balance.

3. Approach and Scope of Work

Our technical approach is geared towards the identification of an expeditious, yet technically reasonable and implementable path to sustainability for the Basin. We understand that a great deal of information exists for the Basin and these data will be the foundation upon which the GSP will be built. A GSP is not required to be a large document or overly complicated. Our approach is to prepare a GSP that:

- Is tailored to the critical issues of the Basin;
- Addresses the items prescribed by DWR in their GSP Preparation Checklist and GSP Annotated Outline guidance documents; and
- Is sensitive to the scope of work and available funding as defined by County of Inyo Water Department.

SGMA specified many actions that a GSA must do to be in compliance. Many GSAs throughout California are newly formed public entities created in direct response to SGMA, and have limited experience in groundwater management. To assist these GSAs in meeting their sustainability goals and thereby achieve compliance with SGMA, the DWR has created a series of documents to aid the GSAs. These documents were published by DWR as Best Management Practices (BMPs) or Guidance Documents. The BMPs and Guidance Documents are not a replacement for the GSP Regulations or SGMA statutory provisions, but do provide insight into DWR expectations and how DWR will evaluate the adequacy of a GSP.

BMPs are defined as "the practice, or combination of practices, that are designed to achieve sustainable groundwater management and have been determined to be technologically and economically effective, practicable, and based on best available science." To date, the following BMPs are available to provide clarification and guidance on GSP content:

BMP 1 - Monitoring Protocols Standards and Sites

BMP 2- Monitoring Networks and Identification of Data Gaps

BMP 3 - Hydrogeologic Conceptual Model

BMP 4 - Water Budget

BMP 5 - Modeling

BMP 6- Sustainable Management Criteria (draft)

BMP Framework

Guidance Documents "...address topic areas unique to SGMA, for topics where no established practices in the water management industry exist, and which may not have been specifically identified in the GSP Regulations." To date, the DWR has developed the following guidance documents:

- Guidance for Climate Change Data Use During Sustainability Plan Development
- Stakeholder Communication and Engagement
- Engagement with Tribal Governments
- GSP Annotated Outline
- Preparation Checklist for GSP Submittal

These BMPs and Guidance Documents will assist the DBSA team in the preparation of the GSP. Each of the major GSP project elements (i.e., Outreach, Basin Setting, Planning, Projects and Management Action, and Monitoring), when combined, present a systematic path to completing the GSP. The BMPs and Guidance Documents serve to inform the process and provide a framework where the OVGA and interested stakeholders can understand the general steps and recognize how the Basin sustainability planning can be achieved.

The DBSA team's approach to this project has the following major components:

✓ **Leverage existing knowledge**

» Make extensive use of the information obtained from the many existing technical and management reports;

» Refer to the local expertise and knowledge of our team members;

» Engage with local stakeholders early in the process to identify their concerns and identify knowledge beneficial to the GSP development process; and

» Rely upon the broad experience of our team members gained from working on other GSPs, water resource management projects, groundwater modeling, and regulatory compliance programs.

✓ **Proactive Stakeholder Engagement Strategy**

» Engage stakeholders early to identify issues early in the process;

» Establish multiple venues for stakeholders to participate in the process; and

» Create and implement a stakeholder engagement plan-show stakeholders how they can participate in the process.

✓ **DWR Interaction**

» Engage in strategic discussions with DWR personnel to help resolve questions or potential problems in an expedient manner; and

» Communicate frequently and effectively to minimize the potential for delays in GSP preparation or in DWR approval.

✓ **Effective Data Management**

» Implement a multi-function data management system;

» Use data archival functionality for existing and future data sets; and

» Use data retrieval capabilities for research, analysis, and public information.

✓ **Technical Analyses Focused on Essential Issues**

» Concentrate technical work on issues critical to determining the sustainable yield of the Basin;

» Fill in data gaps later. Significant data unknowns can be addressed over time rather than spending limited fiscal resources during the early stages of the GSA operations;

» Prepare a GSP substantially compliant with DWR requirements. Our team's approach will develop a GSP based largely on existing data supplemented with a plan describing how the data gaps will be minimized in the future. This approach is being used by several GSAs to focus their GSP development efforts on activities that will result in a substantially compliant GSP, but also provides DWR with a plan that describes how the data gaps will be addressed. GSAs are using this approach in the early stages of their formation when fiscal resources are limited and other financial sources (e.g., grants) have long lead times that can preclude their availability before the January 2022 deadline for GSP submittal to DWR; and

» Identify Other Recommended Actions (some of these are provided in Task 16 in the proposal) that the GSA may want to consider performing so the resultant information can be included in the January 2022 GSP submittal.

✓ **Projects and Management Actions are Important**

» Sustainable yields can be enhanced through the implementation of project and/or management actions;

» Projects and management actions must be cost-effective; and

» Stakeholders must be convinced of the cost-benefit relationship for proposed projects.

"Tony was a valuable, eloquent and intelligent voice at a critical time when we were forming our GSA. Furthermore, Tony is a powerful advocate for water, committed to educating the community about the issues and implications around this new legislation and constantly thinking of creative projects and collaborations in order to maximize the opportunities SGMA now offers."

~Gordon Kimball, Attorney

Scope, Schedule and Budget

DBS&A's proposed schedule, budget, key assumptions, and descriptions of each task and their associated deliverables are provided below.

SCHEDULE

Our detailed schedule to perform the work in compliance with DWR deadlines is provided on Page 27. Our schedule shows the submittal of the GSP to DWR in the last quarter of 2021.

BUDGET

DBS&A has developed a not-to-exceed budget for accomplishing Tasks 1 through 15 outlined in our scope of work. Our budget is summarized on Page 28. A complete breakdown of each task with hours allocated to each labor category and all outside charges with a total cost of $710,928 is provided on Page 29. Assumptions inherent in our proposed scope and cost are discussed below.

KEY ASSUMPTIONS

The DBS&A team has highlighted the following assumptions that are central to our proposal:

- The Inyo County Water Department issued the RFQ for this project and in the RFQ suggests that it is expected that the OVGA will take over this project. For the purposes of our proposal, we have assumed the OVGA is the entity responsible for this project and our proposal refers to OVGA as the primary GSP decision-making entity;
- Funding for this project is to come from the Prop 1 grant and is limited to the Prop 1 grant amount;
- The 400 square miles of land in the Basin covered by the Inyo/Los Angeles Long-Term Water Agreement is considered to be adjudicated for the purposes of GSP preparation and is, therefore, exempt from the process;
- The vast majority of the existing data in the Basin (e.g., groundwater elevation, water quality, stream flows, vegetation mapping) is available in a digital format. This assumption is valid as most of these data are expected to be provided by LADWP, Inyo County, Mono County, BLM, tribes, CADFW, USFWS, and other entities;
- Ecosystem evaluations will largely be restricted to desktop analyses using databases available from entities, such as LADWP, DWR, Inyo and Mono counties, tribal groups, and the Nature Conservancy (TNC). The TNC guidance document on assessing Groundwater Dependent Ecosystems (GDEs) will be a centerpiece in the evaluation of surface water - groundwater interactions and surface water depletion due to groundwater extractions. The inclusion of extensive field ecosystem mapping is beyond the scope of the budget for this initial GSP;
- Legal counsel in support of the GSP development process will be provided by OVGA and/or Inyo County;
- The existing groundwater models will be found to be adequate for use in the evaluation of the influence of future project and management actions on basin sustainable yield. The scope and budget needed to merge the models, standardize the base periods, incorporate more recent groundwater data, and recalibrate have not been included in this proposal.

Proposed Schedule

TASKS	2018 Q3	2018 Q4	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3	2021 Q4	2022 Q1	2022 Q2
Authorization to Proceed	★															
Task 1 - Initial site visit		■														
Task 2 - Public engagement plan		■	■													
Task 3 - Data and document compilation, review, and management		■	■	■	■											
Task 4 - Develop interagency agreements			■	■												
Task 5 - GSP area and GSA information		■	■	■												
Task 6 - Basin setting		■	■	■												
Task 7 - Sustainable management criteria			■	■	■											
Task 8 - Progress report public meeting					■											
Task 9 - Develop/refine monitoring program					■	■										
Task 10 - Identify and describe projects and management actions to maintain or achieve sustainability						■	■	■								
Task 10a - Cost and rate study								■								
Task 10b - Assessment and reconciliation of groundwater models						■	■									
Task 10c - Coordination with Inyo/LA Water Agreement						■	■									
Task 10d - Coordination with stakeholders						■	■									
Task 10e - Improvements to monitoring network improvement						■	■									
Task 10f - Studies/plans on LADWP groundwater development at Owens Lake						■	■									
Task 10g - groundwater flow paths between Tri-Valley/Bishop-Laws regions						■	■									
Task 10h - Examination of hydrologic factors affecting shallow groundwater in West Bishop						■	■									
Task 10i - Recommendations for other studies						■	■									
Task 11 - Develop GSP implementation schedule and budget								■								
Task 12 - Develop system for annual reporting							■	■								
Task 13 - GSP compilation, presentation, and submittal								■	■	■	■					
Administrative draft GSP								■	■							
Prepare administrative draft GSP								■	■							
Stakeholder & OVGA review									■							
Draft GSP									■	■						
Prepare draft GSP									■							
Stakeholder & OVGA review										■						
Final GSP										■	■					
Prepare Final GSP											★					
OVGA adoption of GSP											■					
GSP submittal to DWR											▶					
Task 14 - Address deficiences and corrective actions, and resubmit															■	■
Task 15- Coordination meetings/calls	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

Budget Summary

Task		Description	Total Task Costs
1		Initial site visit	$19,565
2		Public engagement plan	$14,378
3		Data & document compilation, review, and management	$68,613
4		Develop interagency agreements	$25,920
5		GSP area and GSP information	$25,904
6		Basin setting	$154,356
	6a	*Hydrogeological conceptual model*	*$25,272*
	6b	*Establishment of groundwater management zones (GMZs)*	*$40,012*
	6c	*Water budget for each GMZ*	*$63,812*
7		Sustainable management criteria	$26,660
8		Progress report public meeting	$14,613
9		Develop/refine monitoring program	$25,322
10		Identify & describe projects...to meet sustainability	$158,129
	10a	*Cost and rate study*	*$22,000*
	10b	*Assessment and reconciliation of groundwater models*	*$28,480*
	10c	*Coordination with Inyo/LA Water Agreement*	*$21,032*
	10d	*Coordination to identify stakeholders*	
	10e	*Monitoring network improvement*	*$26,365*
	10f	*LADWP: groundwater development at Owens Lake*	*$5,168*
	10g	*Tri Valley/Owens Valley/ Fish Slough groundwater flow paths*	*$17,340*
	10h	*Examination of hydrologic factors affecting West Bishop*	*$25,960*
	10i	*Recommendations for other studies*	*$4,504*
11		Develop implementation budget & schedule	$7,520
12		Develop system for annual reporting	$11,280
13		Compilation, presentation, submittal of GSP	$111,550
14		Refine draft GSP and submit as the final GSP	$16,578
15		Coordination meetings between consultant and GSA staff	$30,540
16		Supplemental / Optional Tasks	
	16a	Analysis of the effects of climate change on the sustainable yield of the Basin	
	16b	Enhanced effort for GDEs	
	16c	Enhanced Stakeholder Outreach	
	16d	Rate adoption assistance	
	16e	Rate Study for GSP Preparation	
	16f	GSP Implementation Funding Plan	
		Total Costs for Required Tasks	**$710,928**

Detailed Budget

Task No. and Description	DBS&A													Stillwater Sciences					Consensus and Collaboration Program (CCP)							TEAM Engineering					Lechowicz & Tseng					
	Principal-in-Charge	Project Manager	Principal Prof I	Senior Prof II	Senior Prof I	Staff Prof II	Staff Prof II	Database Prof	Technical Editor	Total Labor Hours	Total Labor Dollars	ODCs	DBS&A Total Task Costs	Project Engineer	Project Staff	Total Labor Dollars	ODCs	Stillwater Total Task Costs	Facilitator	Lead Mediator/ Facilitator	Associate Facilitator	Admin	Total Labor Dollars	ODCs	Sac State Total Task Costs	Lead Engineer	Project Engineer	Total Labor Dollars	ODCs	TEAM Task Costs	Project Manager	Financial Analyst	Total Labor Dollars	ODCs	L&T Task Costs	Total Task Costs
	$250	$250	$220	$198	$185	$161	$130	$172	$122					$235	$180				$208	$163	$134	$92				$220	$130				$195	$195				
1 Initial site visit		18			18					36	$ 7,830	$800	$8,630						13	13	15	3	$7,109	$2,066	$9,175	8		$1,760		$1,760						$19,565
2 Public engagement plan		8		16			16			40	$ 7,248		$7,248						3	30	10	3	$7,130		$7,130											$14,378
3 Data & document compilation, review, and management		24	16	16	24	40		200		320	$ 57,968		$57,968	15	20	$7,125		$7,125								16		$3,520		$3,520						$68,613
4 Develop interagency agreements	12	60		40						112	$ 25,920		$25,920																						$25,920
5 GSP area and GSP information		16	40				80			136	$ 23,200		$23,200						5	8	2	1	$2,704		$2,704											$25,904
6 Basin setting	12	64	64	12	140	340	100			732	$129,096		$129,096	60	62	$25,260		$25,260																	$154,356
6a Hydrogeological conceptual model	*4*	*16*	*16*	*4*	*20*	*60*	*20*				$25,272		*$25,272*	*30*	*32*	*$12,810*																				*$25,272*
6b Establishment of groundwater management zones (GMZs)	*4*	*24*	*16*	*4*	*40*	*100*	*40*				$40,012		*$40,012*																							*$40,012*
6c Water budget for each GMZ	*4*	*24*	*32*	*4*	*80*	*180*	*40*				$63,812		*$63,812*	*30*	*30*	*$12,450*																				*$63,812*
7 Sustainable management criteria	4	40	20	20			20			104	$ 21,960		$21,960	20		$4,700		$4,700																		$26,660
8 Progress report public meeting		18								18	$ 4,500	$800	$5,300						4	21	35	4	$9,313		$9,313											$14,613
9 Develop/refine monitoring program		20		24			80			124	$ 20,152		$20,152	22		$5,170		$5,170																		$25,322
10 Identify & describe projects...to meet sustainability	4	104	92	60	288		48			596	$118,640		$118,640	20		$4,700		$4,700	$31	$45	$19	$5	$16,789		$16,789						52	28	$15,600	$2,400	$18,000	$158,129
10a Cost and rate study		*16*									$4,000		*$4,000*																							*$4,000*
10b Assessment and reconciliation of groundwater models		*4*	*24*		*120*						$28,480		*$28,480*																							*$28,480*
10c Coordination with Inyo/LA Water Agreement	*4*	*40*	*24*	*24*							$21,032		*$21,032*																							*$21,032*
10d Coordination to identify stakeholders		*8*	*24*								$7,280		*$7,280*																							
10e Monitoring network improvement		*8*		*12*			*40*				$9,576		*$9,576*						*31*	*45*	*19*	*5*	*$16,789*		*$16,789*											*$26,365*
10f LADWP: groundwater development at Owens Lake		*8*		*16*							$5,168		*$5,168*																							*$5,168*
10g Tri Valley/Owens Valley/ Fish Slough groundwater flow paths		*8*	*8*		*48*						$12,640		*$12,640*	*20*		*$4,700*		*$4,700*																		*$17,340*
10h Examination of hydrologic factors affecting West Bishop		*8*	*8*		*120*						$25,960		*$25,960*																							*$25,960*
10i Recommendations for other studies		*4*	*4*	*8*			*8*				$4,504		*$4,504*																							*$4,504*
11 Develop implementation budget & schedule		16	16							32	$ 7,520		$7,520																							$7,520
12 Develop system for annual reporting		24	24							48	$ 11,280		$11,280																							$11,280
13 Compilation, presentation, submittal of GSP	8	40	40	40	40	160	160		40	528	$ 87,560		$87,560	34	40	$15,190		$15,190								40		$8,800		$8,800						$111,550
14 Refine draft GSP and submit as the final GSP	4	16	16	12					16	64	$ 12,848		$12,848	6	8	$2,850		$2,850								4		$880		$880						$16,578
15 Coordination meetings between consultant and GSA staff		48								48	$ 12,000		$12,000	24	16	$8,520		$8,520	3	8	10	16	$4,740		$4,740	24		$5,280		$5,280						$30,540
16 Supplemental / Optional Tasks																																				
16a Analysis effects of climate change on sustainable yield																																				
16b Enhanced effort for GDEs																																				
16c Enhanced Stakeholder Outreach																																				
16d Rate adoption assistance																																				
16e Rate Study for GSP Preparation																																				
16f GSP Implementation Funding Plan																																				
Total Costs for Required Tasks	**44**	**516**	**328**	**240**	**510**	**540**	**504**	**200**	**56**	**2938**	**$547,722**	**$1,600**	**$549,322**	**201**	**146**	**$73,515**		**$73,515**	**59**	**125**	**91**	**32**	**$47,785**	**$2,066**	**$49,851**	**92**		**$20,240**		**$20,240**	**52**	**28**	**$15,600**	**$2,400**	**$18,000**	**$710,928**

TASK 1. INITIAL SITE VISIT

The DBS&A team will conduct an initial site visit that will include meetings with OVGA members and a public meeting. These meetings are envisioned to be publically noticed events that will be organized and conducted to be compliant with the Ralph M. Brown Act (Brown Act - Government Code §54950). As such, these meeting agendas will be publically noticed with formal minutes created to memorialize the actions of the OVGA members. The public notices will posted using social media (e.g., an OVGA Facebook page), the OVGA and member entities' websites, and local newspapers. The DBS&A team will orient the OVGA regarding GSP requirements, GSP goals and objectives, GSP development timeline, and outline for the GSP document.

The OVGA has an important role in the development of the GSP. It must establish, with the assistance of the DBS&A team and input from stakeholders, the sustainability goals for the Basin. Our team will take those sustainability goals as guidance in defining the technical criteria, such as minimum thresholds and measurable objectives that will establish the operational framework for the GSP. An important message to the OVGA at the initial meeting will be to clarify the policy input needed from the OVGA and the timing of that input.

Stakeholder engagement is a fundamental part of the GSP development process. An initial stakeholder meeting to discuss GSP requirements, GSP goals and objectives, GSP development timeline, and GSP outline will help orient stakeholders to their roles in the process. Additional stakeholder information meetings or workshops are envisioned during the GSP development process (See Task 2-Public Engagement Plan and Task 8-Progress Report Pubic Meeting).

The DBS&A team will visit sites in the field as deemed necessary. The goals of the initial site visit will be to foster a common vision among the OVGA Members, the DBS&A team, and stakeholders of 1) the GSP development process, and 2) the role each group plays in the success of that process. A site visit summary will be prepared for each event.

Deliverables:

- Meeting Agenda
- PowerPoint Presentation
- Meeting Notes
- Site Visit Summary

TASK 2. PUBLIC ENGAGEMENT PLAN

As part of our team, CCP will take the lead role to support the OVGA and develop the Public Engagement Plan. The Engagement Plan offers a valuable early benefit to the OVGA in that it is a functional tool that will inform early stage GSP outreach activities, and it is a product that should be included in the GSP submission as proof of compliance with required GSP regulations. CCP has previously worked with DWR to prepare the standard recommendations for such plans statewide. Further, CCP has prepared and/or is in the process of preparing, SGMA public engagement plans (and similar) for the following basins and GSAs:

- Borrego Valley
- Colusa Groundwater Authority
- Glenn Groundwater Authority
- Vina Subbasin
- Wyandotte Creek Subbasin
- Madera Subbasin
- Chowchilla Subbasin
- Turlock Subbasin
- Santa Margarita Groundwater Agency
- Shasta Valley Basin
- Butte Valley Basin
- Scott Valley Basin

Capitalizing on their embedded experience supporting the creation of the OVGA, and their work preparing engagement plans with the 12 basins and GSAs above, CCP will perform the following.

Work with the OVGA to review and potentially update the list of stakeholders, groups, and organizations to engage though the GSP development process. CCP will work with the OVGA to define key and consistent messaging about the SGMA process. As per § 354.10 of the GSA Regulations, the Engagement Plan will include at a minimum, the following information:

- A description of the beneficial uses and users in the Basin, including the land uses and property interests potentially affected by the use of groundwater in the Basin, the types of parties representing those interests, and the nature of consultation with those parties.
- A description of the Agency's decision-making process.
- Opportunities for public engagement and a discussion of how public input and response will be used by the OVGA.
- A description of how the OVGA encourages the active involvement of diverse social, cultural, and economic elements of the population within the Basin.

"Aside from his professional expertise and experience, Tony brings to the table an inherent ability to analyze, successfully communicate and collaborate on complicated water issues with directors, staff, regulators and the public. He speaks directly and honestly to issues. I have on several occasions personally witnessed Tony address a room full of people who were, to put it politely, not receptive to his remarks, yet by the end of these meetings all present had respect for his integrity, character and unfailing courtesy."

~Anthony H. Trembley, Attorney

In addition to these required elements, a section in the Plan that sets the stage to describe methods the OVGA will use to inform the public about GSP implementation progress is also recommended since this item will eventually be required per the regulations anyway. In addition to the required elements, we find that there is significant "value-added" for the OVGA to include the following in the Engagement Plan.

- OVGA key messaging about SGMA.
- A summary of Brown Act requirements to inform staff and consultants of such information, ensure that engagement activities are compliant and ensure that the OVGA is least likely to be subject to legal challenges of the GSP based on procedural deficiencies.
- A summary of venues for stakeholder engagement including points of contact, room options and requirements, and similar.
- A schedule of notices to stakeholders (i.e., a web-based messaging calendar).
- Media outlets, publication dates, and points of contact
- Proposed meeting schedule and workforce projections to implement the Engagement Plan.
- Potential annual budgets for outreach and engagement.
- A summary of the process for reporting communication and engagement highlights to the OVGA Board and other associated groups.

The benefit of these additional items is that they require limited additional costs to present and include; yet, with this information, the Engagement Plan becomes a tool that goes beyond meeting state requirements and provides a functional, operational tool that legitimately informs the OVGA's work.

This task will likely include meetings with the OVGA and/or a dedicated work group assigned to oversee outreach to define and agree on items proposed above, to coordinate with GSA staff to identify venues and engagement resources, and to confirm the messaging calendar. This task also includes time for our team to present the Engagement Plan to the OVGA Board and/or workgroup.

Regarding "outreach approach" of the OVGA and as an overarching recommendation related to many of the following tasks, we believe the following is important. The GSP regulations create a "higher bar" than other environmental compliance laws and regulations, which in concert with §10720.3 and §10723.2 of the statue, creates significant expectations by the SWRCB and DWR for GSAs to achieve regarding stakeholder outreach and engagement. These expectations should lead all GSAs to create abundant opportunities for public input, but this process must be carefully managed to achieve beneficial outcomes and avoid or minimize unintended consequences. Public meetings should happen when there is a compelling and milestone-based reason to hold one. Meetings for the sake of meetings are inefficient and burdensome to beneficial users, staff, and consultants. They create, rather than reduce, stakeholder fatigue and project costs. Further, public engagement under SGMA should create opportunities for the OVGA to investigate and understand the impacts of their future decisions, rather than just deliver technical information. This is the essence of what §354.10 requires and what the OVGA Board should be focused on.

Deliverables:

- Draft Public Engagement Plan
- Final Public Engagement Plan

"By all accounts, the SCSC members are happy with the study and have been distributing it to their stakeholders. On behalf of both SCSC and NWRI, I'd like to thank you for all the work you [Dr. LeClaire] and Hannah did. You both navigated the management challenges with grace and we appreciate your professionalism and attention to detail."

~ Suzanne Sharkey
National Water Research Institute

TASK 3. DATA AND DOCUMENT COMPILATION, REVIEW, AND MANAGEMENT

DBS&A has assembled a database management task team that has the ideal combination of web development, data management and GIS experience, along with water resources planning and hydrogeology background, to support the design, development, and implementation of an OVGA data repository and management system. DBS&A has previously and successfully performed all aspects of the scope of services identified in this aspect of our proposal. For example, DBS&A completed an on-line well registration database for the Northern Trinity Groundwater Conservation District in Texas that is similar in both scope and size to the system under consideration by OVGA. This .NET, MS SQL Server-based system contains forms for users to submit water well applications, upload documents, track application status, submit e-payment for required fees, and view detailed well information.

Communication is critical to successful database design and construction. The DBS&A team will work collaboratively with OVGA and the member agencies and stakeholders, as appropriate, to identify the intended uses (e.g., technical analyses, public information) and users (e.g., general public, researchers, regulatory agencies) of the data and select a data management structure that best meets the needs of the expected users and how they will likely interact with the data. At the beginning of the project, DBS&A will meet with OVGA to review the existing and historical data and develop the short- and long-term goals of the system. This kickoff meeting, as well as any other coordination meetings that may be held throughout the project, will form the foundation for the system design. The kickoff meeting will confirm project objectives, clarify OVGA and DBS&A expectations for the project, and facilitate project planning.

The range of information types to be included in the database will be considered as the data management system is developed. Information to be captured in the database could range from the routine parameters such depth to groundwater, groundwater elevation, water quality analyses, surface water flow, and

precipitation, to more hybrid data sets, such as GIS layers for vegetation type and current and historic land use. We expect the data management scheme to evolve as we collect information on existing sources of data relevant to SGMA and engage in discussions with OVGA member agency representatives and appropriate stakeholders.

Our team will inventory documents and gather data from multiple parties which could include: Tri-Valley Groundwater Management District, Wheeler Community Services District (CSD), Mono County, California Department of Fish and Wildlife (CDFW) (Fish Slough), City of Bishop, Bishop Paiute Tribe Environmental Management Office, Inyo County Water Department, Eastern Sierra CSD, Southern California Edison (Bishop Creek), USGS, BLM, Big Pine Paiute Tribe Environmental Management Office, Inyo County GIS Department, Big Pine CSD, Fort Independence Indian Reservation, Independence Water System, Lone Pine Water System, Lone Pine Paiute Shoshone Tribe, Cartago Mutual Water Company, CG Roxane, and LADWP. Our efforts will be focused on meeting the minimum criteria of Reg 352.4 and 352.6.

DBS&A will also identify existing data that can be accessed and imported from LADWP, state (including GeoTracker), and federal databases. Based on the data needs and existing available data, the DBS&A team will identify data gaps and propose the needed level of detail required to fill the data gaps. The DBS&A team will also, in consultation with OVGA, provide recommendations for securing missing information and data through a streamlined process using standardized data collection templates, as applicable. We anticipate that OVGA, stakeholder agencies, the USGS, the California Statewide Groundwater Elevation Monitoring (CASGEM), LADWP, and other appropriate federal and state agencies will identify data sets and provide data upon request.

DBS&A will consult with the OVGA to determine user requirements for storing, viewing, analyzing, and reporting data relevant to SGMA. Based on the OVGA needs, and consideration of project budget limitations, we will propose a database management system (DBMS) that leverages previous data management systems we have developed and make recommendations for an appropriate data management platform. Through leveraging pre-existing DBMSs we have already developed, we can limit the need for custom programing and **provide significant cost benefit to the OVGA.** The team will also recommend an approach for populating the selected DBMS with existing data.

DBS&A has incorporated many types of hydrogeologic data and historical well data into SQL databases for many of our projects, including Texas Water Development Board groundwater database and water use data, Texas Commission on Environmental Quality water supply data, and the Texas Railroad Commission oil and gas well location and completion information. DBS&A has successfully completed the GIS/database portions of groundwater availability models, geologic structure projects, and an assortment of database projects for public and private clients. We routinely integrate hydrogeologic and well data within ArcGIS-based applications and develop custom forms for data users to easily and efficiently import and link newly added data to our information management systems. Two live examples of current DBS&A projects online are located at:

https://www.utlands.org/gmp/waterwellsearch.aspx

http://waterwellmanagementdemo.dbstephens.com

Deliverables:

- Fully functional DBMS

TASK 4. DEVELOP INTERAGENCY AGREEMENTS

It is recognized that multiple agencies/entities are engaged in the management of groundwater within the Basin and that the effects of water resource management operations under the purview of other agencies can impact the achievement of the sustainability goals. Our team will work with the various agencies in the Basin to prepare interagency agreements that prescribe how the agencies intend to work together, and to ensure that separate agency actions are not detrimental to achieving Basin sustainability. These agreements must also take into consideration how the GSP can be cooperatively structured to be sensitive to the basin management priorities and goals of each entity. The agreements will address topics such as data sharing, stakeholder outreach efforts, and management team coordination. Our proposed Project Manager, Mr. Morgan, has considerable experience with development of interagency agreements and working with multiple agencies to achieve consensus on how these agreements should be structured.

Deliverables:

- Written agreements between the GSA and applicable agencies. The agreements will be documented in the description of jurisdictional setting within the Basin.

"I assure you that as a public official, you will be able to rely not only upon Tony's expertise, experience and superior communication skills, but also to know that-every day-he will act with the utmost integrity and professionalism...."
~Law Office of Anthony H. Trembley

TASK 5. GSP AREA AND GSA INFORMATION

The DBS&A team will compile the information required by the regulations, as well as that appropriate to facilitate the efficient development of the GSP, to identify the required GSA information, and the GSP area. This information will include:

- GSA governance (Reg. § 354.6);
- Mapped delineations of the GSP area (Reg. § 354.8);
- Identification of existing water resources monitoring and management programs (Reg. § 354.8 c,d,e);
- Additional GSP elements (Reg. § 354.8 g) (e.g., land use) important to management of the resource;
- Identification of stakeholders and beneficial users or uses of groundwater;
- Stakeholder/beneficial user outreach via various communication venues (Reg. § 354.10).

Deliverables:

- Draft GSP chapter describing GSP area and information (Reg. 358.4)
- Final GSP chapter describing GSP area and information (Reg. 358.4)

TASK 6. BASIN SETTING

The combined service areas of the OVGA member agencies completely overlie the OVGB, identified, defined, and mapped as Basin No. 6-12 in the DWR Bulletin 118, Update 2016 (Bulletin 118). The Basin is located within Inyo and Mono Counties.

A significant number of existing studies contribute to the current understanding of the Basin, and DBS&A will rely on these studies to a great extent in developing the Basin Setting sections of the GSP. Many of the existing studies that will be used to develop the Basin Setting section have been consulted and are referenced in this proposal. Based on our review of the existing information, critical data gaps will be identified and suggested data acquisition plans may be presented to the OVGA for inclusion in the GSP. DBS&A understands

that all GSP-proposed activities and actions must be discussed and approved by the OVGA before becoming formal recommendations. Regardless, any significant data gaps in the Basin Setting analyses will be noted.

The Basin Setting section of the GSP will be divided into four primary subsections as identified in the RFP and outlined below. These sections are the hydrogeologic conceptual model, current and historical groundwater conditions, the Basin water budget and the establishment of groundwater management areas.

Hydrogeologic Conceptual Model

Harrington (2016b) provides a report of the hydrogeologic conceptual model of the Basin that relies on information from a variety of sources, including the USGS, LADWP, Inyo and Mono Counties, the CDFW, and the DWR. DBS&A will use this report as the core of the hydrogeologic conceptual model. Since it is a recent study, we do not anticipate a significant number of new studies or datasets that have become available since the publication of the Harrington (2016b). For example, Harrington (2016b) relied in part on MWH (2011), who developed a preliminary conceptual model of groundwater beneath Owens Lake and vicinity based on the voluminous body of work conducted on or around the Lake in the last century. As a result of the preliminary study, data gaps were identified, additional monitoring wells were constructed, aquifer testing was conducted, and water quality samples collected and analyzed. The additional work supported development of an updated conceptual model (MWH, 2013).

DBS&A understands that development of a credible hydrogeologic conceptual model is the first step to understanding and conveying the GSP basin setting in the GSP process. The hydrogeologic conceptual model also provides the foundation upon which other GSP tasks will be based, such as the development of GSP monitoring networks and development of a Basin water budget. DBS&A will articulate the Basin hydrogeologic conceptual model in a manner consistent with DWR's BMP for development of a Hydrogeologic Conceptual Model (DWR, 2016).

The BMP guidance states that a hydrogeologic conceptual model:

- Provides an understanding of the general physical characteristics related to regional hydrology, land use, geology and geologic structure, water quality, principal aquifers, and *principal aquitards* of the *basin setting;*
- Provides the context to develop water budgets, mathematical (analytical or numerical) models, and monitoring networks; and
- Provides a tool for stakeholder outreach and communication.

Basin boundaries will be identified as presented in DWR's Bulletin 118, Basin 6-12. The Basin is a long, narrow, northerly trending area of 1,037 square miles located in the western part of Inyo County and in the southeastern corner of Mono County, within the Owens River Drainage Basin (DWR, 1964). The main towns in the area of the Basin are Lone Pine, Independence, Big Pine, and Bishop. As discussed in Bulletin 118, the Basin underlies Benton, Hammil, and Chalfont Valleys, and Fish Slough in Mono County; it also underlies Round and Owens Valleys in Inyo County. The Basin is bounded by nonwater-bearing rocks of the Benton Range on the north, of the Coso Range on the southeast, of the Sierra Nevada on the west, and of the White and Inyo Mountains on the east (Jennings 1958; DWR 1964; Matthews and Burnett 1965; Strand 1967; Danskin 1998). This system of valleys is drained by several creeks to the Owens River, which flows southward into the Owens (dry) Lake, a closed drainage depression in the southern part of the Owens Valley. At the southern end of the Basin, the boundary is defined by the topographic high between Owens Valley and Rose Valley, at the location of Haiwee Reservoir, where most studies have concluded that groundwater flow from Owens Valley to Rose Valley is small (MWH, 2011 and 2012; Danskin 1998 and DBS&A, 2011).

As summarized in Harrington (2016b) and the reports referenced therein, some key elements of the Basin hydrogeologic conceptual model are as follows:

- Aquifer materials consist of unconsolidated and poorly consolidated alluvial, fluvial, lacustrine sediments, and volcanic rocks collectively referred to as valley fill.
- Lateral boundaries of the Basin are formed the surface contact between the valley fill and the surrounding bedrock.
- Beneath the valley fill is low-permeability bedrock consisting of pre-Cenozoic granitic and metamorphic rock. The low-permeability basement rock consists of fault bounded blocks at varying depths, and is not a single down-dropped block, but a series of basins separated by relatively shallow bedrock divides.

Utilizing historical studies and available reports of information and data developed by the USGS, Inyo County, LADWP and others, DBS&A will present surface geology maps, geologic cross sections, and text descriptions to articulate the distribution, extent, and characteristics of the geologic materials present in the Basin along with the location and nature of significant structural features such as faults and bedrock outcrops that influence groundwater flow in the Basin. As appropriate and useful to the articulation and conveyance of the hydrogeologic conceptual model, the cross-sections and maps will include the principal aquifer and aquitard units, and related information as needed, such as the static water level of each aquifer, well screened intervals, and the total depth of the boring or well logs. Maps will be also be provided that illustrate major surface water features, points of diversion, relevant soil characteristics, and groundwater recharge and discharge areas.

DBS&A has an experienced GIS staff with advanced capabilities in cartography and relational databases. DBS&A has a well-established history of working with clients to provide graphical and tabular illustrations that convey critical technical information to diverse stakeholder groups.

Land Use

Land use within the Basin watershed includes high-slope mountain foothills of the Sierra, White, and Coso Mountain ranges with little-to-no development, agricultural areas, and the moderately urban developments within the towns of Lone Pine, Independence, Big Pine, and Bishop.

Based on economic value, the major agriculture in the Inyo County portion of the Basin includes cattle grazing and alfalfa along with other miscellaneous crops such as garlic, grain hay, sudangrass, and other hay crops (Counties of Inyo and Mono, 2017). DBS&A will also factor in the relatively small portion of Mono County that is a part of the Basin when considering the impact of land use on the hydrogeologic conceptual model and the GSP. DBS&A will map land uses and ownership (e.g., federal, state, LADWP, private) based on information from sources such as the Inyo County Water Department, the Inyo and Mono Counties Agricultural Commissioner's Office, the Owens Valley Land Management Plan (LADWP and Ecosystems Sciences, 2010), DWR, USDA, the Inyo and Mono County Planning Departments, and other appropriate sources.

Current and Historic Groundwater Conditions

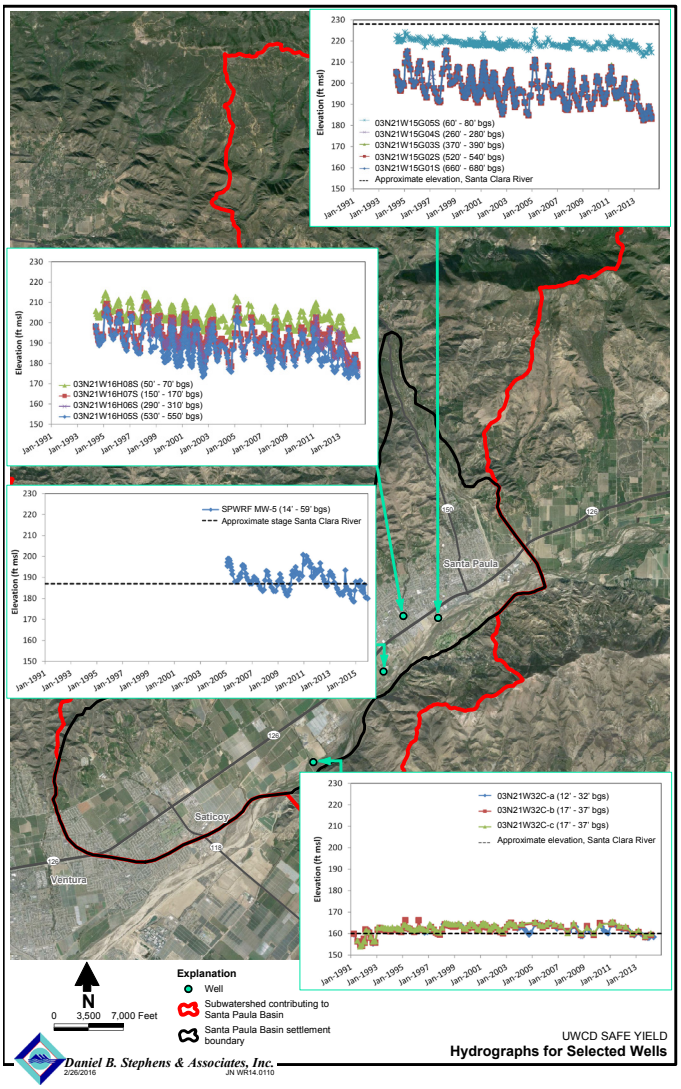
DBS&A will use data compiled under Task 3 to evaluate current and historical groundwater conditions for the primary aquifer units. The data compiled under this task will provide the basis for the evaluation of undesirable results in Task 7 Groundwater Sustainability Criteria, including documentation of historical and current groundwater occurrence and flow, groundwater levels, groundwater in storage, land subsidence (the USGS does not currently report the occurrence of subsidence in Owens Valley), interconnection with surface water, and groundwater quality.

Harrington (2016b) has conceptualized the aquifer system into a shallow unconfined zone and a deeper confined or semi-confined zone separated by a confining unit. He states that this three-layer conceptual model was used in numerical groundwater flow models for Owens Valley (Danskin, 1998) and the Bishop-Laws area (Harrington, 2007). Beneath the Owens Lake area, MWH (2012) identified five aquifer units. MWH (2012) also reported on the installation of zone-specific screened intervals in new monitoring wells in these aquifer units which allowed for discrete-depth monitoring of groundwater elevations in the identified aquifer zones. Static water levels recorded at these monitoring points indicate the presence of strong

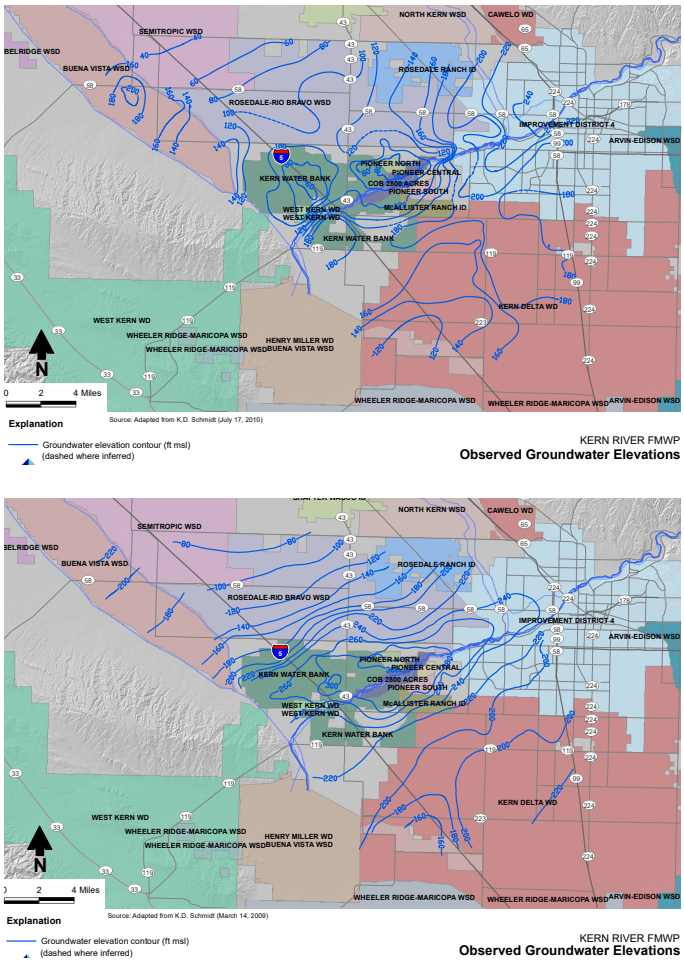
artesian conditions coupled with upward vertical gradients. Groundwater levels for the Tri-Valley area are reported in TEAM (2006). These data indicate relatively steady water levels in Benton Valley and declining water levels in the Hammil Valley, Chalfant Valley, and Fish Slough areas.

DBS&A will create tables and graphical depictions of current and historical conditions for the aquifer units identified by previous studies. To the extent supported by the data acquired under Task 3, DBS&A will present tables and graphs grouped by groundwater management area and aquifer unit. Temporal water-level trends will be illustrated by presenting hydrograph data for key wells selected to represent, at a minimum, each management area/aquifer unit. Where sufficient data is available, seasonal water level trends due to groundwater pumping and recharge will also be considered and presented.

Spatial trends will be represented by groundwater contour maps presented for each aquifer/management unit. Where shallow groundwater is a concern, the depth to groundwater, for historical and current conditions will be plotted as isocontours.



Temporal water-level trends will be illustrated by presenting hydrograph data for key wells selected to represent



Example groundwater contour maps for springtime (top) and fall (bottom)

DBS&A will characterize the physical components and interaction of the surface water and groundwater systems in the Basin. This will include an inventory of the surface water resources focusing on surface water bodies significant to the management of the Basin. In addition to information acquired from Inyo County and previous technical studies, surface water mapping data will be downloaded from the National Hydrography Datasets. Interaction of the surface water and groundwater systems in the Basin will also be considered as a component of the water balance analysis (Task 6.3) and in the evaluation of the effects of groundwater management on GDEs.

Processes that affect Basin water quality vary widely and are dependent upon a range of interacting factors such as natural geology and local aquifer conditions, human activities related to land use, and well construction and operation. DBS&A will provide a narrative description and graphical representation of the Basin groundwater and surface water quality. Groundwater quality will be evaluated and presented for individual aquifer units by depth, and for discrete surface water bodies, based on available data. Water quality data (e.g., total dissolved solids, nitrate, major cations/anions with other analytes, as appropriate) and information will be presented in tabular and in graphical format, as appropriate and needed. Graphical methods such as piper and stiff diagrams and time-concentration trend plots for key representative wells and surface water sources will be used as appropriate to convey information on spatial and temporal Basin water quality trends.

Exported Water

Water that is exported from the Basin will be inventoried, mapped as appropriate, and presented in tabular form considering spatial and temporal trends. Exported water will be included as a component of the water budget analysis (Task 6.3). DBS&A will acquire Basin water import/export data from Inyo County, LADWP, DWR, and the other Basin stakeholder agencies as appropriate and available.

Groundwater Dependent Ecosystems

The project team will review and summarize the general distribution and condition of GDEs in the Basin. The first step in our team's approach involves the background data collected and reviewed under Task 3 and the mapping of known and potential GDEs based on the DWR spatial database (i.e., natural communities commonly associated with groundwater) and available sources. A literature/data review and GIS-based assessment of the current ecological conditions in the GSP Area (i.e, the portion of the Basin not covered by the Inyo/Los Angeles Long-Term Water Agreement) within watercourses, riparian corridors, and other GDEs (e.g., wetlands) will be performed.

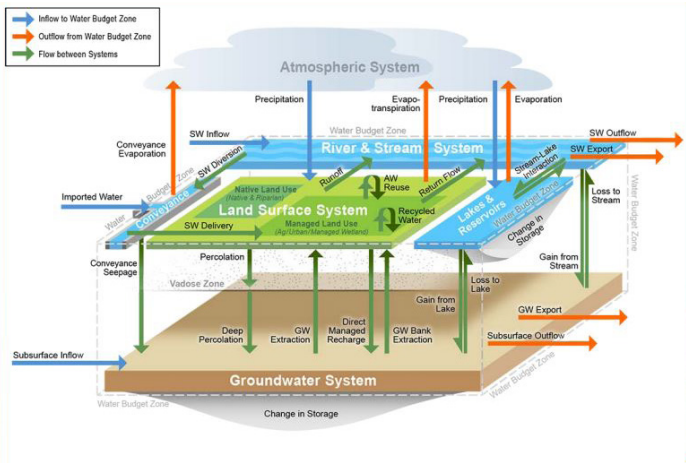
The mapping effort will follow the general approach described by DWR (2018), Rohde et al. (2018), Klausmeyer et al. (2018), and the most relevant scientific literature on integrated groundwater management and identification and assessment of GDEs (e.g., Eamus et al. 2015) to produce a science-based assessment of GDEs that meets the GSP requirements under SGMA. The GDE assessment will also include a review of available information and discussion of species of special concern associated with known or potential GDEs (e.g., Owens pupfish, Owens speckled dace, Owens tui chub, Owens sucker, Owens Valley vole, southwestern willow flycatcher, and endemic springsnails). In addition, the effects of potential changes in future groundwater/surface water interactions on GDEs will be evaluated to determine the range of potential threats and impacts to GDEs within the GSP Area.

Given the project budget constraints, we propose that this assessment of GDEs be office-based and no field work will be conducted. The final GIS dataset will include 1) reasons for including or excluding natural communities mapped in the DWR database, and 2) an indication of the uncertainty in the decision for each polygon (e.g., known GDE, likely GDE, unlikely GDE, non-GDE). Should additional funding become available, we recommend that a follow-up, enhanced effort including field-based study be used to refine the GDE mapping and characterization to reduce uncertainty regarding which natural communities

represent GDEs covered by SGMA, and what the most appropriate GDE-related sustainability criteria, monitoring, and management projects and actions would be (see Task 16).

Basin Water Budget

Water budgets for the Basin constitute an important basis for overdraft susceptibility and sustainable groundwater management assessment. We propose to calculate water budgets based on DWR-accepted sources and standard hydrogeologic practices. We understand that the OVGA objective is to rely, to the extent practical, on existing hydrogeologic studies to inform water budget development (Harrington, 2016b). Water budgets developed by DBS&A will be consistent with DWR's water budget BMPs.



Harrington (2016b) provides the current state of knowledge of the Basin water budget. He states that the water budget for the Owens Valley is well understood because of the extensive surface water and groundwater monitoring facilities of LADWP (Harrington, 2016b). The water budget for the Owens Lake portion of the Basin is also well understood from monitoring conducted by the LADWP and the Great Basin Air Pollution Control District. The most comprehensive water budget for the Owens Lake groundwater system was recently completed by others for LADWP (MWH, 2011; Harrington, 2016b). The Tri-Valley region's water budget is the least well understood in the Basin. A number of water budget analyses have been prepared, including information in Danskin's (1998) modeling study, Jackson (1993), MHA et al. (2001), and TEAM (2006) as cited by Harrington (2016b), but each of these studies has been limited by sparse hydrologic data in the Tri-Valley region. In the Tri-Valley region, recharge from stream channel infiltration is not well known because only 1 of the 15 streams on the west slope of the White Mountains is gauged; however, it is believed that stream channels are the predominant source of recharge (Harrington, 2016b). Harrington (2016b) presented a compiled water budget based on water budgets for the Tri-Valley region, the Owens Valley area, and the Owens Lake area.

Where water budgets have not been adequately developed as part of prior studies, water budget component estimates will be based on the best available information incorporating assumptions and methodologies discussed and vetted with the OVGA. Even where water budgets have been developed, it may be necessary to develop a water budget using an appropriate base period that can be agreed to by the OVGA stakeholders.

Within each Groundwater Management Area (Task 6.4), water budgets will be estimated based on the following equation. Groundwater inputs may include deep percolation of precipitation (Pp), deep percolation of irrigation (Pi), lateral groundwater inflow (GWi), deep percolation from wastewater treatment plants (WWTP), deep percolation beneath stream and river channels (Ri), artificial recharge (AR), recharge from septic systems (Se), and recharge from underground water infrastructure (I). Groundwater outputs may include groundwater extraction (E), riparian evapotranspiration (ET), lateral groundwater outflow (GW_o), and groundwater discharge to streams and wetlands (D).

Using these water budget components, the groundwater balance is given by the equation:

$$\Delta S = [Pp + Pi + GWi + WWTP + Ri + AR + Se + I] - [E + ET + GW_o + D]$$

where ΔS = the change in groundwater storage

When ΔS is equal to zero, groundwater inputs are equivalent to groundwater outputs and the management of groundwater is sustainable. DBS&A

recognizes that this theoretical approach must be tempered in light of the time frame considered, actual measurements on the ground, changes in the basis of water budget component estimation (e.g., changing land use), anticipated future changes in the water budget, the potential for climate change and/or drought cycles, and input from the OVGA.

Groundwater balance component magnitudes will be estimated based on available data and using standard methods for each management area (see Task 6.4 below). Water budget information from the management areas will be combined to develop a Basin-wide water budget.

As part of the water budget task, DBS&A proposes to develop an updated estimate of recharge for the Tri-Valley portion of the Basin using the same methodology we recently applied to estimate groundwater recharge for Rose Valley (DBS&A, 2011). The Tri-Valley area is proposed for this analysis because recharge estimates are more uncertain relative to the southern portions of the Basin due to the lack of observed data. In addition, an improved estimate of recharge in the Tri-Valley area will assist with Task 10g, Determination of Groundwater Flow Paths and Rates Between the Tri-Valley Region and the Bishop-Laws Region. We propose to conduct the updated recharge assessment using the Distributed Parameter Watershed Model, or DPWM.

Application of the DPWM allows for quantitative estimates based on site-specific climatological, geologic, soils, land use, and vegetation factors. Many of these factors have been mapped by the USGS and other agencies, and the relevant information can be downloaded as readily useable GIS coverages. DBS&A developed DPWM based on the MASSIF model developed by Sandia National Laboratories (2007). The DPWM is similar in concept to watershed models used by the USGS (e.g., INFIL [Hevesi et al., 2003]). The model relies on the widely-accepted United Nations FAO-56 procedure for computing actual evapotranspiration (AET) from the reference evapotranspiration (ETo) estimated using the Penman-Monteith method (Allen et al., 1998, 2005). Water budget components accounted for in the model include precipitation, irrigation, bare soil evaporation, transpiration, runoff, run-on, soil water storage, and deep percolation (recharge). Complete documentation of the DPWM is available, and the model software and input and output files are freely available to the public from DBS&A upon request. We recently applied our DPWM to the Inyo County Rose Valley in order to quantify recharge in support of updating the Rose Valley groundwater model used for evaluating a conditional use permit to extract groundwater.

The DBS&A team has previously developed detailed surface water and groundwater budgets for numerous basins in California, including the Ojai, Santa Paula, Ventura River, Oxnard Plain, Pleasant Valley, East Las Posas, and West Las Posas Basins. The water budgets for the latter four basins were developed in support of developing what will likely be the first GSPs submitted to the DWR under SGMA. For one client, DBS&A has maintained a water budget accounting utilizing a FAO56-based spreadsheet model (Allen et al., 1998) and monitoring for over 15 years as part of an institutional water sustainability program. Through this prior experience we are familiar with available data sources and studies. Water budget components will be based on calculations in existing reports, including those published by the reports listed in the reference and other relevant local groundwater management plans, studies, and reports. A comprehensive list of data sources, methodologies used, and detailed calculations for all water budget components will be provided in an appendix to the report submittal. Published calculations will be reviewed for methodology appropriateness and checked for accuracy prior to use in the GSP. Data gaps in the calculations will be noted.

Consistent with DWR's SGMA BMP for a water budget, DBS&A will develop and assess current, historical, and projected future water budgets for the Basin. Also consistent with the BMP, the GSP water budget will be quantified in sufficient detail to build OVGA's understanding of how historical changes to supply, demand, hydrology, population, land use, and climatic conditions have affected the six SGMA sustainability indicators in the Basin. The ultimate aim is to use this information to predict how these same variables may affect or guide future management actions to achieve

and maintain sustainability. As explained in DWR's SGMA Water Budget BMP, examples of uses for the water budget are:

- Account for spatial and temporal distribution of basin inflows and outflows by water source type and water use sector.
- Assess how the water budget component vary by water year type (e.g., dry, normal, wet).
- Develop an understanding of how historical water budget component conditions have impacted the ability to operate the basin within the sustainable yield.
- Improve communication between and within OVGA member agencies and stakeholders.
- Identify data gaps and uncertainty critical to future basin water management actions.
- Identify water budget conditions that can commonly result in overdraft conditions.
- Evaluate the effect of proposed projects and management actions on future water budget projections.
- Inform GSP monitoring requirements.
- Inform development and quantification of sustainable management criteria.
- Help identify and evaluate potential projects and management actions to achieve the sustainability goal for the basin within 20 years of GSP implementation.

DBS&A will work with the OVGA to identify an appropriate base period. If the historical data set is sufficiently robust, a base period will be selected in consultation with the OVGA, and a statistical representation of the amount of total recharge water that can be expected in a "dry" year (represented by the 25th percentile of water years), in an "average" year (represented by the 50th percentile of water years), and in a "wet" year (represented by the 75th percentile of water years) will be presented.

Using the selected methodology and available data, DBS&A will prepare historical and current water budgets for the identified groundwater management areas and for the overall Basin. DBS&A will report the results of the water budget, along with the methodologies utilized, data incorporated into the evaluation, and assumptions that underlie water budget component estimates. A draft water budget will be delivered to the OVGA for comment. Based on receipt of one set of consolidated written comments from the OVGA member agencies and stakeholders, DBS&A will address the comments and produce a final water balance report.

Establishment of Groundwater Management Areas

This task will define the groundwater management areas for use in the GSP. The rationale for establishing groundwater management areas can be scientific or jurisdictional. Prudent delineation of groundwater management areas can be an important tool in achieving sustainability, while providing for flexibility in the beneficial use of groundwater resources. Based on the Basin conditions and local water budgets, areas with similar hydrogeologic conditions and/or management goals may be grouped into groundwater management areas with a unique set of sustainable management criteria.

For this task, management areas will be grouped according to the hydrogeologic conditions and water balance determined under tasks 6.1 through 6.3, and then will be re-examined for various management criteria in Task 7. For example, the analysis of undesirable results in Task 7 may identify areas where water levels or other conditions may be significant and unreasonable, while those same conditions might be acceptable elsewhere.

As discussed in Harrington (2016b) several likely groundwater management areas have already been identified within the Basin based on management approach, jurisdiction, and Basin hydrogeology. Subject to further discussion and concurrence with the OVGA, one logical delineation of groundwater management areas may be:

1. The Tri-Valley area, which includes the Benton, Hammil, and Chalfont Valleys and Fish Slough within Mono County

2. Round and Owens Valleys in Inyo County; and

3. Owens (dry) Lake, a closed drainage depression in the southern part of the Owens Valley, also within Inyo County.

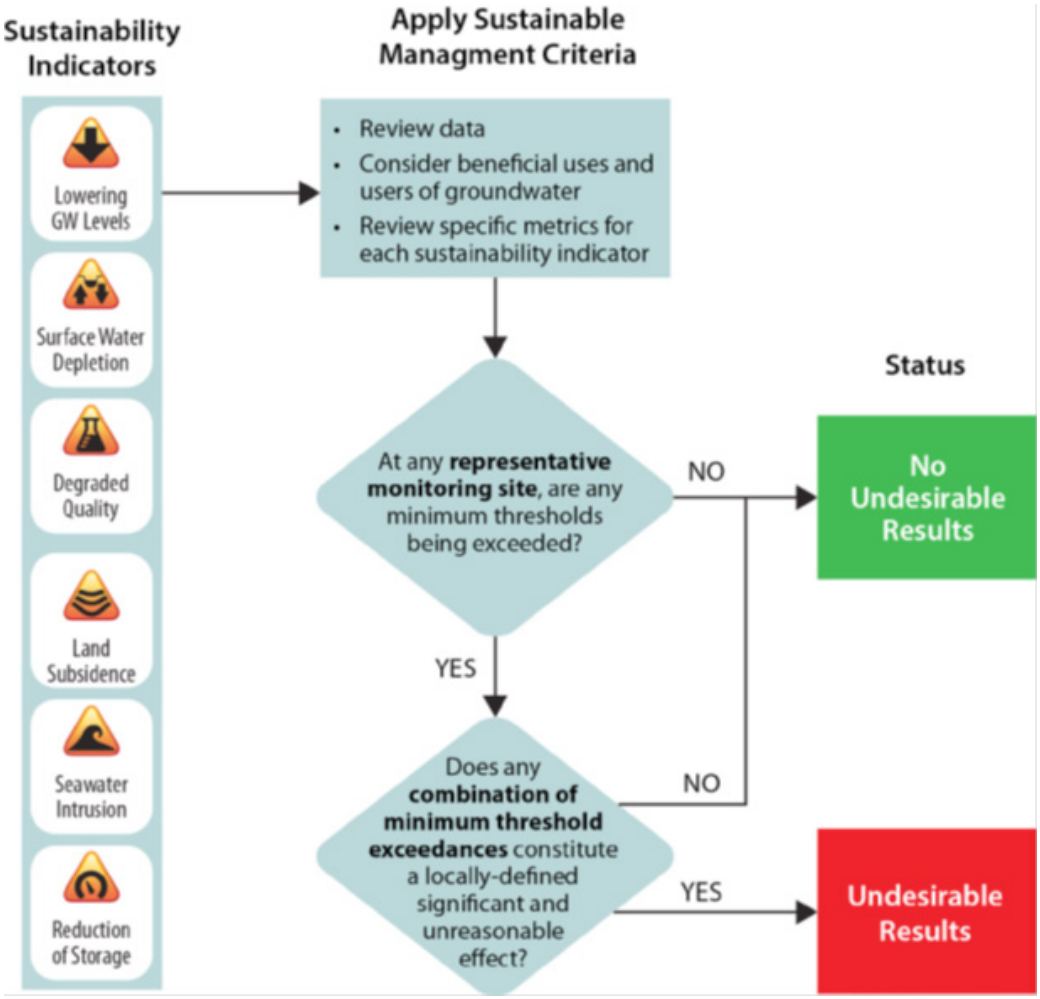
The GSP will include a discussion of the rationale for the management areas (e.g., why they are scientifically significant or how they align with the management actions of another agency) and maps delineating the extent of each area.

Deliverables:

- Draft Basin Setting Report that details the results of tasks 6.1 through 6.4.
- Final Basin Setting Report that includes consideration of OVGA and stakeholder comments.

TASK 7. SUSTAINABLE MANAGEMENT CRITERIA

The development of the sustainable management criteria is a cornerstone of the groundwater management process within SGMA. The process begins with the identification of sustainability goals for the Basin, selection of appropriate metrics for each of the criteria, setting measurable objectives and interim milestones for each criteria specific to a management area, identifying the minimum thresholds and linking those thresholds to undesirable results as defined under SGMA. The DWR (Draft BMP Sustainability Management Criteria, Nov 2017) describes the relationship between sustainability indicators, minimum thresholds, and undesirable results in this graphic.



DWR continues "Sustainability indicators are the six effects caused by groundwater conditions occurring throughout the basin that, when significant and unreasonable, are undesirable results. For example, surface water depletion due to groundwater pumping is a sustainability indicator because it is an effect that must be monitored to determine whether it has become significant and unreasonable."

Sustainability indicators become undesirable results when a GSA-defined combination of minimum thresholds is exceeded. Those combinations of minimum threshold exceedances define when a basin condition becomes "significant and unreasonable."

Sustainability Goals

Our team will assist the OVGA in identifying the sustainability goals for the Basin by providing technical rationale to aid the OVGA in their discussions. These goals are functionally policy guidelines that meet the needs of the stakeholders and promote sustainable management of the resource. Stakeholders will provide input regarding sustainability goals through their participation in workshops or other outreach events and the goals will be consistent with guidelines offered by DWR and SWRCB.

The sustainability goals are often keyed to the sustainability indicators:

- Chronic lowering of groundwater levels indicating a significant and unreasonable depletion of supply.
- Significant and unreasonable reduction of groundwater storage.
- Significant and unreasonable seawater intrusion
- Significant and unreasonable degraded water quality, including the migration of contaminant plumes that impair water supplies.
- Significant and unreasonable land subsidence that substantially interferes with surface land uses.
- Depletions of interconnected surface water that have significant and unreasonable adverse impacts on beneficial uses of the surface water.

Under SGMA, a groundwater condition is deemed "undesirable" if it significant and unreasonable. As an example, the lowering of the water table to achieve sustainability may be considered undesirable by stakeholders, but unless it is significant and unreasonable, it is not considered an undesirable result per SGMA.

Undesirable Results

Our team will identify undesirable results for the sustainability indicators and provide descriptions of the groundwater conditions that could lead to undesirable results. This list of undesirable results will be keyed to the impacts of the groundwater condition on the beneficial users/uses of groundwater. DBS&A will prepare the essential descriptions of the sustainability criteria and the undesirable result(s). These descriptions are important to the establishment of the minimum thresholds.

The DWR provides some flexibility to the OVGA with respect to the sustainability criteria. It is assumed that sustainability criteria will be developed for each of the sustainability indicators unless adequate information exists to determine that the indicator does not apply to the Basin. An obvious example of a criterion that does not apply to the basin is sea-water intrusion; the geographic remoteness of the Basin from the Pacific Ocean make this indicator a non-factor and as such, sustainability criteria would not be developed for this indicator. We will evaluate each of the sustainability criteria to determine those that are applicable to the current and anticipated future conditions in the Basin and provide narratives as appropriate for inclusion in the GSP.

Minimum Thresholds

The team will establish the minimum thresholds (MT) for each of the applicable sustainability indicators. MTs are quantitative (i.e., numeric value) and represent a groundwater condition that, if exceeded, would result in significant and undesirable results to the beneficial users/uses of groundwater in the Basin. The MT must also be set at values that do not impede other adjacent basins or management areas, such as the 400 squares miles of the Inyo/Los Angeles Long-Term Water Agreement, and the Rose Valley Groundwater Basin to the south. Monitoring the success of the groundwater management plan is accomplished, in

part, by comparing groundwater conditions to the MT. Monitoring sites will be identified for each indicator for each management area and the appropriate metric (e.g., water levels, water quality) will be defined for each indicator.

Measurable Objectives

We will develop and describe measurable objectives (MO) for each sustainability indicator with descriptions of a reasonable margin of error (i.e., the range between the MO and MT). Implementation of the GSP will position the Basin to achieve the MO for each applicable indicator within a 20-year sustainability timeline. Interim Milestones (IM) will be identified along the sustainability timeline to aid the OVGA and DWR in evaluating the Basin's progress towards achieving the MO.

Management Areas and Monitoring Sites

Monitoring sites will be defined for each sustainability indicator in each of the management areas. Delineation of the management areas is discussed under Task 6b. The monitoring sites are the locations where OVGA and DWR will evaluate the progress to achieving the MOs.

Deliverables:

- Draft and final sustainability goals and undesirable results narrative for the GSP
- Measurable objectives, minimum thresholds, margins of operational flexibility, and interim milestones for all applicable sustainability indicators
- An initial draft Sustainable Management Criteria section of the GSP document

TASK 8. PROGRESS REPORT PUBLIC MEETING

At roughly the mid-point of the GSP preparation, a public meeting will be held where the work to date and next steps will be presented. This will be an opportunity for the public to provide feedback and comment on the GSP components prepared to this point. Utilizing CCP's extensive SGMA and general public meeting facilitation expertise, we will support the design and delivery of this meeting. The meeting will be conducted consistent with approaches described in the Engagement Plan (Task 2). It will be conducted in compliance with the Brown Act even though it is envisioned by the OVGA to function differently than a standard Board meeting. Our team will:

- Prepare the draft and final agenda.
- Work with staff and potentially OVGA Board members to prepare speaking points and presentations.
- Similarly work with staff to prepare meeting materials.
- Coordinate and do set up for the meeting location (if warranted).
- Facilitate the meeting.
- Take notes during the meeting.
- Conduct meeting debrief with OVGA staff and others as appropriate.
- Prepare a draft and final meeting summary.

Deliverables:

- Meeting agenda
- Presentation materials
- Meeting summary

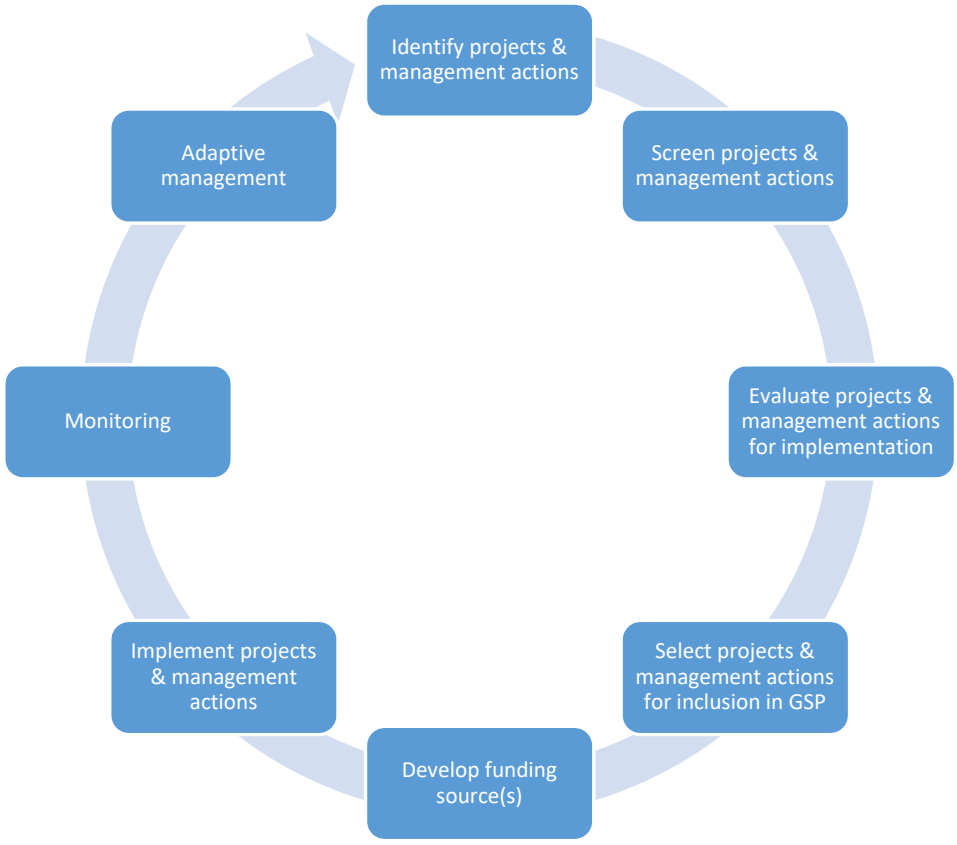
TASK 9. DEVELOP/REFINE MONITORING PROGRAM

The preparation of the GSP will be a data-intensive effort. Fortunately, this Basin has had multiple monitoring networks operated by various entities, such as LADWP, Mono County, Tri-Valley Groundwater Management District, Inyo County, and the BLM for various purposes such as water supply evaluation, ecosystem monitoring, and water quality (e.g., landfill) evaluation. The focus of this task will be to determine how to develop a monitoring program where one is not available in a critical area, and how refinement of the existing monitoring programs might minimize or eliminate data gaps. As project Task 3 (Data and Document Compilation, Review, and Management) proceeds, our team will provide guidance ways to leverage the existing data set and/or ideas on monitoring program refinements that could benefit the GSP development process and the Basin stakeholders. The process may benefit the CASGEM reporting entities and others.

The ecosystem specialists on our team will review the existing monitoring programs and identify potential refinements to improve monitoring of GDE conditions and surface water-groundwater interactions. In most basins, groundwater monitoring and modeling are focused on the deeper aquifers, while shallow water-table aquifers are treated with reduced precision and greater uncertainties. Effective monitoring of important GDEs may require monitoring of potential surface water depletions and the establishment of shallow groundwater wells as part of GSP implementation to track deviations from baseline conditions and monitor trends over time as part of an adaptive management program to determine if additional management actions are needed to maintain GDEs.

Deliverables:

- Draft monitoring program, Including identification of data gaps
- Final monitoring program



Project and Management Action Identification and Implementation

TASK 10. IDENTIFY AND DESCRIBE PROJECTS AND MANAGEMENT ACTIONS TO MAINTAIN OR ACHIEVE SUSTAINABILITY

The GSP will describe projects and management actions that will help maintain or achieve the sustainability goal. The expected benefit of each project or management action will be described along with how each benefit will be evaluated and accomplished. Stakeholder and OVGA evaluation of the management actions or projects must include a variety of data to allow for informed decisions to be made. The DBS&A team will work with local project proponents to identify the objectives, technical feasibility, work plans, preliminary budgets, implementation schedules, CEQA and permitting requirements, and implementation priority within the GSP of these projects. Projects or management actions developed by the DBS&A team will also be characterized as to their feasibility, expected budgets, and schedules.

The selection of which, if any, of the projects and management actions are included in the GSP will require stakeholder engagement and OVGA input. Frequently, stakeholders are keenly interested in the cost-benefit relationship between how much the sustainable yield can be increased versus the cost for that additional yield. The project team will work with project proponents and stakeholders to prepare cost-benefit evaluations for projects to be included in the GSP.

Deliverables:

- Project evaluations to achieve or maintain sustainability goals
- Project vetting to identify cost-benefit relationship
- Project and management action implementation schedule and funding options

TASK 10A. A COST AND RATE STUDY

The purpose of this scope is to provide a rate study to fund GSP implementation. However, it may be prudent to also evaluate the nearer-term costs of preparing the GSP and develop cost recovery mechanisms. We understand that the OVGA has adopted its annual budget and applied for grant funding. Member agencies have pledged to contribute matching funds or services for the grant and/or cover costs should the grant not be awarded. As an optional subtask, our project team, including L&T, can develop a funding plan and rate study for the GSP development period.

The major work elements for the Cost and Rate Study include the following:

Identification of Cost of Service and Funding Options

Determine Cost of Service

Develop a comprehensive cost of service that will be recovered by the proposed fees. GSP implementation costs will include items such as administration, overhead, monitoring, and capital projects. Our project team will develop a cash flow model based on this information covering the next five to ten years.

Review Funding Mechanisms

Provide the OVGA with a comprehensive list of funding mechanisms, including but not limited to: grants, Proposition 26 regulatory fees, Proposition 218 utility rates, assessments, and taxes. Describe the advantages and disadvantages of each mechanism and the costs that can be legally recovered by each. We will also review the most up-to-date legal information regarding appropriate groundwater fee mechanisms in California.

Board Workshop

Provide a Board workshop describing potential funding mechanisms and L&T's recommendations. This workshop will give an overview of the legal requirements for fee calculations and the steps for implementation. If needed, L&T will provide a high-level, ballpark estimate of potential fees. Most likely, we will present a range of rate options that could consist of grant funding versus no grant funding, full agency contributions versus limited agency participation, and high versus low project cost estimates, for example.

Cost Allocation

Based on direction from the OVGA, our team will allocate costs to each funding mechanism. For example, OVGA administration and overhead may be recovered

from a parcel fee and project costs may be recovered via assessments from the benefitting property owners. This subtask involves reviewing the budget line items and assigning each to a revenue source.

Rate Design

Evaluate Billing Options

For this subtask, L&T will determine how each funding mechanism will be billed. Proposition 26 or 218 fees can be billed based on groundwater pumping ($/AF) as a parcel charge or as a $/well fee. Prop 218 fees could be collected on Inyo County's property tax roll. Proposition 26 or 218 fees could be billed directly by OVGA. For taxes, L&T will estimate potential revenues and customers impacted.

As a second step, the number of billing units for each fee will be determined by reviewing available data sources (e.g., county property owner data and metered groundwater use). For unmetered, agricultural water use, L&T will estimate pumping using crop reports and evapotranspiration records (i.e., precipitation and surface water supply netted out).

Develop Rate and Fee Recommendations

Divide the cost of service by the billing units for each funding mechanism. Given that there may be several cost of service options, there will be corresponding rate options. Rate options will be presented to the Board.

Regional Bill Comparison

For comparison purposes, we will prepare a survey of the current and proposed OVGA fees and charges to regional and/or comparable agencies. In addition, L&T will compare the proposed fees to other groundwater sustainability agencies, fees for alternate sources of water (e.g., surface water, for example), and fees charged by the State Water Board for noncompliant basins. The survey will be summarized in table and charts and can be used for outreach, presentations, and the final report.

Draft and Final Reports

The draft and final reports will summarize OVGA's expenses and cost recovery options. L&T will document the cost of service applicable to OVGA's fees and describe the rate setting process. For Proposition 26 and 218 fees, our report will provide detailed rate calculations that will serve as the administrative record for adoption of the fees. Adoption assistance is offered as an optional task. If taxes and assessments are preferred by the Board, our final report will describe the process of raising revenues and provide rough calculations for the tax rate or assessment amount. Our project team is willing and able to provide a stamped assessment engineer's report as an optional task.

L&T will submit a draft report for review and feedback. The report will summarize findings and recommendations and discuss key alternatives when applicable. Receive input from the project team and OVGA Board. Prepare final reports incorporating feedback received. We will provide printed copies and electronic versions of both the draft and final reports and the excel models supporting all tasks. Our final report will describe legal requirements and industry standard practice, cost allocation and rate recovery, and our project methodology and approach.

Outreach

The rate study task includes up to five in-person meetings. We propose one internal meeting with staff, two stakeholder meetings, and two Board presentations.

Board Meeting and Presentations

Present draft and final results to staff, OVGA Board, and stakeholders (as appropriate). Presentations will provide brief background and study objectives, make a clear case why the fees are needed, describe the fee structure (and potentially key alternatives) recommended by the project team, present findings of the fee survey, and discuss related financial and policy recommendations. L&T will document input from the public and prepare meeting minutes.

Customer Outreach

Our proposed scope includes two informational meetings with the OVGA Board. In addition, we recommend the OVGA conduct customer outreach meetings. Outreach is especially critical for taxes and assessments which require an affirmative vote of landowners. Early in the study, L&T will work with the OVGA to develop an outreach plan to target various

stakeholder types (e.g., agricultural pumpers, urban pumpers) and various geographic areas within the OVGA territory. L&T will give presentations describing OVGA activities and rate options. After the workshops, we will provide a summary to the Board. As appropriate, L&T will fine-tune our recommendations based on feedback received.

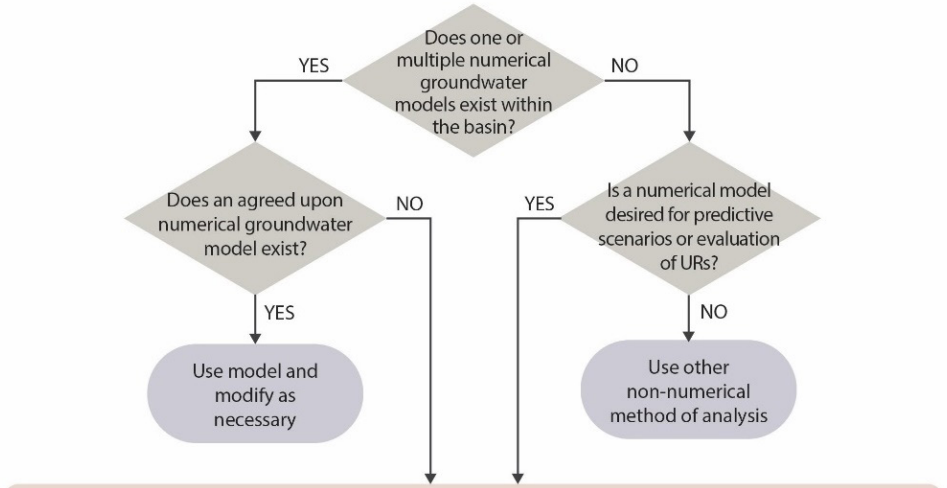
TASK 10B. ASSESSMENT, RECONCILIATION, AND CONSOLIDATION OF EXISTING GROUNDWATER MODELS

At various times, groundwater models for the Tri-Valley region, the central Owens Valley (Laws to Lone Pine), and Owens Lake have been developed. This task will examine existing models and determine the need for and efficacy of consolidating these models into a basin-wide model.

The overall purpose of this task is to examine the utility of the existing groundwater models for GSP development purposes and determine the need consolidating the models into a unified basin-wide model. Each of these tasks are addressed below.

Task 10b.1. Assessment of Existing Models

The first step to be conducted under this task will be to make a determination of whether each model is appropriate for conducting predictive analyses in



Evaluate and select or develop best model for each application objective

Application Objectives	Model Evaluation		
	Model 1	Model 2	Model 3
Water Budget:			
• Historical and Current Conditions	*well-suited*	*well-suited*	*well-suited*
• Predicted Basin Response	*well-suited*	*well-suited*	*well-suited*
Forecasting Changes in Undesirable Results Through 50-Year Planning Horizon:			
• Groundwater Level Declines	*well-suited*		*well-suited*
• Groundwater Storage Declines	*well-suited*		*well-suited*
• Land Surface Subsidence	*well-suited*	*well-suited*	
• Seawater Intrusion		*well-suited*	
• Degraded Groundwater Quality		*well-suited*	
• Surface Water/Groundwater Interaction	*well-suited*	*well-suited*	*well-suited*

Model Selection Complete (re-evaluate if objectives change or new data are available)

support of the GSP. In order for the individual models to be useful, let alone a potentially "combined" model, each model must be able to reasonably simulate future groundwater conditions under multiple groundwater utilization scenarios and changing future climatic conditions. The model assessment task will be conducted by reviewing the model files and documentation to assess the suitability of the model for conducting the types of predictive simulations needed to develop the GSP. The model assessment will be conducted based on our experience in developing numerous groundwater flow models for predictive water resources evaluation and using standard guidance for model evaluation such as that provided in Reilly and Harbaugh (2004).

Our prior knowledge of the Basin and initial review of the available models indicates that the USGS Owens Valley model (Danskin, 1998) as updated in 2005 by Inyo County, LADWP and the USGS (Harrington, 2005), and the Owens Lake model (MWH, 2012) are expected to meet the needs of the GSP development with minor modification for items such as predictive simulation period and assumed climatic conditions during the predictive simulation period. These models are calibrated to observed hydrologic conditions and rely on extensive data sets of observed aquifer and hydrologic parameters, such as observation well water levels and hydrographs, aquifer test results and geologic structure. In addition, these models cover regions that are in large part subject to the Inyo/Los Angeles Long-Term Water Agreement and are therefore exempt from SGMA.

We are less optimistic concerning the utility of the existing groundwater model of the Tri-Valley region (MHA, 2001 and TEAM 2006) for application during the GSP process. This model has not been calibrated to transient groundwater conditions and utilizes a number of generalized assumptions regarding key model inputs, such as the spatial distribution and magnitude groundwater recharge and the amount of groundwater pumping. The Tri-Valley model is also a steady-state model, although important groundwater conditions are not at steady state (equilibrium) conditions within the model domain, such as groundwater pumping, groundwater recharge, groundwater discharge at Fish Slough, and observed water levels in the Hammil and Chalfant Valley areas. We believe that this model could be significantly improved through more detailed consideration of groundwater recharge using DPWM (explained in Task 6) and more accurate determination of groundwater fluxes, such as groundwater pumping for agriculture and groundwater discharge at Fish Slough. TEAM (2006) notes some of these limitations and states that the Tri-Valley model is a preliminary numerical model, and that model estimates of aquifer properties and hydrologic budget components should also be considered preliminary.

Task 10b.2. Determination of Need for Model Consolidation

The need for groundwater model consolidation will be determined based on 1) review and analysis of model calibration results (i.e., simulation results versus observed data) in the vicinity of the adjoining/overlapping model boundaries, and 2) the expected future groundwater pumping subject to SGMA in the vicinity of the model boundaries. The USGS Owens Valley model boundaries overlap in the north with the Tri-Valley model and in the south with the Owens Lake model. Other models have also been developed for the Bishop-Laws region by Inyo County (Harrington, 2007) and LADWP (MWH, 2010).

In the boundary regions (Laws area in northern Owens Valley and Lone Pine in southern Owens Valley), the groundwater model that has the superior calibration is expected to be used for the predictive analysis. Once the model is selected, an initial analysis of the effects of future pumping at the model boundary will be made; if the effects are small or zero, then the model can be used unmodified. If the effects are not small, then an approach needs to be developed for model consolidation or possibly extension. If model consolidation is recommended, multiple issues will need to be addressed, such as synchronization of model layers, aquifer hydraulic properties, and consistent water balances. These issues would be addressed in a separate, future scope of work. The overall GSP process will be less costly and more streamlined if model consolidation is not required.

In the southern model boundary region in the vicinity of Lone Pine, the USGS Owens Valley model domain

overlaps with the Owens Lake model domain for nearly 10 miles. The largest pumping centers in this region are are north of Lone Pine (Bairs-George, Symmes-Shepard and Independence-Oak) and are not subject to SGMA. Pumping at Lone Pine and farther south at Olancha is small compared to these pumping centers, although future pumping by LADWP at Owens lake could be significant (see Task 10f). Given this background, we expect that the USGS model can be used for LADWP pumping in the Owens Valley north of Lone Pine and Lone Pine pumping, and the Owens Lake model can be used for pumping in the Owens Lake region by LADWP and others, without a significant concern of overlapping drawdown in the vicinity of Lone Pine where the model boundaries overlap.

In the northern portion of Owens Valley proper, in the Laws region, the need or lack thereof for model consolidation is less clear. As discussed in greater detail under Task 10g, we believe that additional resolution of key mass balance terms is required for the Chalfant Valley/Fish Slough area in order to better assess the flux of groundwater between the Chalfant Valley and Owens Valley at Laws. Based on the results of the updated mass balance and other technical work proposed under Task 10g, we expect that the current discrepancy in simulated groundwater flux across this boundary region (TEAM, 2006 and Harrington, 2016) can be better determined. We expect that the sensitivity analysis will focus on the USGS Owens Valley model, since relative to the Tri-Valley model this model has a superior model calibration based on transient observed data and numerous observed input parameters. If the model results are sensitive to the prescribed groundwater inflow at Laws, then particular attention needs to be paid to reconciling flow values between the two models.

Deliverables:

- Technical memorandum documenting the results of the model evaluation study, and recommendations regarding the utilization of models for SGMA purposes, including the need for model consolidation.

TASK 10C. COORDINATION AND COMPATIBILITY WITH THE INYO/LOS ANGELES WATER AGREEMENT

With the knowledge that the Owens Valley water management has witnessed a history of conflict, litigation, and settlement negotiations, Inyo County and Los Angeles entered into an agreement in October of 1991 entitled, "Agreement between the County of Inyo and the City of Los Angeles and its Department of Water and Power on a Long Term Groundwater Management Plan for Owens Valley and Inyo County".

As stated in Section III.A of the agreement between the City of Los Angeles (LA) and the LADWP, and the County of Inyo, known as the Long-term Agreement (LTA), "The overall goal of managing the water resources within Inyo County is to avoid certain described decreases and changes in vegetation and to cause no significant effect on the environment which cannot be acceptably mitigated while providing a reliable supply of water for export to Los Angeles and for use in Inyo County." The agreement goes on to state in Section III.B that, "The goal is to avoid long term groundwater mining from aquifers of Inyo County. This goal will be met by managing annual groundwater pumping so that the total pumping from any well field area over a 20-year period (the then current year plus the 19 previous years) does not exceed the total recharge to the same well field area over the same 20 year period." Under this agreement, the amount of annual recharge to each well field area over the 20-year period is determined by a Technical Group, established under the LTA using information developed by the USGS and others.

DBS&A understands that in order to accomplish the goals of the LTA, a document called the "Green Book" was written that describes the management areas, monitoring sites and wells, monitoring methodologies, and standardized interpretation procedures for determining the amount of available soil water and the amount of soil water required by vegetation. The sole purpose for the Green Book is to set forth the techniques to be used to support the implementation of the management goals specified in the LTA. The Green Book is an adjunct, but separate, document from the LTA. The terms

in the LTA have been mutually agreed upon and cannot change without a revised written and signed agreement. The Green Book, however, is based upon scientific research, and its contents and methods may be changed as understanding of water and environmental management is improved. As stated in the memorandum to the Standing Committee from the Technical Group, "Maintaining the Green Book as a separate document from the Agreement [LTA] ensures flexibility to encorporate [sic] new information."

The goals of the LTA, and the methodologies of the Green Book, are generally consistent with the goals of SGMA in achieving sustainable groundwater management. For example, a primary consideration of the Green Book is to turn off pumping wells when groundwater elevations are lowered such that insufficient soil water is predicted by the specified monitoring techniques to maintain vegetation. In the LTA-based program, monitoring levels (e.g., groundwater elevations and plant water use rates) at representative monitoring sites are identified that, when exceeded, indicate the development of an undesirable condition (with respect to the LTA, in this case) and trigger the discontinuation of pumping to sustain an adequate density and areal coverage of groundwater-dependent vegetation over the long term. DBS&A believes that this program is very similar to the approach taken by SGMA as discussed in the DWR's Draft BMP for Sustainable Management Criteria.

Since the LTA represents an agreement that produces a management program similar to SGMA, and the RFQ states that SGMA provides that land managed pursuant to the LTA (about 400 square miles) is considered adjudicated for the purposes of SGMA, DBS&A proposes that the most logical and expedient approach might be for the OVGA to consider developing a coordination agreement with the Standing Committee, or other appropriate legally empowered authority, that oversees the LTA. Under such a coordination agreement, the goals of the LTA and of the GSP, which are already similar, could be formalized in such way as to meet the requirements of SGMA, but does not alter the requirements embodied in the LTA. The coordination agreement could also be used to provide for the negotiated free flow of information and data between the OVGA and ICWD and LADWP, the principal parties to the LTA. Under the LTA, coordination and communication between ICWD and LADWP is already occurring and a coordination agreement would extend this relationship to the OVGA for the purposes of the GSP.

The DBS&A team will consult with and assist the OVGA in coordinating and communicating with the Standing Committee, or other appropriate legally-empowered authority that oversees the LTA, with the objective of establishing a coordinating agreement and considering the area managed under the LTA as though it were an adjudicated area. The DBS&A team has strong experience in developing inter-agency communications and relationships, and our team has front-line experience in facilitating coordinating agreements between collaborating water agencies.

Deliverables:

- A GSP that is compatible with the LTA.

TASK 10 D. COORDINATION WITH OTHER LANDOWNERS

Consistent with services provided under other tasks, we will utilize the extensive experience of our teaming partner CCP to support coordination and engagement with federally recognized Tribal governments and the federal government, and potentially any land and water management associated with state lands. Under §10723.2, SGMA defines specific information about how entities defined as "sovereign" are to be addressed by a GSA. We will strictly adhere to and provide specific guidance and support on these requirements. It should be noted that as a governing agency, the OVGA may find it necessary and/or beneficial to conduct formal, government-to-government consultation with the Tribes. Such activities would benefit greatly from proactive, strategic discussions with the Tribes to define mutual understanding of formal requirements under such an effort, and more specific and unique "rules of engagement" describing how the Tribes and the OVGA will work together. Under SGMA, federally

recognized Tribes have unique standing. Proactively recognizing and engaging the Tribes' interests, whether unified amongst all Tribes, or unique to a specific Tribe or Tribes, would be of significant long-range benefit to the OVGA's SGMA implementation. While it is not necessarily appropriate for a consultant team to participate directly in a formal consultation, our team will be available to work with the OVGA and respective Tribes (as warranted) to prepare for such consultation events. This might include items such as:

- Preparing background materials
- Designing meeting agendas
- Ensuring that mutual protocols are understood and followed

"Tony has the great ability to balance these solutions between different users to create as much "fairness" as there can be while still staying true to the overall mission of creating groundwater sustainability. He works on compromise but does not sell out the goal that must be achieved."

~E. Michael Solomon, General Manager (ret.), United Water Conservation District

TASK 10 E. IMPROVEMENTS TO MONITORING

The DBS&A team will draw on the outcomes of previous tasks, particularly Task 3: Data and Document Compilation, Review and Management, to familiarize ourselves with the active monitoring networks in the Basin, including their overall coverage, objectives, monitoring practices and protocols, and degree of public access to data. From this review, we will describe the physical, jurisdictional, and administrative aspects of current programs, identify and address monitoring gaps, and assess their applicability to GSP sustainability criteria.

In accordance with DWR's "Monitoring Networks and Identification of Data Gaps BMP" and "Monitoring Protocols, Standards, and Sites BMP," we will propose improvements with focus on leveraging the existing datasets and monitoring programs to minimize or eliminate data gaps. DBS&A and TEAM routinely perform groundwater monitoring and understand that proper characterization of changes in a groundwater system requires collection of relevant data, including groundwater levels, water quality, land surface elevation, and surface water discharge conditions. This data is most useful when collected at spatially distributed sites at a consistent frequency.

Deliverables:

- GSP chapter describing monitoring network conditions, protocols, and improvements

TASK 10F. STUDIES AND PLANS RELATED TO A MONITORING, MANAGEMENT, AND MITIGATION PROGRAM FOR LADWP'S PROPOSED GROUNDWATER DEVELOPMENT AT OWENS LAKE

The proposed groundwater development program at Owens Lake by LADWP is envisioned to include monitoring, management, and mitigation that will result in pumping criteria developed from ongoing, collaborative efforts between multiple entities, including LADWP, Inyo County, Great Basin Unified Air Pollution Control District, and Habitat Group of Owens Lake Master Planning group. Our team will assimilate the plans and studies (including the resultant data sets) for this project into the GSP project database that will be used throughout the GSP development process.

Deliverables:

- Utilization of studies and data to inform the GSP where applicable.

TASK 10 G. DETERMINATION OF GROUNDWATER FLOW PATHS AND RATES BETWEEN THE TRI-VALLEY REGION AND THE BISHOP-LAWS REGION AND SUSTAINABILITY OF FISH SLOUGH

The objective of this task is to quantify groundwater flow between the Tri-Valley region and Owens Valley proper. We propose to address this issue as follows:

1. Review existing geologic and hydrogeologic data available for the Chalfant Valley and Laws areas.
2. Conduct an updated water balance for the Tri-Valley and Fish Slough regions.

The data review will confirm and potentially add to the existing body of work that includes estimates of basin fill thickness, water levels, aquifer hydraulic properties and groundwater pumping in the Laws region. However, in order to improve existing estimates of groundwater flow between Chalfant Valley and Laws, we believe that improved estimates of the water budget, particularly in the Chalfant Valley, are required. We intend to accomplish this by estimating groundwater recharge using DPWM, and developing improved estimates of groundwater pumping irrigation using aerial photography and input from local contacts on crop type and typical irrigation methods.

Another important water balance component to be estimated is the proportion of groundwater discharge as Fish Slough is believed to be comprised of Chalfant Valley alluvial water. Jayko and Fatooh (2010) document that groundwater discharge at Fish Slough is likely a combination of Chalfant Valley groundwater and isotopically enriched waters from depth that rises along fault zones.

We propose to identify potential sources of water to Fish Slough using available temperature and water quality data. Available temperature data will be used to identify potential deep groundwater sources to Fish Slough. Elevated total dissolved solids (TDS) and fluoride concentrations in Fish Slough may indicate that an older groundwater, potentially with a geothermal component, may be mixing with other groundwater from upgradient of the Fish Slough. Water quality data will be used to conduct mixing calculations based on the isotopic and ionic water chemistry to estimate the proportion of Fish Slough discharge sources from Chalfant valley groundwater. Chemistry of end-member components will be used to calculate binary or ternary mixing of water sources and volume fraction of the end-members at a particular location. Chemistry for the end-members may include groundwater data from the eastern Chalfant Valley representing snow melt, the axially located wells in Chalfant Valley, spring, and surface water data. Additional water quality analyses may be recommended as the results of the mixing calculations are evaluated. The results of this analysis will be used for updated mass balance analysis and potentially updated groundwater modeling if conducted by the OVGA. Groundwater in the Chalfant Valley not extracted by pumping or diverted to Fish Slough by geologic structure must be entering the Bishop-Laws region of Owens Valley.

The DBSA team will also review the groundwater flow conditions as they pertain to ecological linkages of groundwater flow paths and rates to functioning and sustainability of the Fish Slough Area of Critical Environmental Concern. Spatial and temporal variability in spring flows and depth and persistence of ponds are important drivers of ecosystem function and habitat value for key species such as the Owens pupfish in the aquatic and wetland components of Fish Slough.

Deliverables:

- Documentation and utilization of study results in GSP development.

TASK 10H. DETERMINATION OF HYDROLOGIC FACTORS AFFECTING SHALLOW GROUNDWATER IN WEST BISHOP

High groundwater poses a threat to private property in West Bishop. Under this task, the DBS&A team will review the DWR study (Owens, 2016) in detail and obtain the data collected for that study. Particular attention will be paid to recent changes in the local hydrologic system, as the problem appears to be a relatively recent phenomenon despite the fact that

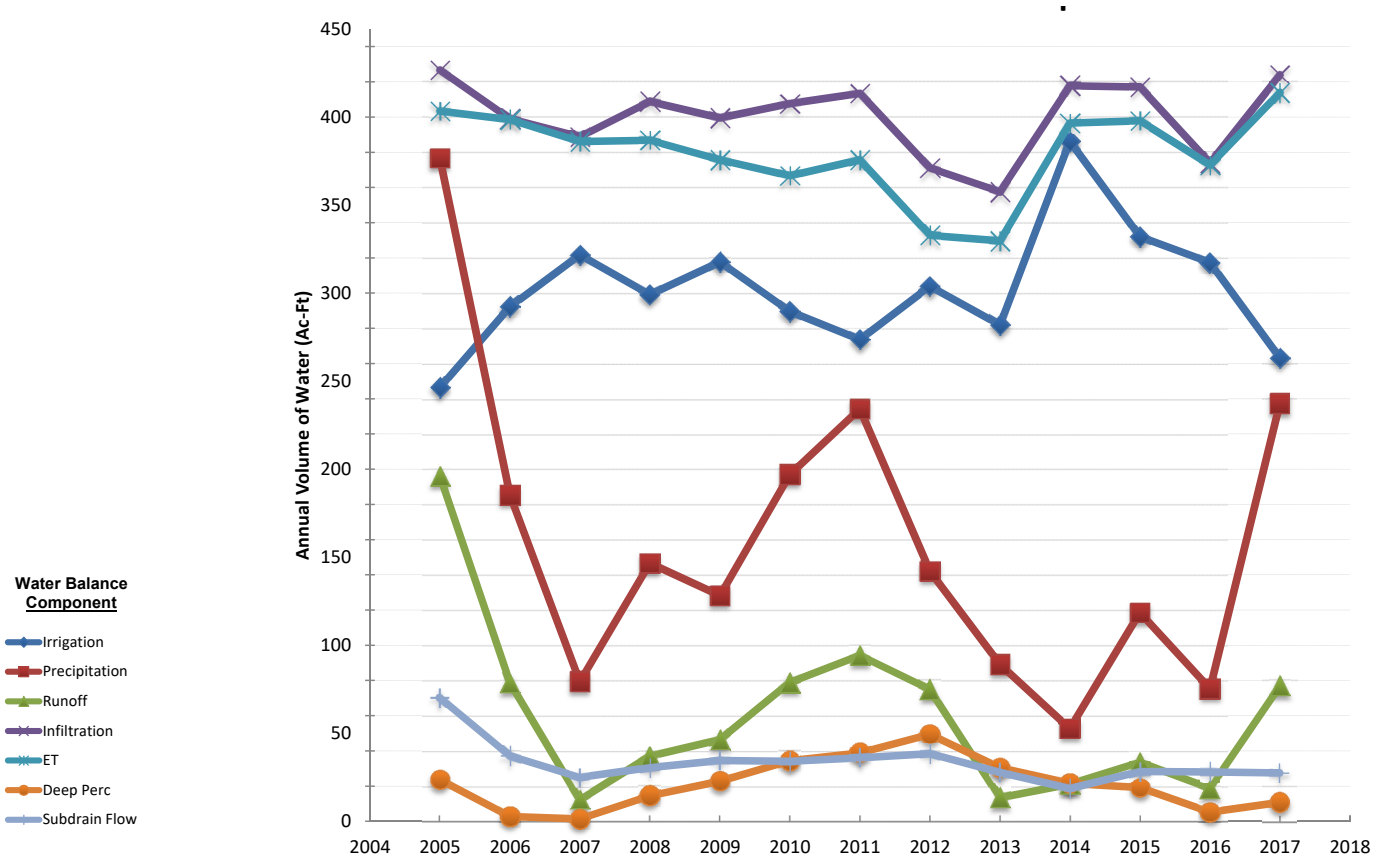
the neighborhoods have existed for decades. As recommended in Owens (2016), groundwater levels and surface water flow data from Inyo County and the Bishop Creek Water Association for 2016 and more recent periods will be obtained and reviewed to identify correlations.

TASK 10 I. RECOMMENDATIONS FOR OTHER STUDIES OR PLANS

As the GSP is developing, it is common to identify one or more undesirable results that are driving the sustainable yield of a basin. The DBS&A team will develop, with input from stakeholder groups, OVGA, beneficial users of groundwater, and DWR, a suite of actions and/or projects that, if implemented, could beneficially impact the sustainable yield. Those actions and projects might include, for example, enactment of special management areas where distinct management actions provide basin-wide benefit to the sustainable yield, development of conservation, in lieu deliveries, or supplemental water programs, moving or sequencing groundwater extractions, or participation in water exchange programs. Each of the actions or projects will have a cost-benefit relationship that can be used by the stakeholders and the OVGA to settle on a workable, sustainable Basin yield.

Deliverables:

- Draft and Final GSP chapter on recommendations for other studies



12-Year Institutional Water Sustainability Program Multi-Year Plot of Water Balance Component Trends

TASK 11. DEVELOP GSP IMPLEMENTATION SCHEDULE AND BUDGET

The GSP will identify those tasks, activities, or projects that will aid the OVGA in guiding the Basin towards sustainability by achieving the Measurable Objectives. Fundamental to achieving the MOs is the need to develop a GSP implementation schedule and an associated budget. The DBS&A team will prepare a schedule encompassing the time period from submittal of the GSP to DWR through the 20-year compliance period to achieve sustainability. A major element in the schedule will be the anticipated implementation timing of projects that will beneficially impact the Basin sustainable yield. The schedule will have greater detail for early years of the implementation period during which there is greater certainty about the scope, timing, permitting and funding of the projects.

Our team will prepare a budget for the implementation of the GSP to accompany the implementation schedule. This budget will be a key part of the Task 10a - Cost and Rate Study.

Deliverables:

- Draft and Final GSP chapter on recommendations for other studies

> **"Tony is very, very knowledgeable of the SGMA timelines, issues and requirements."**
>
> **~E. Michael Solomon, General Manager (ret.), United Water Conservation District**

TASK 12. DEVELOP SYSTEM FOR ANNUAL REPORTING

Annual reports are due to the DWR in accordance with Reg. § 356.2. These reports must include the following information per the regulations:

(a) General information, including an executive summary and a location map depicting the basin covered by the report.

(b) A detailed description and graphical representation of the following conditions of the basin managed in the Plan:

(1) Groundwater elevation data from monitoring wells identified in the monitoring network shall be analyzed and displayed as follows:

(A) Groundwater elevation contour maps for each principal aquifer in the basin illustrating, at a minimum, the seasonal high and seasonal low groundwater conditions.

(B) Hydrographs of groundwater elevations and water year type using historical data to the greatest extent available, including from January 1, 2015, to current reporting year.

(2) Groundwater extraction for the preceding water year. Data shall be collected using the best available measurement methods and shall be presented in a table that summarizes groundwater extractions by water use sector, and identifies the method of measurement (direct or estimate) and accuracy of measurements, and a map that illustrates the general location and volume of groundwater extractions.

(3) Surface water supply used or available for use, for groundwater recharge or in-lieu use shall be reported based on quantitative data that describes the annual volume and sources for the preceding water year.

(4) Total water use shall be collected using the best available measurement methods and shall be reported in a table that summarizes total water use by water use sector, water source type, and identifies the method of measurement (direct or estimate) and accuracy of measurements. Existing water use data from the most recent Urban Water Management Plans or Agricultural Water Management Plans within the basin may be used, as long as the data are reported by water year.

(5) Change in groundwater in storage shall include the following:

(A) Change in groundwater in storage maps for each principal aquifer in the basin.

(B) A graph depicting water year type, groundwater use, the annual change in groundwater in storage, and the cumulative change in groundwater in storage for the basin based on historical data to the greatest extent available, including from January 1, 2015, to the current reporting year.

(c) A description of progress towards implementing the Plan, including achieving interim milestones, and implementation of projects or management actions since the previous annual report.

Our team will make use of the databases created during development of the GSP as a tool to streamline the annual reporting effort. These types of summary reports are common in the water industry and our team has experience in preparing the information required by DWR. We will work with OVGA staff to develop a streamlined system for extracting the required information from the databases and assembling it into an annual report format suitable for submittal to DWR.

Deliverables:

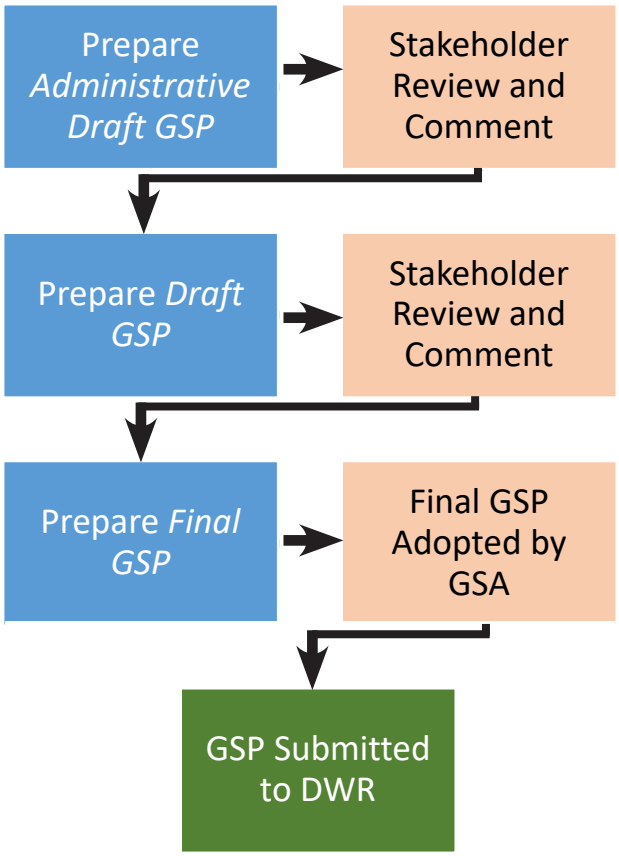
- Database report templates to minimize staff effort
- Annual report template for OVGA use

TASK 13. GSP COMPILATION, PRESENTATION, AND SUBMITTAL OF GSP

The DBS&A team will work with OVGA and its staff to prepare a GSP outline, an administrative draft, a public review draft, and a final GSP that the OVGA will consider for adoption. The administrative draft will incorporate comments received on initial draft sections, as applicable. Each GSP draft will include all required sections of the GSP, including appendices.

A draft GSP outline will be provided to the OVGA appointed project manager for review. We will then work with the OVGA's project manager to develop a final outline that will be used for the GSP document development.

This task will also be used to track references used during GSP preparation. GSP regulations require that a copy of every reference used in GSP preparation that is not easily available be included with the GSP submission. This task includes collection of all applicable references used in the report for submittal with the completed GSP.



We will prepare an administrative draft of the GSP and all supporting appendices. The administrative draft will be provided for review by the OVGA and other stakeholders involved in the GSP development process.

We will prepare a draft GSP and all supporting documentation. This draft document is to respond to comments made on the administrative draft document. The draft GSP will be circulated for agency and public review and comment. The public and agency

comments will be considered in the creation of the final version of the GSP. The final GSP will be provided to the OVGA for consideration for adoption and submittal to the DWR.

Deliverables:

- Draft and Final GSP outlines
- Administrative Draft of GSP
- Public Review Draft of GSP
- Final GSP for consideration for adoption by OVGA

TASK 14. ADDRESS DEFICIENCIES AND CORRECTIVE ACTIONS IDENTIFIED BY DWR, AND RESUBMIT

Once the GSP has been adopted by the OVGA and submitted to DWR, the DWR has a two-year timeline for their review of the GSP and to assign a status of Approved, Incomplete, or Inadequate. Should the DWR request supplemental information to address deficiencies or a need for corrective actions to the GSP, our team will promptly mobilize to supply DWR with the desired information.

TASK 15. COORDINATION MEETINGS BETWEEN CONSULTANT AND GSA STAFF

Mr. Morgan and other key staff will organize and participate with GSA staff in semi-monthly teleconferences to keep the project on track and provide staff with information to keep GSA decision makers informed of progress, solicit input at key decision points, and to address problems that may arise. These coordination meetings will help us to work as a partnership with both parties contributing their background knowledge and experience toward refining our path forward to ensure the GSA's compliance with DWR requirements and timelines.

TASK 16. OTHER RECOMMENDED ACTIONS

The DBS&A team has carefully reviewed the RFQ and prepared a cross tabulation of the tasks identified in the RFQ with the GSP checklist and annotated outlines provided by DWR. The cross tabulation has highlighted some topics, issues, or analyses that could be essential or recommended for inclusion in the GSP, but that were not a part of the scope of work specified in the RFQ and/or part of the budgeting process as noted in the Prop 1 grant proposal. These include, but are not necessarily limited to, the following:

- **Analysis of the effects of climate change on the sustainable yield of the Basin** - An essential element of the GSP is the evaluation of the impacts climate change will have on the sustainable yield of the Basin over the 50-year planning and implementation timeframe. In many basins, this includes the use of groundwater modeling to predict future groundwater conditions under changing climatic conditions.

  The DBS&A team includes experienced groundwater modelers familiar with the DWR's guidance document on climate change. The guidance document provides GSAs with standardized information regarding projected changes in variables such as precipitation, evapotranspiration, and air temperature. These change variables would be used to, for example, quantify changes to the water budget, project groundwater elevations, and assess the impacts that future water supply augmentation projects and management actions may have on the sustainable yield.

  Should the existing groundwater models be found to be inadequate for use in the evaluation of the influence of future project and management actions on Basin sustainable yield, the OVGA may find it beneficial to merge those models into a new, unified tool. This effort could include, for example, selecting a representative base period, incorporation of more recent groundwater data, recalibration or calibration confirmation, and the performance of sensitivity analyses. The creation of a single groundwater flow model would be an important management tool for the OVGA as it moves through the 20-year compliance period and 50-year implementation period and uses an adaptive management approach to achieving sustainability.

- **Enhanced effort for GDEs (mapping, classification, characterization, potential effect, sustainability criteria, monitoring, and potential projects/actions)**

The Basin has a large extent of known or potential GDEs. However, the existing DWR GDE mapping is relatively coarse and inconsistent throughout the Basin. Our core proposal includes a basic level of effort under a number of tasks that is sufficient to ensure the GSP shows due diligence in addressing GDEs. However, given the number of potential and known GDEs, such as Fish Slough, and listed species dependent upon them, such as the Owens pupfish and southwestern willow flycatcher, our team recommends that the OVGA seek additional funding to conduct an enhanced GDE effort that builds on the core approach to reduce uncertainties and provide an efficient path towards ensuring sustainability of GDEs. Given the stakeholder interest in the topic of GDEs, it would be prudent to fund our team's ecosystem/GDE specialists to participate in one or more of the public meetings.

- **Enhanced Stakeholder Outreach** - the DBS&A team includes the CCP organization that has worked with over 30 basins and GSAs throughout California. Once the PEP is completed, we will determine the number of public meetings.

  Based on their experiences in these basins, there is definite benefit in having CCP participate in additional tasks, rather than limiting their involvement to tasks where their expertise is fundamental. These additional tasks include, for example:

  - Task 4 - Develop Interagency Agreements. Consistent with the RFQ and in concert with steps that might be taken under Task 10d, CCP has extensive experience and can facilitate specific discussions leading to development of Interagency Agreements to ensure that mutual consultation, coordination and requirements are established between adjacent entities and a respective GSA. While each Basin and GSA is different, CCP has found that collaborative, structured and facilitated discussions that follow a multi-interest negotiation approach provides exceptional value to the process of creating such agreements.
  - Task 6 - Basin Setting. Consistent with Task 2, PEP above, we believe that the Basin Setting steps of SGMA provide an invaluable, early opportunity for public outreach. Consistent with the experience CCP has had statewide, there is a wide range of expertise and understanding by beneficial users about the accurate conditions of their groundwater resources. This lack of consistency influences subsequent behavior and beliefs by these beneficial users when working with a GSA. The work to prepare the Basin Setting portion of the GSP provides an exceptional opportunity to present information, educate the public, dispel "myths" and misunderstandings about the Basin, and align stakeholder awareness such that they are better informed for subsequent key decision milestones under GSP development and presentation. In this context, we recommend that under Task 2, the Engagement Plan includes specific text about outreach activities that will coincide with this Task as a means to capitalize on the efforts done under this task.
  - Task 7 - Sustainable Management Criteria. Similar to Task 6, CCP has found that development of sustainable management criteria is a step in GSP development subject to significant misunderstandings by beneficial users, and is nonetheless an exceptionally critical milestone to inform subsequent planning steps, define basin conditions and eventual planning actions. The ability to dispense with misunderstandings can be a valuable part of informing public opinion and maintaining productive engagement. Therefore, consistent with Task 2 above, this is a point in the GSP process that we believe benefits from focused public engagement to better educate beneficial users about SGMA criteria and their relationship to future decisions and actions.

- **Rate Adoption Assistance** - Our project team is fully equipped to assist OVGA with adoption of the proposed fees following the submittal of the GSP. The scope of this task will depend on the funding mechanism selected by OVGA.

  If Prop 218 or 26 Rate Implementation is deemed appropriate, our project team will assist the OVGA with each step of implementing the proposed rates and fees. For Prop 26, the OVGA must advertise and hold a public hearing. L&T will draft the hearing advertisement, if needed. For Prop 218, the OVGA

must mail impacted property owners a hearing notice 45 days in advance of the public hearing and conduct a protest vote. L&T can develop the property owner mailing list, print and mail the notices, and tabulate the protest votes. L&T will attend the public hearing and provide a summary presentation to the public, if needed. This subtask includes two meetings.

Should the OVGA elect a Taxes and Assessment funding approach, DBS&A will prepare the Engineer's Report and L&T will assist with implementation. We can prepare the assessment ballots, mail them to property owners, tabulate the votes, and record the assessment with the county tax assessor. If the OVGA elects other types of taxes, L&T will assist with developing a timeline for balloting (if in conjunction with a general election or as a special election as appropriate). This subtask includes two meetings.

- **Rate Study for GSP Preparation** - This optional task consists of developing a two- or three-year rate study for the GSP preparation period. We understand the OVGA members have committed to providing financial contributions for the GSP and grant funding has been pursued. A backup financial plan may be helpful. If grant funding is not awarded or is less than anticipated, there may be a funding shortfall. Moreover, grant disbursements can lag six to twelve months from when funding is requested. The OVGA may have temporary cash flow constraints and require bridge financing. As a political consideration, OVGA agencies may prefer OVGA to collect funds directly from landowners in their jurisdictions rather than the individual agencies raise funds themselves and contribute the revenue to OVGA.

  This task would follow the same methodology as the rate study for GSP implementation. Our team will calculate the cost of service, develop a cash flow, recommend funding mechanisms, calculate rates, submit a report, and assist with adoption. It is envisioned that the GSP preparation rate study would be a simpler process than the implementation rate study. It would use existing OVGA administrative budgets and readily available customer data. It would not allocate specific projects to benefitting landowners, for example. L&T recommends Prop 26 fees for this optional task because they are straightforward to administer and can be adopted faster than other funding mechanisms. Due to this streamlined process, our project team recommends up to 4 meetings for this task.

- **GSP Implementation Funding Plan** - the DBS&A team is prepared to assist the OVGA in developing a funding plan geared towards the identification and acquisition of funds from outside sources to offset some of the costs associated with GSP implementation. These outside sources could be, for example, grants or low interest loans. The DBS&A team has grant preparation experts who could be accessed to assist the OVGA in identifying grant opportunities that may be available to minimize short-term GSP preparation funding shortfalls, as well as GSP implementation. A strategy to establish funding mechanisms to support the development of the GSP, as well as implementation plans, and project execution will benefit all stakeholders in the Basin.

If additional funds (above the Prop1 grant amount) are available (or could become available), the scope of this project could be revised to include some or all of the additional detail or elements as listed above, furthering efforts towards completion of a GSP. The DBS&A team will work with the OVGA to rank the priority of the other recommended activities based on stakeholder input, DWR consultations, and the desires of the OVGA Board of Directors.

We look forward to discussing possible scope and budget refinements with you, with the objective of maximizing benefits to the Owens Valley Basin.

"In addition to focusing on groundwater overdraft information to inform the community on the seriousness of the problem. Tony also was innovative in developing ideas for solutions so we just didn't talk about the problem. His efforts went a long way in maintaining the district's credibility and leadership standing in the area...."

~E. Michael Solomon, General Manager (ret.), United Water Conservation District

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4. References

Our proposed Project Manager, Tony Morgan, and the DBS&A team have performed a range of services similar to those necessary to achieve success in developing the OVGA GSP. We encourage the County to contact the following clients to learn about working with our team and who can attest to the quality of work first-hand.

Project	Owner	Reference
Safe Yield Study – Santa Paula Groundwater Subbasin	United Water Conservation District 106 North 8th Street Santa Paula, CA 93060	John Lindquist Senior Hydrogeologist (805) 525-4431
Effects of River Flow and Municipal Water Program on Surface Water and Groundwater Conditions	Art Chianello City of Bakersfield 1000 Buena Vista Road Bakersfield, CA 93311	Arthur R. Chianello, P.E. Water Resources Manager (661) 326-3715
Hydrogeologic Evaluation, Watershed-Scale Recharge Evaluation, and Groundwater Model Development	Ojai Basin Groundwater Management Agency P.O. Box 1779 Ojai, CA 93024	Jerry Conrow and/or Russ Baggerly, Board Members (805) 640-1207
Fox Canyon Groundwater Management Agency Development of Groundwater Budgets for Groundwater Sustainability Planning	Fox Canyon Groundwater Management Agency & Ventura Watershed Protection District 800 South Victoria Avenue Ventura, CA 93009-1610	Kim Loeb Groundwater Manager (805) 650-4083
Ambient Water Quality Recomputation for Santa Ana Watershed Groundwater Management Zones	Santa Ana Watershed Project Authority 11615 Sterling Avenue Riverside, CA 92503-4979	Mark Norton, PE, LEED AP ENV SP Water Resources & Planning Manager (951) 354-4221
Groundwater Modeling for Santee Basin Groundwater Recharge and Replenishment Project	Padre Dam Municipal Water District 9300 Fanita Parkway Santee, CA 92071	Arne Sandvik Engineer (619) 258-4643
Fillmore and Piru GMA (Tony Morgan professional reference)	N/A 4200 Timber Canyon Road Santa Paula, CA 93060	Gordon E. Kimball Fillmore and Piru GMA Stakeholder Director (805) 469-8815
UWCD Legal Council (Tony Morgan professional reference)	N/A 2801 Townsgate Road, Suite 200 Westalke Village, CA 91361	Anthony H. Trembley (805) 418-5328

5. Specialty Subconsultants

5.1. SUBCONSULTANT STAFF CAPABILITIES

As discussed above, DBS&A has engaged CCP, TEAM, Stillwater, and L&T as specialty subcontractors to support us through the duration of the contract. Each subcontractor's capabilities are described in detail below. Specific information requested in items 5.1 through 5.4 (i.e., staff capabilities, recent project experience, task and references) are integrated into Sections 1 through 4 above for ease of review.

CONSENSUS AND COLLABORATION PROGRAM

Established in 1992 as the Center for Collaborative Policy, the Consensus and Collaboration Program (CCP) is a fee-for-service, not for profit unit of the College of Continuing Education at California State University Sacramento.

CCP's mission is to build the capacity of Californians to use collaborative strategies to develop broadly supported, sustainable solutions to complex public policy challenges. CCP specializes in assessing, designing, and managing collaborative projects. Amongst many policy sectors that CCP serves, they are uniquely experienced in water resources having supported SGMA, the California Water Plan, Department of Water Resources (DWR) Water Use and Efficiency Program, the Drought Contingency Program, the Proposition 1 Water Storage Investment Program, the State Drinking Water Program, and the Irrigated Lands Regulatory Program.

CCP staff have exceptional content fluency in water policy. In this context, CCP has played a prominent role providing facilitation, mediation, governance, public engagement, and strategic advice services to support SGMA implementation. CCP has supported DWR and the SWRCB statewide public and tribal engagement to share information, receive input, and cultivate relationships throughout the state. Through DWR and SWRCB SGMA Facilitation Support Services (FSS) programs, CCP has served over 30 GSAs statewide, supporting local public agencies, water suppliers, and other key groups to design and develop formal governance structures and legal agreements, enhance coordination and communication, resolve conflicts, build collaborative problem solving organizations, engage a broad spectrum of stakeholders, and lead the public engagement for numerous Groundwater Sustainability Plans (GSP). No other organization in California has more comprehensive in-house experience implementing SGMA than CCP. Local GSA and GSP support experience includes:

- Owens Valley Basin GSA
- Siskiyou County – Shasta Valley Basin GSA
- Siskiyou County - Butte Valley Basin GSA
- Siskiyou County – Scott Valley Basin GSA
- Shasta County - Enterprise / Anderson Subbasins GSA
- Colusa County GSA and GSP (Colusa Subbasin)
- Glenn County GSA and GSP (Colusa Subbasin)
- East Butte Subbasin GSA
- West Butte Subbasin GSA
- Wyandotte Creek Subbasin GSA
- Vina Subbasin GSA
- Yolo County Subbasin GSA
- Sonoma Valley GSA and GSP
- Santa Rosa Plan GSA and GSP
- Petaluma GSA and GSP
- Ukiah Valley Basin GSA
- Santa Margarita Groundwater Agency GSP
- Stanislaus SGMA Regional Groundwater Coordinating Committee
- Madera Subbasin GSP
- Chowchilla Subbasin GSP
- Kern County Subbasin GSA and GSP
- Turlock Subbasin GSA
- Kaweah Delta Subbasin GSA

- Mid Kaweah GSA
- Paso Robles Subbasin GSA
- Soquel-Aptos Basin Groundwater Management Committee and GSA
- Santa Maria Basin GSA (adjudicated)
- Santa Clara River Valley East Subbasin GSA
- Upper Ventura River Basin GSA
- San Luis Rey / Pauma Valley Basin GSA
- San Diego River Valley Basin GSA
- Borrego Valley Basin GSA and GSP

In addition to the above local GSA and GSP experience, CCP staff were advisors during the initial authoring of the law, with a specific invited focus on governance. CCP has provided a vast and successful range of SGMA support including subject matter expertise about the statute, outreach and engagement, conflict resolution governance design, and similar. CCP has supported almost all statewide public engagement for DWR and SWRCB in the implementation of:

- Initial statewide SGMA Information Sessions,
- the Basin Boundary Modification process,
- Basin Reprioritization,
- the Development of GSP Regulations, and
- the Fee Assessment Program.

CCP has designed and facilitated various SGMA training workshops for DWR and the Groundwater Resources Association (GRA) including GRAs Webcast SGMA series, the GRA Contemporary Groundwater Issues Council (of which Mr. Ceppos is also the public engagement representative specialist), and the recent Groundwater Sustainability Planning Workshop held as part of the GRA/DWR GSA Summit. Mr. Ceppos, CCP's SGMA Program Manager is a frequent guest lecturer and state-recognized SGMA expert, particularly regarding governance, implementation and stakeholder / beneficial user engagement. He has been a co-author of numerous academic journal articles regarding SGMA implementation, partnering with and published by Stanford University, University of California Agriculture and Natural Resources, and the Western Water Report.

TEAM ENGINEERING & MANAGEMENT, INC.

TEAM
ENGINEERING & MANAGEMENT, INC.
Bishop, California

was founded in 1987 in Bishop, California and has served clients in the Eastern Sierra and the Owens Valley for more than 30 years. TEAM is a woman-owned, California-Certified Small Business. TEAM's professionals, the majority of which are long-time residents of Inyo and Mono Counties, provide a range of environmental, technical, engineering, and management consulting specialties. The firm's projects have included numerous groundwater monitoring projects in the Eastern Sierra, including projects for Inyo County, Mono County, Tri-Valley Groundwater Management District, Great Basin Unified Air Pollution Control District, Coso Operating Company, and Crystal Geyser Roxane. With a qualified and diverse staff located in Bishop and the Owens Valley, TEAM is uniquely positioned to add value and efficiency to a team of professionals for support to the Owens Valley Groundwater Authority and Inyo County for compliance with SGMA. TEAM will provide a local office and as-needed support to DBS&A as a key subcontractor for the preparation of the GSP. TEAM's vast experience with groundwater monitoring projects and land use in the Owens Valley and surrounding areas, as well as its understanding of the multiple stakeholders and unique jurisdictional relationships in the area, will provide significant value to the project team.

STILLWATER SCIENCES

Stillwater Sciences

Stillwater Sciences is a 65-person scientific consulting firm with specialists in geology, hydrology, engineering, aquatic and terrestrial biology, wetland and restoration ecology, water quality, and spatial analysis. Stillwater specializes in science-based technical approaches to water resource management and has been conducting hydrologic, geomorphic, riparian, and ecological studies for over 20 years. Their diverse expertise in watershed and river restoration includes decades of practical experience integrating hydrologic, geomorphic, riparian, and fisheries sciences throughout the western US. Stillwater's scientists have been actively engaged in evaluating hydrologic and

geomorphic characteristics of groundwater basins throughout California river systems, and provide a keen insight on habitat linkages to the overall aquatic ecosystem, including sensitive species and habitats. Stillwater staff use a combination of field data collection, field- and GIS-based modeling methods, and an array of analytical methods to help with issues such as project orientation and conceptual model development, determination of current site conditions, interpretations of past and predictions of future site conditions, and interdisciplinary problem-solving and project planning. Stillwater is leveraging this experience to understand the impacts of groundwater management on groundwater-dependent ecosystems (GDEs) throughout California. Stillwater's physical scientists routinely help answer client questions related to erosion risk assessment, regional planning, engineering design, landscape evaluation, restoration and mitigation opportunities, endangered species assessment, and clean water directives in support of basin-scale water resource management for water agencies and utilities. In addition to targeted field studies in the Tuolumne, Merced, Napa, Santa Clara, Sacramento, and San Joaquin rivers evaluating hydrologic impacts on riparian vegetation and aquatic species habitat, prey availability, and predation, Stillwater scientists played a key role in developing restoration objectives and strategies to support resilient hydrologic and ecological functions in the San Joaquin River downstream of Friant Dam as a precursor to the San Joaquin River Restoration Program, including analyses of riparian habitat establishment and groundwater resources, and in developing a monitoring and mitigation crediting system after Program implementation.

LECHOWICZ & TSENG MUNICIPAL CONSULTANTS

LECHOWICZ + TSENG
MUNICIPAL CONSULTANTS

Lechowicz & Tseng Municipal Consultants (L&T) is a women-owned, small business founded by Alison Lechowicz and Catherine Tseng. Areas of expertise include: financial plans, utility rate and fee studies, impact fee/capacity charge studies, public approval process, utility appraisal, and expert witness.

Ms. Lechowicz and Ms. Tseng have extensive experience assisting public agencies with Proposition 218 and 26 utility rate and fee studies. In response to SGMA, L&T are working with sustainability agencies to adopt groundwater management fees. Their experience includes utility rate setting, SGMA fees, special assessments, and the public approval process.

5.2. SUBCONSULTANT RECENT EXPERIENCE

Detailed project descriptions of recent work experience completed by our subconsultant team members are in Appendix B.

5.3. SUBCONSULTANT TECHNICAL

DBS&A has integrated the scope, not-to-exceed budget, schedule, labor category task breakdown, and assumptions associated with our subconsultants into Section 3 above. Inyo County and OWGA can expect a similarly seamless integration of DB&A's team work throughout the GSP process.

5.4. SUBCONSULTANT REFERENCES

Project	Owner	Reference
CCP		
Working with Meagan Wylie and Dave Ceppos	Borrego Water District	Geoff Poole General Manager (760) 767-5806
Working with Dave Ceppos	Colusa Groundwater Authority	Mary Fahey Program Manager (530) 383-4625
Working with Meagan Wylie and Dave Ceppos	Department of Water Resources	Mr. Peter Brostrom Water Use and Efficiency Program (916) 651-7034
TEAM		
Groundwater and Surface Water Monitoring and Reporting For The Hay Ranch Hydrologic Monitoring and Mitigation Plan, Rose Valley, Inyo County	Coso Operating Company	Chris Ellis Site Manager (760) 764-1300 x207
Lake and Streambed Alteration Agreement for Routine Maintainance Activities by the Inyo County Road Department, Inyo County Public Works	Inyo County Public Works	Ashley Helms Inyo County Public Works (760) 878-0200
Inyo County Landfill Monitoring and Reporting Services, Inyo County Recycling and Waste Management	Inyo County Recycling and Waste Management	Richard Benson, Assistant County Administrator (661) 706-7080 Fred C. Aubrey, Solid Waste Supervisor (760) 873-5577 Jerry Oser, Environmental Health Department (760) 873-7866
Stillwater		
Fish Slough Aquatic Habitat Restoration and Native Species Monitoring	California Department of Fish and Wildlife	Steve Parmenter Senior Environmental Scientist (760) 872-1123
Feasibility Study for a Water Transaction Program in the California Walker River Basin	Shannon Peterson, Ltd	Shannon Peterson Ciotti (541) 973-5608

Project	Owner	Reference
Santa Clara River Parkway Floodplain Restoration Feasibility	California Coastal Conservancy	Peter Brand Project Manager (retired) (510) 520-3018
Instream Flows for a Semi-Arid Stream	California Ocean Protection Council and California Department of Fish and Game	Michael Bowen Project Manager, California Coastal Conservancy (510) 286-0720
L&T		
SGMA Groundwater Fee Study	Kings River East Groundwater Sustainability Agency	Chad Wegley General Manager, Alta ID (559) 471-9852
SGMA Groundwater Fee Study	McMullin Area Groundwater Sustainability Agency	Janelle Kratigger Legal Counsel (916) 447-2166

6. Meeting Deadlines on Similar Projects

DBS&A completes and submits 200 to 300 regulatory deadline-driven reports and planning documents every year and we maintain a 99% on-time submission rate. In all, we have submitted an estimated 7,000 total project documents to meet regulatory deadlines. We are diligent about meeting deadlines on behalf of our clients because we understand their importance in:

- Maintaining the client's and our own regulatory credibility
- Retaining the client's access to deadline-dependent funding mechanisms
- Avoiding fines or penalties for the client (in the worst case).

Some of the typical circumstances that cause project schedules to slip are overdue external reviews of draft documents by regulators or stakeholders, and weather, site access, or unexpected site conditions that delay field work. We have come to expect these delays and build extra time into project schedules as contingency.

For projects like the development of the GSP for OVGA, we prepare a detailed work plan to outline project requirements. This plan divides the work to be accomplished into manageable, coherent work elements (tasks). For each element, the requirements, schedules, milestones, and budgets are established to be compatible with the overall project objectives and funding. These plans have proven to be important in accomplishing the work required on time by allowing team members, especially subconsultants, see how their tasks fit into the overall schedule.

Examples of similar projects that were completed on-time are below, including a summary of our approach to maintain control of the project schedule or expedite completion when needed.

PROJECT	DEADLINE STATUS	APPROACH TO MAINTAIN PROJECT SCHEDULE
Rose Valley Groundwater Model	On time	♦ Regularly reviewed project progress and solicited input from Inyo County to ensure approach continued to meet Inyo County expectations ♦ Performed early quality assurance on analytical procedures and calculations ♦ Segmented analytical components; delegated each task to the most qualified technical staff to efficiently complete tasks in unison, before compiling the results
Safe Yield Study – Santa Paula Groundwater Subbasin	On time	♦ Communicated with stakeholders early in the process to gain consensus on methodologies for calculations and basis for assumptions ♦ Requested receipt of singular set of consolidated, written comments on draft documents ♦ Engaged specialty subconsultants with technical and/or geographic advantages

PROJECT	DEADLINE STATUS	APPROACH TO MAINTAIN PROJECT SCHEDULE
Fox Canyon Groundwater Management Agency Development of Groundwater Budgets for Groundwater Sustainability Planning	On time	♦ Identified data gaps and addressed unreliable sources early ♦ Redirected and allocated additional resources to compensate for schedule deviations ♦ Obtained data from multiple stakeholder sources, presenting requests in an efficient, organized fashion very early in the process; followed up frequently ♦ Worked with client to set well-defined goals and developed mutual understanding of definitions and action plan for achieving success; communicated action plan to all stakeholders

Resources

With access to a large number of technical staff members throughout the GLA companies, we are able to reallocate resources as necessary to provide additional support or specialized expertise.

COMPANYWIDE RESOURCES	STAFF
Hydrologists/Hydrogeologists	53
Environmental Scientists	13
GIS/CADD/Database	14
Biologists	2
Geologists	38
Engineers	57
Laboratory and Field Technicians	39
Other	29
Total	245

7. COI Disclosure

DBS&A has no financial, business or other relationships with the OVGA or any OVGA member(s) or the LADWP that may have an impact upon the outcome of the selection process of this project. In the interest of full transparency, the founder of our subconsultant, TEAM, is a CSD Board member.

8. Contract Acceptance

DBS&A is able to enter into County of Inyo Standard Contract No. 118 (Attachment 1).

Tony Morgan, P.G., C.HG.

Vice President/Principal Hydrogeologist/Market Leader, Water Planning and Development

EDUCATION

M.A., Geology (Quaternary Geology Specialization with Hydrogeology and Geotechnical Engineering Minors), Indiana University, 1984

B.S., Geology (Specialization in Hydrogeology and Quaternary Geology), Indiana University, 1979

PROFESSIONAL REGISTRATIONS

Professional Geologist, California, No. 4178

Certified Hydrogeologist, California, No. 159

PROFESSIONAL AFFILIATIONS

American Ground Water Trust, Board of Directors, 2008-present

National Ground Water Association, Member, 1985-present, NGWA/ANSI Water Well Construction Standard Development Committee

Groundwater Resource Association of California, Member, 2001-present, Central Coast Branch – President, 2011-2017

Mr. Morgan has nearly 40 years of experience in water supply, water management, and hydrogeological programs for municipal, industrial, and agricultural applications. Over his career as a consultant and, recently the Deputy General Manager of a California water district, he has been involved in a broad range of projects related to groundwater supply development and management. In recent years, Mr. Morgan has gained expertise in Sustainable Groundwater Management Act (SGMA) compliance, including formation of Groundwater Sustainability Agencies (GSAs), creation of Groundwater Sustainability Plans (GSPs), and conducting groundwater basin studies.

Mr. Morgan has developed, performed or provided oversight for: basin-wide groundwater elevation and water-quality monitoring programs; basin-scale hydrostratigraphic models; surface geophysical (e.g., CSAMT, TDEM, resistivity, and gravity) exploration programs; acquisition and interpretation of borehole geophysical logs; basin-scale groundwater flow models; evaluation of water-quality data for potable and irrigation suitability; siting and design of new potable and irrigation water supply wells; and aquifer replenishment activities (i.e., surface water diversions, spreading basins).

He is also experienced with administrative/management activities, including: development of scopes, specifications, and budgets; contract negotiations with subcontractors and clients; management of multi-disciplinary teams; project management to accomplish technical, schedule, and fiscal guidelines; and administrative/personnel management.

South Oxnard Plain Brackish Water Treatment Plant, Ventura County, California
Project leader for feasibility study to extract and treat up to 28,000 acre-feet/year of groundwater impaired by seawater intrusion to supplement irrigation and potable water uses on Oxnard Plain and provide an engineered solution to existing and future seawater intrusion. Feasibility study confirmed that the project was technically feasible and cost comparable (e.g., municipal recycled water) or less expensive (e.g., seawater desalination) than other major water supply projects.

Fillmore-Piru Basin Water Banking Program, Ventura County, California
Project lead for the conceptualization of and feasibility evaluations of the enhanced conjunctive use of the Fillmore and Piru groundwater basins as a water bank to mitigate groundwater level fluctuations in these basins and provide supplemental water supplies to other basins in Ventura County. Project expected to develop 50,000-100,000 acre-feet of storage depending on management strategies.

Recycled Water, Ventura County, California
Project lead for the evaluation of alternatives for the expanded use of recycled water from the City of Oxnard's Advanced Water Purification Facility, as well as Conejo Creek flows for agricultural irrigation and/or managed aquifer recharge uses.

Anacapa Project, Ventura County, California
Project director for feasibility study to capture groundwater flow moving offshore in aquifers that extend beneath the seafloor and use those waters as supplemental supplies for irrigation or potable purposes or as part of a managed aquifer recharge effort.

Groundwater Sustainability Agency (GSA) Joint Powers Authority Formation Negotiation Committee, Ventura County, California
Local agency representative for the negotiations with County of Ventura, City of Ventura, Mound Basin AG Water Group, and environmental stakeholders to form the JPA that elected to become the GSA in the Mound basin. Similarly, served as chief negotiator with County of Ventura, City of Fillmore, Fillmore Basin Pumpers Association, Piru Basin Pumpers Association, and environmental stakeholders for creation of JPA that became the GSA for the Fillmore and Piru basins.

Lead Technical Representative to Fillmore and Piru Basins GSA (FPBGSA), Ventura County, California
Served as lead technical staff to FPBGSA Board of Directors. Worked with Clerk of the Board to create Agency meeting agendas and staff reports. Provided guidance to Board of Directors on Agency formational issues, SGMA compliance steps, preparation of successful Prop 1 GSP grant application ($1.5 million grant award) and Groundwater Sustainability Plan preparation strategies.

Local Agency Representative to Fillmore and Piru Basins GSA & Mound Basin GSA, Ventura County, California
Local water agency stakeholder representative to these GSAs.

Local Agency Representative to Multi-Agency Team, Ventura County, California
Team met with California Department of Water Resources (DWR) to re-assess the "overdrafted" status of several groundwater basins in Ventura County. Successfully negotiated the removal of Piru, Fillmore, Mound, and Las Posas basins from "overdrafted" condition classification.

SGMA Technical Advisory Group (TAG) – Fox Canyon Groundwater Management Agency (FCGMA), Ventura County, California
Appointed by the United Water Conservation District representative on the FCGMA Board of Directors to the Agency's SGMA Technical Advisory Group. The TAG advises the Board of Directors on technical aspects of the four Groundwater Sustainability Plans currently under development.

SGMA Groundwater Dependent Ecosystems (GDEs) Guidance Framework, The Nature Conservancy and Department of Water Resources, California Statewide
Served on a subcommittee of the Fox Canyon GMA SGMA Technical Advisory Group that worked with The Nature Conservancy and DWR to develop a guidance manual for the identification, evaluation, and consideration of Groundwater Dependent Ecosystems

SGMA Water Supply Augmentation Project Ad Hoc Committee, Ventura County, California
Served on a subcommittee of the Fox Canyon GMA SGMA Technical Advisory Group that is working to identify water supply augmentation projects for consideration in the Groundwater Sustainability Plans.

Santa Paula Basin Technical Advisory Committee (TAC), Ventura County, California
Local agency representative to committee that oversees adjudication of basin. Participated in various technical activities such as safe yield determinations, review of water level and water quality trends, preparation of Annual Reports for submittal to Court and Annual Adjudicated Basin reports to California Department of Water Resources (DWR).

Sea-Water Intrusion Evaluation, Ventura County, California
Project director for time domain electromagnetics (TDEM) survey to estimate the areal extent of sea-water intrusion in the multi-aquifer system of the south Oxnard Plain.

Oxnard Plain Forebay Surface Geophysical Exploration Project, Ventura County, California
Project director for time domain electromagnetics (TDEM) survey to refine hydrostratigraphy of Forebay sub-basin. Survey provided information on previously unidentified faults and areal limits of major aquitard separating Upper Aquifer System and Lower Aquifer System.

Santa Paula-Mound-Forebay Basin Boundary TDEM Surface Geophysical Survey, Ventura County, California
Project director for time domain electromagnetics (TDEM) survey to provide data on subsurface conditions that may affect groundwater flow at the boundary of these basins.

High-Resolution Seismic Reflection Survey, Ventura County, California
Supervised a high-resolution seismic reflection survey on the south Oxnard Plain to determine if stratigraphic geometries were influencing sea-water intrusion migration pathways.

Groundwater Flow Model Development, Ventura County, California
Oversaw Phase 1 of the creation of a new groundwater flow model for United Water Conservation District. Phase 1 included development of hydrostratigraphic basin conceptual model, as well as the creation and calibration of a MODFLOW-NWT flow model for the Oxnard Plain, Pleasant Valley, Mound, and West Las Posas basins. Phase 2 incorporates extension of the model into the Santa Paula, Fillmore, and Piru basins where the process of creating the hydrostratigraphic model is underway.

Hydrostratigraphic Evaluation of Harper Dry Lake area of Harper Lake basin, San Bernardino County, California
Project lead for development of hydrostratigraphic model for use in constructing a groundwater flow model in support of the Abengoa Harper Lake Solar Project. Field surveys included collecting surface geophysical data (i.e., Controlled Source Audio Magnetotellurics-CSAMT, gravity) and limited field mapping. Hydrostratigraphic model incorporated surface and borehole geophysical data, review of existing well logs, and field mapping. Groundwater flow model (MODLFOW) constructed to estimate project water supply impacts on basin resources.

Pauma and Pala Groundwater Basins, San Diego County, California
Lead hydrogeologist for surface geophysical surveys in Pauma and Pala Groundwater basins. Surveys included the use of resistivity, gravity, and Controlled Source Audio Magnetotellurics (CSAMT) to evaluate the potential for developing additional groundwater supplies from areas with thicker alluvium and/or underlying fractured bedrock.

Antelope Valley Water Bank Feasibility Evaluation, Los Angeles County, California
Project Hydrogeologist for areal screening program to evaluate suitability of areas for construction of spreading basins. Screening techniques included exploratory backhoe excavations, CPT probes, and test holes. Assisted in the testing of a pilot-scale recharge basin and monitoring of groundwater levels and wetting front downward migration using recurring neutron borehole surveys.

Potable Water Supply Well Design and Installation, Ventura County, California
Lead hydrogeologist for installation, design, and development of two water supply wells at the United Water Conservation District El Rio facility. Final well extraction rates were 150% of the target design quantity.

Potable and Irrigation Water Supply Well Siting Design, and Installation, Various Locations
Lead hydrogeologist for Layne Christensen Company / Layne GeoSciences Division well design team responsible for siting, design, installation, and development of irrigation and potable water supply wells at locations throughout the western U.S.

High-Level Radioactive Waste Repository Siting, Various Locations
Performed geological analyses to evaluate the suitability of Gulf Coast salt domes, bedded salt deposits, and southern Appalachian crystalline rock masses for use as repositories for high-level radioactive waste disposal or monitored retrieval storage. Prepared technical evaluations (e.g., rates of salt diapirism, fracture propagation at depth) for U.S. Department of Energy.

Intercontinental Ballistic Missile Launch Site Evaluations, Nevada-Utah
Performed geologic, hydrogeologic, and aggregate source studies in rural valleys of Nevada and Utah being considered for potential construction of MX missile launch facilities by U.S. Department of Defense - Air Force.

Groundwater and Water Resource Advisory Committees

Watershed Coalition of Ventura County, Ventura County, California
Local water agency representative to the Coalition Steering Committee.

Santa Clara River Watershed Committee, Ventura County, California
Local water agency representative to SCRWC. Contributor to Integrated Regional Water Management Plan (IRWMP).

Association of California Water Agencies (ACWA), Groundwater Committee, Statewide
Local water agency representative to the Groundwater Committee. Assisted Groundwater Committee with review of proposed SGMA language and DWR Best Management Practices (BMPs).

Additional Professional Affiliations

National Ground Water Association, Well Siting and Sampling Task Group, Screens and Intakes Task Group

Association of California Water Agencies, Groundwater Committee, 2010-present

American Water Works Association

Watersheds Coalition of Ventura County, Steering Committee, 2014-2018

Santa Clara River Watershed Committee, United Water Conservation District representative, 2015-2018

California State University-San Bernardino, Dept of Geological Sciences, Professional Advisory Board, 2010-present

Additional Professional Training

OSHA Hazardous Waste Operations and Emergency Response Training (40-Hour), 1987

OSHA HAZWOPER Annual Updates 1987-2008

OSHA Site Safety Supervisor Training for Hazardous Waste Operations (8-hour course), 1989

Technical Assistance Team (TAT) and Emergency Response Training (16-hour course), 1988

Paleoseismicity and Active Tectonics, Geological Society of America Short Course, 1987

Archaeological Geology: Environmental Siting and Material Usage, Geological Society of America Penrose Conference

Publications and Presentations

Morgan, Tony, 2018, The Unknown Unknowns: Things You Learn Preparing a GSP at The First Annual Western Groundwater Congress, Groundwater Resource Association of California, Sept 2018 (abstract accepted).

Morgan, Tony, 2018, Adaptive Management – Operating Under Unknowns at The First Annual Groundwater Sustainability Agency Summit, Groundwater Resource Association of California, June 2018 (invited panelist).

Morgan, Tony, 2018, Stormwater and Ground Water Conjunctive Use in the Santa Clara River Valley at Everything Aquifers and Groundwater Management, Association of Ground Water Agencies and American Ground Water Trust, Feb 2018 (presentation).

Morgan, Tony, 2017, What's in the tank at Countdown to Sustainability: A Forum on Ventura County's Progress Toward SGMA Implementation sponsored by Farm Bureau of Ventura County, Ventura County Watershed Protection District and Watershed Coalition of Ventura County, Nov 2017 (presentation).

Moore, Tim, Dan Detmer, Tony Morgan, John Lindquist, 2017, Santa Paula-Mound-Forebay Basin Boundary TDEM Geophysical Survey in Ventura County, California, Groundwater Resource Association of California, October 2017 (poster).

Kuepper, Kathleen, Dan Detmer, John Lindquist, Tony Morgan, 2017, Groundwater Monitoring Protocols for Seawater Intrusion – Example of Challenges and Experiences in a Coastal Groundwater Basin, Groundwater Resource Association of California, October 2017 (presentation).

Lindquist, John, Jason Sun, Tony Morgan, Dan Detmer, 2017, Minimum Thresholds, MODFLOW, and Sustainable Yield – Example of Model Application in a Coastal Groundwater Basin, Groundwater Resource Association of California, May 2017 (presentation).

Morgan, Tony, 2017, SGMA Implementation Flexibility and Adaptability – Examples from Ventura County, California Irrigation Institute 55th Annual Conference, Managing our Water Checkbook: Solutions for a Balanced Bottom Line, Jan 2017 (presentation).

Morgan, Tony, 2017, GSP-Lite: Using a Groundwater Flow Model to Approximate Sustainable Yields for Oxnard Plain and Pleasant Valley Groundwater Basins, Coast Geological Society, Jan 2017 (presentation).

Morgan, Tony, 2016, Groundwater Manager's Perspective, Drought Response Workshop, California Department of Water Resources, Southern California Water Committee, and National Water Research Institute, May 2016 (panel presentation).

Miller, Richard, William Black, Martin Miele, Tony Morgan, Julian Ivanov, Shelby Peterie, and Yao Wong 2016, High- Resolution Seismic Reflection to Improve Accuracy of Hydrogeologic Models in Ventura County, California, USA, The Leading Edge, V. 35, Issue 9, pg. 776-785.

Morgan, Tony, 2016, A Historic Drought and Groundwater Management Legislation: Can We Regulate our Way to Sustainability, Coast Geological Society, March 2016 (presentation).

Morgan, Tony, 2016, SGMA Compliance: Full Speed Ahead…Sort Of - Lessons from Ventura County, Overview of Current Groundwater Management Efforts in Ventura County, Association of Ground Water Agencies and American Ground Water Trust, Feb 2016 (presentation).

Morgan, Tony, 2016, Sustainable Groundwater Management Act Workshop, Fillmore-Piru Basins Groundwater Pumpers Associations, January 2016 (presentation).

Melissa Rohde, Sally Liu, Kirk Klausmeyer, Jeanette Howard, Bryan Bondy, and Morgan, Tony, 2016, A Guidance Framework for Considering Groundwater Dependent Ecosystems under SGMA: A Case-Study from Ventura County, Developing Groundwater Sustainability Plans for Success, Groundwater Resource Association of California, June 2016 (poster presentation).

Jason Sun, Dan Detmer, Tim Moore, John Lindquist, and Morgan, Tony, 2016, Development of a Numerical Model for Sustainable Groundwater Management in Ventura County, California, Groundwater Models and Data, Groundwater Resource Association of California, February 2016 (poster presentation).

Morgan, Tony, 2016, Where Will We Find the Water, Water Market Solutions for California Water Issues, American Ground Water Trust, April 2016 (presentation).

Morgan, Tony, 2014, Surface and Borehole Geophysics as Tools for Groundwater Resource Management – Recent Experiences from Ventura County, Inland Geological Society, Mar 2014 (presentation).

Morgan, Tony, 2013, 80+ Years of Aquifer Replenishment in Ventura County, Association of California Water Agencies, Regulatory Summit, August 2013 (presentation).

Morgan, Tony, 2013, Dynamic Well Profiling – Optimizing Well Performance in High Resolution Tools and Techniques for Optimizing Groundwater Extraction for Water Supply, Groundwater Resources Association of California, June 2013 (presentation).

Morgan, Tony, 2013, E-Logs, Driller's Logs, and GeoWizardary: Recent Developments in the Hydrostratigraphy of the Oxnard Plain, Pleasant Valley and Forebay Groundwater Subbasins, Ventura County, California, Coast Geological Society, April 2013 (presentation).

Additional project experience, references, and 60 additional publications or presentations available upon request.

Stephen J. Cullen, Ph.D., P.G.

Principal Hydrogeologist

EDUCATION

Ph.D., University of California at Santa Barbara, 1996

Dissertation title: Field and Laboratory Investigations of Contaminant Natural Attenuation and Intrinsic Remediation in Soils and the Vadose Zone

M.Sc., Soil Physics, Montana State University, 1981

B.Sc., Soil Science and Hydrology, University of California at Davis, 1977

PROFESSIONAL REGISTRATIONS

California Professional Geologist, No. 7399

Certified Environmental Manager, State of Nevada, No. 1839

Certified Professional Soil Scientist, Reg. No. 03169,

PROFESSIONAL AFFILIATIONS

Board of Directors, American Groundwater Trust

Member, Groundwater Resources Association of California

Dr. Cullen is a Principal Hydrogeologist with more than 40 years of experience. Areas of expertise and experience include vadose zone hydrogeology, conceptual model development, recharge assessments, watershed studies, groundwater studies to support sustainable planning for compliance with the California's Sustainable Groundwater Management Act (SGMA), conjunctive use, and vadose zone and groundwater flow and transport modeling. He has provided expert opinions and testimony in state and federal court, before the California State Water Resources Control Board (SWRCB), and on expert technical panels for the U.S. DOE and U.S. EPA.

Sustainable Safe Yield Study, Santa Paula Groundwater Subbasin, United Water Conservation District, Santa Clara River Watershed, Ventura County, California. Principal Hydrogeologist, Technical Reviewer. Updated the safe yield of the Basin. Recharge assessment addressed by use of an advanced watershed model, the Distributed Parameter Watershed Model (DPWM), to account, in part, for surface water/groundwater interaction. Assessed surface water/groundwater interactions through comparison of installed groundwater piezometer and well data to nearby stream gauging data. Evaluated impact of groundwater seeps on Santa Paula Creek flow.

Groundwater Sustainability Plan Groundwater Balances, Fox Canyon Groundwater Management Agency, Ventura County, California. Principal Hydrogeologist. Developed groundwater budgets for the Oxnard, Pleasant Valley, Arroyo Santa Rosa, and Las Posas Basins for SGMA compliance. Coordinated with Technical Advisory Group and stakeholders to finalize groundwater basin water budgets and reconcile with independently-developed numerical model.

Groundwater Budget and Groundwater Management Plan, Upper and Lower Ventura River Basin, Ventura County Watershed Protection District, Ventura, California. Principal Hydrogeologist, provided oversight and quality assurance for a Ventura River subbasins groundwater budgets. A primary focus of the project recharge assessment was quantification of the exchange of water between surface water and groundwater in the upper and lower subbasins.

Coupled Watershed/Surface Water/Groundwater/Water Quality Numerical Model for the Ventura River Watershed and Groundwater Basin, California State Water Resources Control Board. Principal Hydrogeologist & Technical Reviewer. Currently, developing an integrated surface water/groundwater model (GSFLOW-based) of the Ventura River watershed for evaluation of management options to increase instream flows and reduce nutrient impacts associated with a TMDL regulation.

Numerical Groundwater Flow Model Design, Ojai Groundwater Basin, Ojai Basin Groundwater Management Agency, Ojai, California. Principal, Technical Review and Quality Assurance. Developed basin-scale groundwater model using MODFLOW-SURFACT. Model calibration included transient effects of recharge, groundwater pumpage, and surface water-groundwater interactions. A DPWM was applied to parameterize the groundwater

recharge to the groundwater flow model. Model will be used by the agency for groundwater management planning and to understand impacts of various climate and groundwater withdrawal scenarios, including long-term drought.

Hydrologic Characterization and Groundwater-Surface Water Budget for Newport Bay Watershed, Orange County, California. Principal Hydrogeologist, Technical Reviewer and Oversight for watershed-scale assessment of selenium loading to surface channels leading into Newport Bay. Project included historic document compilation and review, identification of sources and sinks for surface water and groundwater flow, evaluation of large regional databases, watershed modeling, contaminant transport evaluation, stakeholder presentations and coordination, identification of data gaps and recommendations to control selenium loading to Newport Bay. Results will be used to develop approaches for compliance with a Newport Bay selenium total daily maximum load (TMDL).

Hydrologic Characterization and Groundwater-Surface Water Budget for Big Canyon Watershed, City of Newport Beach, California. Principal Hydrogeologist, Technical Reviewer and Oversight for project including hydrogeologic characterization, stream gaging, recharge and infiltration modeling, groundwater flux and flow mapping, selenium flux assessment, and water balance development. The goal is to meet selenium and nitrogen TMDL requirements.

Water Balance and Hydrologic Analysis, Kern River Environmental Impact Report, City of Bakersfield, California. Quantitative evaluation of groundwater impacts to result from planned increased Kern River flows through the City of Bakersfield. The 118-year historical record of upstream Kern River flow and water balance modeling was used to project stream channel losses, on eight reaches, due to evapotranspiration, diversion, and infiltration, and to evaluate how far down-river flows of various planned magnitudes will reach. A numerical groundwater flow model was used to quantify impacts of surface water losses on groundwater levels, gradients, flow to municipal well fields, and the impacts of alternative groundwater pumping.

Investigation of Aquifer Connectivity and Sources of High Level Total Dissolved Solids Impacts to Deep Groundwater, Basic Management, Inc., Henderson, Nevada. Principal Hydrogeologist. Evaluated source of high concentrations of TDS using analysis of bomb tritium and oxygen and hydrogen stable isotopes to demonstrate that deep TDS was not anthropogenic but rather the result of deep groundwater dissolving paleo-evaporitic deposits. Evaluated Site historic operational history, hydrostratigraphy, lithology, mineralogy, comparison of aquifer geochemistry, industrial chemical tracers, aquifer vertical gradients, and analytic groundwater flow modeling.

Updated Water Master Plan, Big Bear City Community Services District, Big Bear, California. Principal Hydrogeologist. Evaluated long-term groundwater recharge potential to the Big Bear Valley watershed. Constructed watershed-scale recharge model using the DPWM. Evaluated prior efforts by USGS and private consultants, updated the watershed conceptual model, including identification of previously unrecognized basin surface water discharge features. Managed civil engineering and hydraulic modeling team partners to develop a master plan that addressed current supply, current hydraulic conveyance systems and infrastructure, land use and water demand, system analysis, and recommended capital improvements.

RiverPark Recharge Basins Hydrogeologic Feasibility Study, United Water Conservation District, Santa Paula, California. Principal Hydrogeologist for hydrogeologic analysis of potential spreading of Santa Clara River water via recharge basins. Scope includes: literature research regarding projects with similar site attributes; regulatory research to determine potential regulatory hydraulic and water quality constraints; compilation, review, and analysis of site and basin historical data, analytic modeling; impact assessment of spreading water; evaluation of monitoring approaches; recommendations for future work.

Additional project experience and references available upon request.

T. Neil Blandford, P.G.

Principal Hydrogeologist

EDUCATION

M.S., Hydrology,
New Mexico Institute of Mining and Technology, 1987

B.A., Environmental Science,
University of Virginia, 1984

PROFESSIONAL REGISTRATIONS

Professional Geoscientist,
Texas, No. 1034

Mr. Blandford specializes in water supply investigations and water rights analysis, numerical simulation of groundwater flow and contaminant transport, water planning and sustainability analysis, computation of the effects of groundwater pumping on surface water, source water determinations, well field design and expert testimony.

Update and Recalibration of Rose Valley Groundwater Model for Permit Evaluation, County of Inyo, California

Principal Investigator for comprehensive update and recalibration of an existing groundwater flow model in accordance with Mitigation Monitoring and Reporting Program of Conditional Use Permit 2007 003. Updates included conducting a basin-wide recharge estimate, refinement of the model grid and boundary conditions, improved calibration to historical water levels, and consideration of historical stresses on the basin (Haiwee Reservoir construction and pumping for irrigation) from 1915 through 2010. The updated model was used to reevaluate future pumping amounts and associated drawdown trigger levels at monitor wells that could occur without exceeding the allowable reduction in groundwater outflow to Little Lake. The model and associated predictions have been updated multiple times as part of the adaptive management approach implemented under the permit.

Evaluation of Groundwater Modeling for Santee Basin Groundwater Recharge and Replenishment Project, Padre Dam Municipal Water District, Santee, California

Principal Investigator for hydrogeologic evaluation and feasibility modeling of indirect potable reuse (IPR) project. Effort included development and evaluation of multiple implementation scenarios, simulation of IPR water injection and extraction, interaction of surface water and groundwater, computation of residence time to meet state regulations and identification of critical flaws. Provided recommendations on aquifer testing and well design.

Little Colorado River Adjudication, The Hopi Tribe, Hopi Indian Reservation, Arizona

Serving as groundwater hydrology expert representing the Hopi Tribe in litigation and settlement negotiations regarding groundwater and surface-water resources under past and future conditions. Tasks have included evaluation of groundwater resources for multiple aquifer systems, development of aquifer management plans and concepts, providing guidance regarding production well placement and expected long-term yield, developing predictions of the effects of groundwater pumping on aquifer conditions and surface water flows (streams and springs), development of groundwater flow models and utilization of multiple existing groundwater models, and expert testimony.

Blaine Aquifer System Brackish Groundwater Analysis, Texas Water Development Board, North-Central Texas
Project Manager for the assessment and evlaution of the fresh and brackish groundwater resources of the Blaine Aquifer system in north-central Texas. The aquifer system encompasses a region of about 10,000 square miles and is the sole source of supply for numerous communities, agriculture and industry. Project involved geologic and hydrogeologic mapping of aquifer units and production intervals, determination of groundwater quality, evalaution of the effects of potential well fields, and interaction with stakeholders.

Groundwater Resource Evaluation, Online Water Well Management System, and Water Well Inventory, University Lands, Midland, Texas
Principal-in-Charge for evaluation of multiple brackish aquifers underlying University Lands in west Texas. Project included database development, construction of three-dimensional geologic models, and hydrogeologic analysis of multiple aquifers, including production zones, expected well yield and water quality. The water well management system allows oil and gas operators and other University Lands leaseholders to apply for water supply well permits and upload completed water well information, such as well diagrams, geophysical logs, and water quality. GIS development for the groundwater resource evaluation included compiling data related to several thousand oil and gas geophysical logs, water well logs, and cable-tool driller reports obtained from University Lands, Texas Railroad Commission and the Bureau of Economic Geology well log libraries. Also compiled and mapped water levels, water quality, and water well production capacities.

Region O Water Plan, Llano Estacado Regional Water Planning Group and the High Plains Underground Water Conservation District, Lubbock, Texas
Principal-in-Charge for development of a 50-year regional water supply plan to meet drought-of-record demands for Region O. The plan includes evaluation of existing water supplies, identification of potentially feasible water management strategies, selection and detailed evaluation of selected strategies, and prioritization for selection of funding.

Simulation of Groundwater Flow for Aquifer Storage and Recovery Project Permitting, Cities of Rio Rancho and Albuquerque, Bernalillo County, New Mexico
Conducted numerical simulations of aquifer storage and recovery in support of State Engineer permitting requirements for multiple projects. Two projects involve injection wells and one project involves surface infiltration. Conducted analysis of effects of aquifer storage and recovery on surface water balance of the Rio Grande in conjunction with water right permit conditions.

Analysis of Municipal Water Supply Sources from the Southern Ogallala Aquifer, City of Lubbock, Texas
Project Manager and principal investigator for assessment of sustainability of the City's Bailey County well field and pumping groundwater from beneath the City to assist with meeting peak water demands. Ogallala aquifer water quality beneath the City was also considered, as was the contributing zone for proposed water supply wells. Project included the development of historical water level maps and other hydrogeologic analysis, along with development of detailed groundwater flow models for the City of Lubbock area and the Bailey County well field area. Study results were used by the City to make key water planning and sustainability decisions.

Expert Testimony Regarding Numerical Groundwater Flow Modeling and Evaluation of Salinity Encroachment, City of Alamogordo, Tularosa Basin, New Mexico
Provided expert review and testimony regarding evaluation of multiple groundwater flow models, then applied the model results to predict hydrologic effects of a proposed groundwater appropriation of 10,000 acre-feet per year by the City of Alamogordo. Also conducted an assessment and provided testimony regarding the potential for encroachment of saline groundwater due to pumping the well field, and effects of groundwater pumping on spring flow.

Municipal Well Field Development and Sustainability Analysis, Colorado River Municipal Water District, Ward County, Texas
Principal Investigator for due diligence analysis for a large water right purchase in Ward County, Texas. The water right purchase was followed by a program of test drilling, construction and aquifer testing of 21 high-capacity, raw water supply wells. The well field build-out was required to supplement existing groundwater supplies and was completed on a highly expedited schedule. A groundwater flow model was constructed to assist with well field operations, evaluation of well-field sustainability and water quality, and groundwater resources planning.

Development of Groundwater Availability Model for Southern Ogallala Aquifer, Texas Water Development Board, High Plains of Texas and New Mexico
Principal Investigator for development and application of numerical groundwater flow model for the Southern Ogallala aquifer in Texas and New Mexico, an area that exceeds 29,000 square miles. Project involved extensive data collection and incorporation into a numerical groundwater flow model using a geographic information system (GIS), model calibration and verification, presentation at public meetings, and detailed study documentation. The model was used by groundwater conservation districts, municipalities and other stakeholders to assist with water-supply planning efforts.

Water Rights, Hydrologic, and Environmental Analysis, Pueblo of Acoma, New Mexico
Conducted hydrologic water rights analyses, provided training on hydrologic issues and water resources, developed spring sampling plan, conducted detailed review and analysis of complex regional groundwater flow model, and assisted with development of water quality standards and water code.

Three-Dimensional Groundwater Flow Modeling, New Mexico Office of the State Engineer, Roswell, New Mexico
Participated in construction, calibration, and verification of multi-layer numerical model of Roswell Groundwater Basin to assist State Engineer with water rights adjudication and water resources planning. Modeling simulated impacts to Pecos River flows resulting from changes in groundwater pumping.

Public Supply Well Wellhead Protection, Southwest Florida Water Management District, Hernando County, Florida
Project Manager and Pprincipal Investigator for delineation of wellhead protection areas (WHPAs) for approximately 60 major public supply wells. Conducted methods comparison study using semi-analytical modeling, flowpath delineation, and three dimensional numerical groundwater flow modeling combined with three-dimensional particle tracking to delineate WHPAs. Presented final recommended WHPAs to Hernando County Board of County Commissioners and Southwest Florida Water Management District in a public hearing and incorporated them into the County's comprehensive Water Resource Protection Plan. District used results of comparative analysis to guide WHPA delineation efforts in other counties.

Saltwater Intrusion Modeling, St. Johns River Water Management District, Orange County, Florida
Project Manager and Principal Investigator in evaluation of regional groundwater resources using density-dependent groundwater flow and solute transport simulation techniques. Phases included development and calibration of regional, three-dimensional groundwater flow model (MODFLOW), delineation of WHPAs for major municipal supply wells, and cross-sectional and three-dimensional simulations of density-dependent groundwater flow and contaminant transport.

Joseph P. LeClaire, Ph.D.

Senior Scientist II

EDUCATION

Ph.D., Soil Science, University of California (Riverside), 1985

B.A., Chemistry (specialization in Earth Science), University of California (San Diego), 1980

PROFESSIONAL AFFILIATIONS

Groundwater Resources Association of California

Sigma Xi - The Scientific Research Society of North America

Dr. LeClaire has over 34 years of professional experience in water resources and environmental engineering. He has demonstrated success in managing large, multi-disciplinary projects and in working with stakeholder groups with disparate and often conflicting objectives. Dr. LeClaire's substantial experience spans numerous water resources, groundwater basin management, and environmental studies and projects. His technical expertise is in the area of groundwater quality and sustainability, equilibrium chemistry, and the mobility of trace metals and organics in groundwater. He has completed several technical studies that provided the framework for the Salt and Nitrate Management Program (SNMP) for the Central Valley and recently presented an invited paper entitled: "Groundwater Sustainability, Salinity, and Nitrate: The Central Valley" at the Association of Ground Water Agencies - American Ground Water Trust Annual Conference. He was the technical lead on critical components of the Nitrogen / Total Dissolved Solids study in the Santa Ana River Watershed which was the first functionally-equivalent comprehensive Salt and Nutrient Management Plan in California. Dr. LeClaire also played a key role in the development and implementation of the Optimum Basin Management Program for the Chino Groundwater Basin.

Triennial Recomputation of Ambient Water Quality in the Santa Ana River Watershed, Santa Ana Watershed Project Authority (SAWPA), Riverside, California
Project Manager for a Santa Ana Watershed Project Authority (SAWPA) project to compute the volume-weighted average Total Dissolved Solids (TDS) and nitrate concentrations – ambient water quality – in all 37 groundwater management zones within the 2,840 square-mile Santa Ana River Watershed. This computation is necessary to assess compliance with the groundwater quality objectives in the Water Quality Control Plan for the Santa Ana River Basin (Basin Plan), and to determine if assimilative capacity exists in groundwater management zones – a requirement of the January 2004 Nitrogen and TDS Basin Plan Amendment (Resolution No. R8-2004-0001).

Strategic Salt Accumulation Land and Transportation Study, San Joaquin Valley Drainage Authority, Hanford, California
Lead project scientist for the Strategic Salt Accumulation Land and Transportation Study (SSALTS), the objective of which is to identify the range of viable Central Valley alternatives for salt disposal to provide input for consideration during development of the Salt and Nitrate Management Plan (SNMP) for the region under the jurisdiction of the Regional Water Quality Control Board (RWQCB Region 5). Dr. LeClaire reviewed and ranked salt disposal mitigation measures for 10 archetype study areas in the Central Valley, developed potential long-term salt disposal alternatives, and ranked the alternatives.

Chino Basin Groundwater Storage Basin Environmental Impact Report, Metropolitan Water District of Southern California
Assistant Project Manager for a study to determine the environmental impact of storing up to one-million acre-feet of State Water Project (SWP) water in the Chino Basin. The operation of the Storage Program had the potential to raise the water table between 50 and 100 feet. The project team assembled historical land use, cultural practices, hydrologic, groundwater, and soil data to evaluate the possible degradation of water quality caused by the interception of salts and other

constituents of concern in the vadose zone. An extensive field program for the collection of groundwater samples was undertaken, yielding the most comprehensive assessment of water quality in the Chino Basin at that time.

Groundwater and Reclaimed Water Study, City of Thousand Oaks, California
The purpose of this study is to evaluate the role that development of local supplies, including groundwater, surface water, and reclaimed water, can play in improving the City's water supply reliability. Dr. LeClaire performed the groundwater assessment of the Conejo Valley Groundwater Basin, which included an operational yield analysis, analysis of groundwater elevations and storage changes, as well as water quality issues and concerns.

Salt Mitigation Bank for the City of Anaheim's Recycled Water Demonstration Project, Anaheim, California
Dr. LeClaire successfully negotiated with the Santa Ana Water Board on behalf of the City of Anaheim to create a Salt Mitigation Bank (SMB) to meet salt offset requirements for the use of recycled water for landscape irrigation in the city's service area. The Anaheim SMB consists of capturing and recharging storm water or other high quality water that will help improve the water quality of the Orange County Groundwater Management Zone (OCGMZ). The city proposed the establishment of an SMB as a demonstration project and for other future similar projects that may introduce salt into the OCGMZ at concentrations in excess of the water quality objective. Deposits to the Anaheim SMB are from future projects that introduce water – through municipal separate storm sewer (MS4) compliance, infiltration galleries, recharge basins or injection wells – into the OCGMZ that is of higher quality (i.e., lower TDS) than the OCGMZ water quality objective. Dr. LeClaire developed a database system to track water banked as a salt offset.

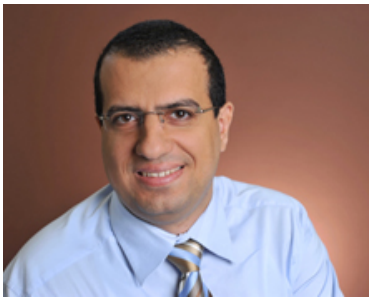
TIN/TDS Study - Santa Ana Watershed Project Authority, Riverside, California
Project Manager for this study, which set revised water quality objectives for groundwater basins throughout the Santa Ana Watershed. The objectives were based on estimating historical ambient groundwater quality for the 1954 to 1973 period. Current ambient conditions were also estimated for the 1978 to 1997 period. Dr. LeClaire also managed the subsequent recomputation of ambient water quality (1984 to 2003) for the Task Force. The project team developed revised sub basin boundaries, based on a reassessment of hydrogeology and water quality, to create management zones for a more effective environmental stewardship of these systems. In January 2009, the Little Hoover Commission cited the regulatory model under which this technical work was performed as a model that should be followed throughout the State of California. The study included the impact of recycled water groundwater recharge projects on groundwater and surface water quality and developed surface water translator for meeting groundwater objectives that accounted for nitrogen losses during percolation (nitrogen loss coefficients) that were adopted in the Basin Plan amendment. In this task, an understanding of recharge operations was developed at the Hidden Valley Wetlands Enhancement Project (City of Riverside), the Rapid Infiltration-Extraction (RIX) Regional Tertiary Treatment System (Cities of San Bernardino and Colton), and Anaheim Lake (Orange County Water District).

Chino Basin Groundwater Recharge Project and Support of Maximum Benefit Showing for the Basin Plan, Chino Basin Watermaster/Inland Empire Utilities Agency, California
Project Manager for this study in which several sets of lysimeters were installed in recharge basins in the Chino Basin. Dr. LeClaire worked extensively with the IEUA, the RWQCB, and the Department of Public Health (DPH; now the Division of Drinking Water [DDW]) to obtain a permit for recharging recycled water in recharge basins in the Chino Basin. The study results allowed IEUA to propose the use of lysimeters to measure compliance with permit requirements for nitrogen and total organic carbon reduction during soil-aquifer treatment. The use of lysimeters was approved by DPH and RWQCB, and the lysimeters are showing significant reduction in both nitrogen and TOC as the recharge water moves vertically in the vadose zone. This project marks the first time this innovative technology was used in this type of application.

Indirect Potable Reuse Project - Phase 2, Eastern Municipal Water District, Perris, California
Groundwater lead for Phase 2 of the Indirect Potable Reuse Project (IPR). He led the modeling team in estimating retention times from proposed recycled water recharge basins to downgradient potable supply wells, as well as the recycled water contribution (RWC) in each well. The modeling team is using MODFLOW-OWHM: One Water Hydrologic Flow Model, including the Local Grid Refinement (LGR2) to develop the local (child) model. MODPATH will be used to estimate retention time and MT3DMS will be used to estimate RWC.

Farag E. Botros, Ph.D., P.E.

Senior Engineer



EDUCATION

Ph.D., Hydrogeology, University of Nevada-Reno, 2007

M.S., Civil Engineering, Cairo University, Egypt, 2004

B.S., Civil Engineering, Cairo University, Egypt, 2000

PROFESSIONAL REGISTRATIONS

Professional Engineer, California, No. 76531

PROFESSIONAL AFFILIATIONS

American Geophysical Union

Dr. Botros is a Senior Hydrogeologist/Engineer with more than 14 years of experience in numerical simulation of groundwater flow and contaminant transport through saturated and unsaturated media. His expertise includes site characterization, statistical and geostatistical analysis of field and laboratory data, and optimization and uncertainty assessment of hydrologic parameters and conceptual models. Dr. Botros has also great undertstanding of watershed hdrology and has assisted in developing water budgets in many groundwater basins.

Update and Recalibration of Rose Valley Groundwater Model for Permit Evaluation, Inyo County, California

As technical lead, performed substantial update and recalibration of an existing groundwater flow model of the Valley. Updates included developing a watershed model to estimate groundwater recharge in the basin, refinement of the model grid and boundary conditions, and improved calibration to historical water levels. Performed predictive simulations that were used to maximize future pumping amounts without exceeding the allowable reduction in groundwater outflow to a terminal lake at the southern end of the Valley. The model was updated multiple times to take into consideration actual climatic conditions and recorded pumping.

Groundwater Modeling for Santee Basin Groundwater Recharge and Replenishment Project, Padre Dam Municipal Water District, Santee, California

As lead modeler, conducted analytical calculations to evaluate multiple implementation scenarios of indirect potable reuse using different rates and locations of water injection and extraction. The screening computations were followed by development of a three-dimensional groundwater flow model and particle tracking simulations that included aquifer heterogeneity, complex aquifer boundaries and simulation of multiple ponds. Residence time of injected water was considered relative to State of California requirements.

Groundwater Analysis and Planning Support, Colorado River Municipal Water District, West Texas

Technical lead for evaluation to optimize the well field operation. Tasks included developing a groundwater flow and contaminant transport models, assessing multiple operational scenarios of the well field, evaluating of potential sources for groundwater contamination within or near the well field, and providing recommendations of the optimal operational scenario to mitigate degrading water quality.

Groundwater Resource Evaluation and Geologic Modeling, University Lands, Midland, Texas

Provided technical support in evaluating multiple brackish aquifers underlying University Lands in west Texas. Project tasks included using data from the database of several thousand oil and gas geophysical logs, water well logs,

and cable-tool driller reports to construct three-dimensional geologic models. The model was used to generate multiple maps that depict the thickness and the depth to aquifers and confining units underneath University Lands properties in west Texas.

Analysis of Municipal Water Supply Sources, City of Lubbock, Texas
Technical lead in assessing the sustainability of the City of Lubbock's Bailey County well field. Tasks included updating an existing three-dimensional groundwater flow model of the well field using newly acquired field data and estimating the longevity of the well field under various pumping scenarios. Study results were used by the City to make key water planning decisions.

Multi-Scale Investigation of Nonpoint Source Pollutant Transfer Across Deep Vadose Zones, Kearney Foundation of Soil Science, Fresno County, California
Technical support for an extensive characterization and geostatistical analysis of the geology, hydraulic properties, and nitrogen distribution in a 16-meter-thick vadose zone across a nectarine orchard in Fresno County. Duties included site characterization and identification of major hydraulic units and 2- and 3-dimensional groundwater flow and nitrate transport modeling of the 16-meter-thick vadose zone. Results of the study are beneficial for agencies in regulatory monitoring, assessment, and decision-making to evaluate long-term impacts of nitrate fertilizer management practices on groundwater quality in agricultural basins of California and other semi-arid regions.

Modeling Support for Bear Canyon Recharge Project for Permit Application, Albuquerque Bernalillo County Water Utility Authority, New Mexico
Bear Canyon is an artificial recharge project that uses in-stream infiltration to recharge the Middle Rio Grande Basin Aquifer. Project tasks included modifying the administrative groundwater flow model used by the Office of the State Engineer to incorporate the Bear Canyon recharge and recovery schedule. Modifications to the administrative model included refining the model grid around the Bear Canyon area. As a part of the permit application, tasks also included providing water budget calculations for the Middle Rio Grande Basin as a result of the project implementation with the consideration of population growth and assumed climatic conditions.

Investigation of Possibility of Impact of a City Well by Historical Chromium and Arsenic Leakage from a Nearby Wood Treatment Facility, Confidential Client, California
In support of litigation reviewed the U.S. Geological Survey (USGS) Central Valley Hydrologic Model (CVHM), including shapefiles, database, and the geostatistical model supporting the hydraulic properties of the CVHM. Performed a model telescope by using customized FORTRAN codes to extract information from the CVHM and build a local model focusing on geological and hydrological details of the investigated site. Calibrated the local model, concluded results of the modeling efforts, and helped write an expert report. Court ruling was in favor of our client.

Hydrologic Analysis and Groundwater Modeling, Lower Rio Grande Regional Facility Plan, Rio Grande Regional Water Authority, Texas
Technical lead for this project that used information provided in Texas Water Development Board groundwater modeling and BRACS reports and their supporting GIS files to identify potential well field locations within Cameron, Hidalgo, and Willacy Counties that can meet estimated future water demands and that produce water quality in the range of 1,000 to 3,000 milligrams per liter. Tasks included refining the grid of an existing groundwater model that covers GMA-16 area and running predictive flow and particle tracking simulations to investigate hydrologic effects of potential well fields.

Kenneth Calhoun, G.I.S.P.

GIS Manager

EDUCATION

M.A., Geography (emphasis in GIS, Remote Sensing, and Water Resource Management), University of New Mexico, 1997

B.A., Geography (emphasis in Physical Geography and GIS), University of New Mexico, 1993

PROFESSIONAL REGISTRATIONS

Certified Geographic Information Systems Professional (G.I.S.P.), GIS Certification Institute, No. 46134, September 2007

PROFESSIONAL AFFILIATIONS

New Mexico Geographic Information Council (NMGIC) member from 1999 to present. Board of Directors 2012-2013, President 2013

Kenny Calhoun, GISP, is the Manager of GIS services at DBS&A and is in charge of all GIS development. Mr. Calhoun specializes in coordination of enterprise-wide geographic information systems (GIS) for well, groundwater, land use, and water resources management. Implementation of various GIS software, global positioning system (GPS), and remote sensing technologies for GIS project management.

Online GIS-Based Database Management System, San Bernardino County, California

Senior GIS specialist and Information Solutions Team Manager for the development of a new comprehensive, web-accessible GIS-based database management system to manage and analyze water quality information for Geo-Logic Associates, Inc. (GLA's) ongoing groundwater monitoring contract with the County of San Bernardino. Existing legacy data was imported into the system for approximately 42 landfills/disposal sites. Routine monitoring has occurred at 800 monitoring points at 30 of these sites. System capabilities include data import and collection using online forms and documentation, and custom tools and queries to support permitting, monitoring, and reporting to outside agencies. A main GIS map webpage was developed as the portal/entry point to the system for internal users and our client to access and view information related to specific landfills, wells, sample events, or analytical data; view and analyze historical water quality data; generate and export custom graphs; run and export reports used for reporting to state agencies; and manage any documents related to the County landfills.

GIS Support for Environmental Mediation, Confidential Client, California

Senior GIS specialist for environmental litigation involving allocation of responsibility for contamination at Superfund site. Developed Microsoft Access database to manage site data derived from consultant reports and government databases, which included data from more than 1,000 monitor wells and approximately 250,000 records of chemistry data. Developed GIS using ArcGIS to manage and analyze site data. Integrated aerial photographs, Access data, and ArcGIS data of facility locations and property ownership, topography, domestic and monitor well locations, and chemistry data. Coordinated exhaustive quality assurance/quality control (QA/QC) review of chemistry data. Used GIS to develop groundwater quality and soil chemistry maps and created GIS applications for incorporation in real-time presentations that were used in mediation sessions to communicate technical issues to a non-technical audience. Integrated modeling data (kriged lithology distribution) into GIS cross-section utility to visually verify results.

GIS Support for Analysis of Municipal Water Supply Sources from the Southern Ogallala Aquifer, City of Lubbock, Texas

GIS technical lead for assessment of sustainability of the City's Bailey County well field and pumping groundwater from beneath the City to assist with

meeting peak water demands. The project included the development of historical water level maps and other hydrogeologic analysis, along with development of detailed groundwater flow models for the City of Lubbock area and the Bailey County well field area (northern Bailey and Lamb counties, and southern Parmer and Castro counties). Integrated GIS data from various sources (including the Texas Water Development Board and the U.S. Geological Survey [USGS]) into ArcView GIS geodatabase files. Used DEM data to develop land surface topography and spot well elevations. Performed coordinate conversion to integrate well location and attribute data, DEM data, stratigraphy, cultural features, and USGS raster topography data into consistent coordinate system. Coordinated digitizing of wells, surface water features, and water table contours for use in ArcView. Produced maps and graphics for reports.

Water Rights Support, Confidential Client, Nevada
GIS technical lead to assess perennial yield of basins in Nevada in support of water rights applications. Developed GIS methodology and datasets for model input to support innovative modeling techniques supported by basin-wide field program to collect climate and vadose zone data. Integrated various data including U.S. Geological Survey DEM and PRISM precipitation data to delineate basin watersheds, flow accumulation, and historical precipitation distributions.

Online Water Well Management System, Water Well Inventory, and Groundwater Resource Evaluation, University Lands, Midland, Texas
Project manager and GIS technical lead responsible for development of a water well management system where oil and gas operators and other University Lands leaseholders can apply for water supply well permits and upload completed water well information, such as well diagrams, geophysical logs, and water quality. GIS data is delivered from within ArcGIS Server 10. System capabilities include online mapping, data collection using online forms, and linkage to online documentation and scanned documents. Administrative users can track the water well application process, and approve or deny well applications. Included e-mail functionality to automatically notify applicants of status changes of their application. The system includes a unique feature that allows the user to view the depths to underlying aquifer formations based on the user-entered x-y coordinates. A publicly available water well search queue provides a customizable interface to search for existing wells from a variety of options, including well number, well owner, county, and spatial queries utilizing the GIS interface. Mr. Calhoun also compiled, and mapped water levels, water quality information, and water well production capacities.

Aquifer Storage and Recovery/Groundwater Banking, Texas Water Development Board, Austin, Texas
Project manager for identifying areas suitable for groundwater banking of available surface water across Texas during non-drought periods using a GIS and a modified Boolean logic querying scheme. Data was integrated into the GIS from multiple sources, including the U.S. Geological Survey, the Texas Water Development Board, the Texas Natural Resources Information System, the U.S. Department of Agriculture, and regional water planning groups. A statewide database was constructed that related data layers to grid cells from which complex spatial analysis could be performed using weighted Boolean screens. Developed a product that consisted of two components: (1) a standard report with eye-catching graphics summarizing work done and its application for the client and (2) a detailed review of data quality going into each layer of the GIS, including a user's manual with detailed analysis of certainty and validity of conclusions reached using available data. Detailed review allows client to develop its own Boolean queries for assembled datasets with an understanding of strengths and weaknesses of each component dataset and the GIS tools themselves.

Hannah Erbele

Staff Professional II

EDUCATION

B.S., Earth & Environmental Science (minor in Education), University of California, Irvine, 2010

As a water resource scientist, Hannah Erbele has been providing hydrogeology and environmental services for the past seven years. She uses ArcGIS and statistics to analyze and interpret data related to water quality, groundwater, environmental, and remediation services. Ms. Erbele is also well versed in field activities and can provide technical, field, and professional support on issues pertaining to groundwater, surface water, water quality, and water conservation.

Hydrogeologic Monitoring Program, Malibu, California
A water seepage was discovered along a hillslope that flows into irrigation storage ponds. Ms. Erbele is currently involved with the field investigation to determine source water by exposing known utilities and drilling, installing, and sampling new monitoring wells. The additional wells will be added to the routine Hydrogeologic Monitoring Program to better characterize groundwater conditions of the site and to refine the ability to detect abnormalities in data trends.

Critical Infrastructure Problems and Restoration Solutions, Portuguese Bend Area, City of Rancho Palos Verdes, California
An engineering feasibility study is currently in development to systematically select a remedy to stabilize the Portuguese Bend Landslide Complex and restore community infrastructure in the City of Rancho Palos Verdes, California. Over one mile of critical coastal roadway and sewer, power, and potable water lines have been significantly compromised for decades along Palos Verdes Drive South in western Los Angeles County since significant landslide activity was reactivated in 1956. Ms. Erbele provides technical support as directed by the department which has included an evaluation of surface topography and a delineation of watershed boundaries.

Evaluation of Long-Term Trends and Variations in the Average Total Dissolved Solids Concentration in Wastewater and Recycled Water, Southern California Salinity Coalition, Southern California
During the 2011 to 2015 California drought, various wastewater treatment facilities in Southern California experienced difficulty meeting discharge permit limits. Under the direction of Southern California Salinity Coalition, Ms. Erbele studied the impacts that water conservation, self-regenerating water softeners, droughts, and long-term climate have on Total Dissolved Solids (TDS) in wastewater across a region extending from Los Angeles to San Diego County. Ms. Erbele was instrumental in analyzing data monthly flow and concentration data from over 20 treatment facilities, developing statistical models to represent trends, and determining the impact conservation has on wastewater treatment plants.

Recomputation of Ambient Water Quality for the Period 1996 to 2015, Basin Monitoring Program Task Force, Santa Ana Watershed Project Authority, Santa Ana River Watershed, California
The Santa Ana River Basin Regional Water Quality Control Board requires the

re-computation of ambient water quality for all groundwater management zones in the Santa Ana watershed for which adequate data exist. As an integral member of the project team during the 1996-2015 re-computation, Ms. Erbele collected and formatted data from the 22 member agencies, managed the database team, helped develop new statistical tools, and applied GIS analysis to contour and interpret the data to calculate the current ambient water quality.

Central Valley-Salinity Alternatives for Long-Term Sustainability, Central Valley, California
Under the guidance of the Central Valley Regional Water Quality Control Board, the State Water Resources Control Board, the Central Valley Salinity Coalition, and other stakeholders, the Central Valley-Salinity Alternatives for Long-Term Sustainability (CV-SALTS) program is developing a comprehensive regulatory and programmatic approach to the management of salt and nitrate in the Central Valley. As one of the main technical members on the team, Ms. Erbele relied heavily on ArcGIS and Microsoft Excel to analyze and interpret data for the following projects within CV-SALTS.

Nitrate Implementation Measures Study: The objective of this study was to identify the range of viable Central Valley alternatives for salt disposal to provide input for consideration during development of the Salt and Nitrate Management Plan. Ms. Erbele assisted with the ranking of salt disposal mitigation measures in the Central Valley groundwater basins, and the development potential long-term salt disposal alternatives, such as treatment plants and brine lines, through research and GIS analysis.

Surveillance and Monitoring Program: Developed a cost-effective monitoring program that will allow for statistically-defensible ambient water quality determinations and trend analyses. As part of the project team, Ms. Erbele determined volume weighted average nitrate and TDS for each groundwater basin. A Monte Carlo approach was taken to determine a subset of wells that could represent a monitoring network that when calculated was within 15 percent of the determined basin volume weighted average.

Playa Vista Property Remediation, Playa Vista, California
Under direction of the Los Angeles Regional Water Quality Control Board (Region Board), Playa Vista is an environmental investigation and cleanup site which consists of approximately 460 acres of land located in western portion of the City of Angeles. The site is divided into three phases based upon the historical use: Phase 1 Residential Area which was used for aircraft and aircraft equipment testing and fire-safety training; Phase 1 Campus Area which was used for manufacturing, research, development and testing of electronics, aircraft, and other equipment; and Phase 2 which was used for aircraft testing, maintenance and storage, a firing range, and fuel and drum storage. Various chemicals were used and stored during the former operations including solvents, metals, and fuel related compounds. Ms. Erbele performed various tasks related to the groundwater, soil, soil vapor, and ambient air investigation and monitoring of this site.

Playa Vista has over 300 wells that are monitored on a quarterly and semi-annual basis. Ms. Erbele routinely collected water level measurements and oversaw sampling and drilling activities. Ms. Erbele also prepared the quarterly and annual monitoring reports. As part of the remediation, Playa Vista operates a dual phase extraction system and a soil vapor extraction system. Ms. Erbele was responsible for the calculation of the removal of various VOC contaminants and the quarterly monitoring reports.

In preparation of the redevelopment of a historical building, the Regional Board required a soil and soil vapor investigation. The investigation included the installation and removal of over 90 temporary soil borings and vapor probes within three weeks. Ms. Erbele was a key field personal during this fast paced investigation.

Amy Ewing, P.G.

Hydrogeologist

EDUCATION

M.W.R., Water Resources (with distinction), University of New Mexico, 2003

B.S., Earth Sciences, University of California, Santa Cruz, 1998

PROFESSIONAL REGISTRATIONS

Professional Geoscientist, No. 10413, State of Texas, 2008

PROFESSIONAL AFFILIATIONS

American Water Resources Association

American Water Resources Association—New Mexico Section

National Ground Water Association

Ms. Ewing specializes in water resources investigations, water resources planning, hydrogeology, surface and groundwater quality studies, aquifer storage and recovery; and water rights planning.

Rio Rancho Water Resources Management Plan Implementation Plan Update, City of Rio Rancho, New Mexico
Project manager for the City of Rio Rancho Water Resources Management Plan Implementation Plan Update, which documented the City's implementation progress on 39 policy initiatives identified in the original water resources management plan, and reprioritized existing and identified new initiatives where appropriate for the five-year planning period of fiscal years 2014 through 2018**.**

New Mexico State Water Plan, New Mexico Office of the State Engineer, Santa Fe, New Mexico
Supported the Office of the State Engineer in developing sections for the 2010 State Water Plan addressing statewide water supply, statewide water demand, regional water conservation strategies, climate variability and its impact on water supply, integration of planning efforts, and water management strategies.

Regional Water Plan Integration, New Mexico Office of the State Engineer, Santa Fe, New Mexico
Worked to integrate components of the State of New Mexico's 16 regional plans in a manner that would assist in the State Water Plan's development. Evaluated and compiled climate, surface water, groundwater, water quality, water demand, supply-demand gap, and water management strategy data, and made recommendations for how to achieve better consistency in future planning efforts.

Llano Estacado (Region O) Regional Water Plan, High Plains Underground Water Conservation District No. 1, Lubbock, Texas
Project manager for the 2016 Region O regional water planning project spanning a 21-county area in west Texas. The plan quantifies water supply and projects water demand through 2070, and includes evaluations of water supply strategies for meeting drought-of-record demands. Project tasks include contacting municipalities and water suppliers for information regarding their water supply and demand, current and planned infrastructure, and conservation and drought management plans; evaluating existing water supplies; and identifying potentially feasible water management strategies. The Plan was adopted by the Llano Estacado Regional Water Planning Group in November 2015, and accepted by the Texas Water Development Board in December 2015.

McKinley County Small Systems Regionalization Plan, Phase IIB, Northwest New Mexico Council of Governments, Gallup, New Mexico
Worked with seven small McKinley County systems to develop operations and maintenance and asset management plans, compiling an inventory of

existing and potential resources available to these systems and analyzing the actions each of these systems can take to reduce their Insurance Services Office (ISO) fire ratings. Also summarized current and potential McKinley County regionalization strategies and funding strategies for future regionalization efforts.

McKinley County Small Systems Regionalization Plan, Northwest New Mexico Council of Governments, Gallup, New Mexico
Developed a regionalization plan for 23 small water systems in McKinley County. Project tasks included summarizing all existing studies and planning efforts and working with each participating system to gather baseline data. The plan identified infrastructure projects with the potential for water service integration, in addition to strategies that will maximize system management efficiency. Project tasks also included providing water systems with support in seeking funding for regionalization, developing written agreements to enable the selected regionalization activities, and outlining plans for implementation of the selected approaches.

Database Management Systems, U.S. Army Corps of Engineers, Albuquerque District, Middle Rio Grande Endangered Species Collaborative Program, New Mexico
Facilitated 12 coordination meetings and contributed to the business analysis/needs assessment report as a part of the development of a comprehensive, web-accessible, GIS-based, database management system for projects associated with habitat restoration, water management, and scientific investigations within the Middle Rio Grande basin for the Middle Rio Grande Endangered Species Collaborative Program.

Reuse Planning, City of Clovis, New Mexico
Currently managing DBS&A's portion of the Clovis reuse system project. Project tasks have included value engineering of the preliminary design, design of the filtration/ disinfection system and low-lift pump station, review of regulatory requirements, funding application support, and construction of the first project phase. Prepared a 2011 Water Trust Board application that was awarded $4.1 million and used to fund the project's first construction phase.

Silver City Comprehensive Water Conservation Plan, Town of Silver City, New Mexico
Project manager for the Town of Silver City's Comprehensive Water Conservation Plan, which outlines long-range water policies and water conservation goals, and identifies and prioritizes water conservation measures.\

Gallup Water Conservation Plan, City of Gallup, New Mexico
Worked with the City of Gallup and a teaming partner to prepare a Water Conservation Plan for the City of Gallup. The plan discusses all historical and existing water conservation measures, details the City of Gallup's water conservation goals, and identifies multiple conservation methods that can be used to assist the City of Gallup in making efficient use of its existing resources.

Clovis Water Conservation Plan, City of Clovis, New Mexico
Worked with the City of Clovis and the City of Clovis Water Policy Advisory Board to prepare a Water Conservation Plan to reduce the amount of groundwater pumping and slow the decline in water levels. This was in an effort to ensure that existing available water supplies will be sufficient to meet future demand.

Northeast New Mexico Regional Water Plan, City of Tucumcari, New Mexico
Developed water supply and demand assessments to include information on climatic conditions, variability of surface water flows, reservoir operations, groundwater resources, and historical and projected water uses for municipalities, agriculture, riparian evapotranspiration, and other uses. Responsible for the public involvement process, including meeting preparation, presentation of technical information at meetings, and meeting facilitation.

Gregory Schnaar, Ph.D.

Principal Hydrologist

EDUCATION

Ph.D., Soil, Water, and Environmental Science, University of Arizona, 2006

B.S., Environmental Science and Policy, University of Maryland, 2002

RECENT PRESENTATIONS

Schnaar, G. 2017. **Lessons learned in developing defensible groundwater budgets and evaluating sustainability indicators.** American Ground Water Trust/Association of Ground Water Agenices joint Annual Conference. Ontario, California, February 15-16, 2017.

Cullen, S.J., G. Schnaar, M. Cruikshank, Botros, F., 2017. **Avoiding Undesirable Effects under SGMA and Other Groundwater Regulatory and Management Programs**. In preparation for Association of Ground Water Agencies - American Ground Water Trust Annual Conference, Ontario, California, February 15-16, 2017.

Dr. Schnaar specializes in watershed-scale hydrologic studies, groundwater and vadose zone modeling, contaminant transport, field sampling and geologic sequestration of carbon dioxide. He has managed a variety of environmental and water resource investigations, including development of rigorous water budgets in support of Groundwater Sustainability Plans (GSPs) and safe-yield determination for an adjudicated basin.

Dr. Schnaar has served as an expert technical consultant to the U.S. Environmental Protection Agency Office of Ground Water and Drinking Water and the California State Water Resources Control Board and is an Associate Editor for the peer-reviewed journal *Groundwater*. He has taught courses in Environmental Science and Water Resources as a faculty member at the University of Maryland, College Park and as an adjunct faculty member at George Washington University.

Groundwater Sustainability Plan, Fox Canyon Groundwater Management Agency, Ventura County, California
Senior Hydrogeologist for the development of groundwater balances used in the Groundwater Sustainability Plans (GSPs) for the four groundwater basins within the Agency's jurisdiction: (1) Las Posas; (2) Arroyo Santa Rosa Valley; (3) Pleasant Valley; and (4) Oxnard. The budget accounts for and assesses the total annual volume of groundwater and surface water entering and leaving the basin, including historical, current, and projected water budget conditions, and the change in the volume of water stored. DBS&A's Distributed Parameters Watershed Model (DPWM) applied to evaluate key groundwater balance components including groundwater recharge by deep percolation of precipitation and irrigation and mountain front recharge.

Santa Paula Basin Safe Yield Determination, United Water Conservation District, Ventura County, California
Managed development of watershed-scale distributed parameter watershed model of the Santa Paula Creek subwatershed and comprehensive water balance and safe yield evaluation for the Santa Paula Basin. Safe yield and hydrogeologic evaluation based on accounting for all significant groundwater inflow and outflows and changes in groundwater storage as evaluated from statistical analysis of available groundwater hydrographs.

Development of Integrated Surface-Water Groundwater Model, California State Water Resources Control Board, Ventura, California
Developing a GSFLOW-based integrated surface water/groundwater model of the Ventura River and surrounding watershed for evaluation of management options to increase instream flows and reduce nutrient impacts associated with a TMDL regulation.

Hydrogeologic Assessment and Numerical Watershed/Groundwater Flow Model Design, San Antonio Creek Watershed, Ojai Basin Groundwater Management Agency, Ojai, California
Project manager and lead modeler for development of a watershed-scale linked distributed parameter watershed-MODFLOW SURFACT groundwater model. Model calibration included transient effects of recharge from deep percolation, groundwater pumpage, and groundwater recharge from and discharge to San Antonio Creek and smaller tributaries. The model has been used for drought impact evaluation, groundwater resource planning, watershed protection efforts, and design of an aquifer storage and recovery (ASR) project.

Evaluation of Numerical Model Estimates of Aquifer Recharge, Indio Water Authority, Indio, California
Project manager for review of the Coachella Valley Groundwater Model, a MODFLOW model that has been used for groundwater management planning and estimates of groundwater recharge from several water spreading pond facilities. Provided Indio Water Authority with independent evaluation of model assumptions and implementation, and resulting limitations of conclusions regarding groundwater recharge assessments.

Groundwater Level and Water Quality Sampling Program, Ventura County Watershed Protection District, Ventura County, California
Project manager for field sampling program initiated to satisfy California State requirements regarding groundwater monitoring, and gather important data for understanding transient groundwater levels, geologic occurrence, and groundwater quality in the Ojai Groundwater Basin. Authored monitoring plan, quality assurance project plan (QAPP), and semi-annual monitoring reports.

Development of Hydrogeologic Groundwater Budget and Approach to Development of a Groundwater Management Plan for Watershed Protection, Upper and Lower Ventura River Groundwater Basin, Ventura County Watershed Protection District, Ventura County, California
Project manager and technical lead for development of an estimated groundwater budget based on available data regarding watershed infiltration, groundwater flow between different geologic formations, irrigation, pumpage, groundwater discharge, and surface water-groundwater interactions. Identified several data gaps and outlined recommendations for constraining estimates of the groundwater budget.

Peer Review, Ventura River Watershed Management Plan, Ventura River Watershed Council, California
Asked to provide a peer review of the Ventura River Watershed Management Plan by the watershed coordinator and stakeholder group. Reviewed sections related to groundwater, surface water, geology, soils, and previous studies conducted in the watershed.

Hydrologic and Water Quality System Project, U.S. EPA, Washington, D.C.
Provided support related to management of the Hydrologic and Water Quality System project, which aims to provide U.S. EPA with a state-of-the-art water quality computational model that is national and regional in scope. Project work entailed review of project reports, coordination with partner agencies at U.S. EPA and the U.S. Department of Agriculture, and development of project scopes and timelines.

Todd G. Umstot

Senior Hydrogeologist

EDUCATION

M.S., Hydrogeology, University of Nevada, Reno, 2002

B.S., Geology, University of Massachusetts, Amherst, 1993

B.S., Environmental Science, University of Massachusetts, Amherst, 1993

Mr. Umstot specializes in quantitative analysis of vadose zone processes, recharge, well hydraulics, soil gas flow, non-aqueous phase liquid (NAPL) migration, groundwater flow and contaminant fate and transport using numerical, stochastic, geostatistical, inverse and analytical techniques.

Basin-Scale Recharge Modeling, County of Inyo, Rose Valley, California
Provided technical support on project to assess recharge to the Rose Valley along the eastern Sierra Nevada. Used basin-scale recharge model to estimate the mean annual recharge for a MODFLOW model of the basin. Recharge model provided estimates of the groundwater inflow to the valley from the adjacent mountain block and the quantity of water recharging from ephemeral runoff over the valley floor. The recharge model significantly improved the groundwater model calibration by allowing for an independent estimate of hydraulic conductivity.

Litigation Support, Evaluate Potential Impacts of Ground Water Production on Adjudicated Basin, Goleta Water District v. Slippery Rock Ranch, Goleta, California
Project manager to evaluate potential connection between Slippery Rock Ranch wells and the Goleta Ground Water Basin. Implemented field program including physical measurements of precipitation, streams and springs; sampling of water chemistry including stable isotopes and radioisotopes in precipitation, springs, wells and streams; and geology field mapping supported by geophysical surveys. Utilized watershed modeling and the Chloride Mass Balance method to quantify recharge.

Basin-Scale Recharge Modeling, Antelope Valley Groundwater Agreement Association, Antelope Valley, California
Project manager to assess the natural recharge on the San Gabriel and Tehachapi mountains for the adjudication of water rights. Used watershed modeling calibrated to remotely-sensed estimates of root zone soil moisture. Used cross-sectional models to evaluate the location of the groundwater divide to assess quantity of recharge flowing to Los Angeles versus Antelope Valley.

Litigation Support, Evaluate Surface Water/Groundwater Interaction, Confidential Client, Central Valley, California
Technical lead in adapting the USGS Central Valley Hydrologic Model (CVHM) to simulate surface water and groundwater interaction to support a project to quantify groundwater recharge from streambed infiltration. Reviewed and incorporated USGS geostatistical sediment texture model into local model.

Basin-Scale Surface Water – Ground Water Modeling, Vidler Water Company, New Mexico
Technical lead to assess quantity of water that can be appropriated as a water right. Used land-surface water balance model to simulate recharge and runoff coupled with MODFLOW. Evaluated and simulated complex mountain block geology in MODFLOW. Evaluated pumping impacts on domestic wells and other existing water rights. Provided expert witness testimony at water rights hearing before the New Mexico State Engineer and in State court.

Water Rights Support, Vidler Water Company, Tule Desert, Nevada
Project manager to assess basin-scale recharge in support of water rights applications. Recharge rates estimated using physically based water balance model, empirical methods, chloride measurements and runoff measurements. Performed sensitivity and uncertainty analysis on the water-balance model using Monte Carlo with Latin Hypercube Sampling (LHS). Results of the watershed modeling were provided as input to a regional-scale MODFLOW model.

License Application Support, Sandia National Laboratories, Yucca Mountain Project, Nevada
Project manager to provide review and technical support for Sandia National Laboratories' (SNL) recharge model, which is part of the Department of Energy's license application to the Nuclear Regulatory Commission (NRC) for the Yucca Mountain site. We reviewed the technical documentation developed by Bechtel SAIC for the model inputs (climate, soils, geology and vegetation) and observed data for model calibration (runoff, infiltration and soil moisture) and we reviewed the SNL recharge model code at each stage of development.

Basin-Scale Recharge Modeling, New Mexico Interstate Stream Commission, Salt Basin, New Mexico and Texas
Technical lead to assess the natural recharge originating within the Salt Basin watershed that straddles the New Mexico and Texas border. Used watershed models with remote sensing estimates of soil moisture and actual evapotranspiration. Model results compared well with independent estimates of recharge from groundwater modeling and geochemical analysis of salt flat cores.

Publications and Presentations

Hendrickx, J.M.H., R.G. Allen, A. Brower, A.R. Byrd, S. Hong, F.L. Ogden, N.R. Pradhan, C.W. Robison, D. Toll, R. Trezza, T.G. Umstot, and J.L. Wilson. 2016. Benchmarketing optical/thermal satellite imagery for estimating evapotranspiration and soil moisture in decision support tools. Journal of the American Water Resources Association 52(1):89-119.

Umstot, T., Schnaar, G., Blandford T.N., Cullen, S., Kaiser, P., Ayarbe, J., 2015. Recharge estimates from a soil water-balance model improve groundwater model calibration. Presentation at the MODFLOW and More 2015: Modeling a Complex World conference. May 31 - June 3, 2015. Golden, Colorado.

Stephens, D.B., J. Cherney, J. Kay, T. Umstot, and B. Casadevall. 2014. High Recharge at a Semi-Arid Site Explains Wide-Spread Perchlorate in Groundwater with a Deep Water Table. Presentation at the National Ground Water Association Ground Water Summit. May 7, 2014. Denver, Colorado.

Blandford, T.N., Umstot, T., Wolf, C., Marley, R., and Bushner, G.L., 2013. Exploration and characterisation of deep fractured rock aquifers for new groundwater development, an example from New Mexico, USA.

Umstot, T., J. Hendrickx, and J.L. Wilson. 2011. Hydrology of the San Gabriel Mountains: The Source of Mountain Front Recharge to Los Angeles and Antelope Valley. Presentation at 2011 American Water Resources Association Annual Water Resources Conference. Albuquerque, New Mexico, November 10, 2011.

Shannon Williams, C.P.G., GISP

Hydrogeologist

EDUCATION

M.S., Hydrology, University of Nevada – Reno, 2010

B.S., Earth and Environmental Science with Geology option and Mathematics Minor, New Mexico Institute of Mining and Technology, 2006

PROFESSIONAL REGISTRATIONS

Certified Professional Geologist, No. 11818

Geographic Information Systems Professional, No. 91354

PROFESSIONAL AFFILIATIONS

American Institute of Professional Geologists, NM Section Vice President

NM Geological Society, Treasurer

Ms. Williams is a Hydrogeologist with nine years of experience in hydrogeological applications using GIS, and soil characterization and analysis. She has provided the geologic framework for integrated groundwater and surface water models by constructing geologic cross sections and utilizing ArcGIS spatial analysis. She has worked as a drilling supervisor and field geologist on a variety of projects throughout the western U.S. and Mexico. She has planned and conducted soil, plant, surface and groundwater sampling efforts, as well as worked as a laboratory technician performing environmental soil analyses and reporting. Ms. Williams is proficient in the use of GIS and is experienced in technical writing and report production.

Groundwater Budget and Groundwater Management Plan, Upper and Lower Ventura River Basin, Ventura County Watershed Protection District, Ventura, California

Ms. Williams constructed several cross sections along the Ventura River and Ojai Valley in order to provide the geologic base to be used in developing an integrated surface water/groundwater model for evaluation of management options. She used ArcGIS to plot and utilize geologic map and well location information in order to accurately portray subsurface geology within the integrated water model

Hydrogeological and Geochemical Characterization for Water Supply Project, Santa Barbara, California

Ms. Williams constructed geologic cross sections to serve as a framework for an integrated surface water/groundwater model to quantify recharge and water budget. She utilized ArcGIS to perform spatial analysis of various watershed parameters, such as precipitation and water chemistry. She also created ArcGIS Collector maps that allow field staff to record accurate sample locations in the field. Finally, she performed image analysis to determine crop types (e.g. grapes, avocados, citrus).

Mine Remedial Investigation, Confidential Client, Alpine County, California

Ms. Williams worked as part of a large, multi-stakeholder team performing a CERCLA remedial investigation and feasibility study for groundwater contamination of a former copper sulphate mine. She performed bi-annual groundwater monitoring, stream sediment sampling, synoptic flow and sampling, water level measurements, stream discharge measurements, evaporation pan and automatic storm water sampler maintenance, and transducer data downloads.

Feasibility Study, Tuba City Dump Site, Bureau of Indian Affairs, Tuba City, Arizona

Ms. Williams helped execute a large Feasibility Study at this CERCLA site. She performed spatial analysis modeling using GIS in order to determine the effects of various water quality parameters on local drinking water sources. She prepared a Feasibility Study Report, which will provide stakeholders

valuable information in determining a remedy for containment or removal of an unpermitted landfill on Hopi and Navajo Tribal lands.

HB Solar Solution Mine, West Plant, Intrepid Potash, Carlsbad, New Mexico
Ms. Williams oversaw the drilling and installation of brine water production wells. She designed and performed a pump test on the production wells and analyzed the data to determine sustainable pumping yield for input into the mine production process.

Field Campaign and Hydrologic Instrumentation in the San Miguel Watershed, Sonora, Mexico, NSF Developing Global Scientists and Engineers Program
Ms. Williams worked with an international team of researchers in order to understand rainfall variations within a small watershed that occur over 1-square kilometer of mountainous terrain during the North American Monsoon. Specific tasks included creating maps using ArcGIS, assembling data loggers for tipping bucket rain gauges, installing field instruments including an eddy covariance tower, performing daily checks of event rain gauges and soil moisture probes.

Sand and Gravel Resource Evaluation for Commercial Use and Clay for Adobe Bricks across Pueblo Lands, Pueblo de Cochiti, New Mexico
Ms. Williams served as the primary geologist to determine the availability of sand and gravel for commercial use and clay for adobe bricks across Pueblo lands. Activities to accomplish this project included desktop research, field mapping of clay and sand/gravel extent, field sampling, and laboratory analysis of material properties, as well as regular interaction with Cochiti and other stakeholders.

New Mexico STATEMAP Program, New Mexico Bureau of Geology and Mineral Resources, Socorro, New Mexico
Ms. Williams acted as the GIS Coordinator for this cooperatively funded program by the USGS and the New Mexico Bureau of Geology and Mineral Resources to create digital geologic maps of 7.5-minute quadrangles at 1:24,000 scale. Routine responsibilities included maintaining a map database in MSOffice Access, digitizing maps using ESRI ArcInfo, creating map layouts using Adobe Illustrator, and training and supervising employees and students in GIS digitizing procedures. Ms. Williams created standardized instruction manuals for GIS digitizing procedures and organized and edited several 7.5-minute quadrangles into single geologic map compilations. She instructed NASA Astronaut Candidates in the operation of a gravimeter during a collaborative teaching program in proper geologic field techniques. Ms. Williams also conducted Quaternary geologic field mapping for several 7.5-minute quadrangles in the state of New Mexico.

Select Publications

Williams, S.F. 2010. Spatial Distribution of fluoride concentration in Goathill North Rock Pile, Questa Molybdenum Mine, Questa, New Mexico. New Mexico Bureau of Geology and Mineral Resources, Open-File Report 534. 376 p.

McCraw, D.J. and S.F. Williams. 2012. Terrace stratigraphy and soil chronosequence of Cañada Alamosa, Sierra and Socorro Counties, New Mexico. New Mexico Geological Society 63rd Field Conference Guidebook. Spencer G. Lucas, Virginia T. McLemore, Virgil W. Lueth, Justin A. Spielmann, and Karl Krainer, editors. p. 475-790.

Frey, B.A., K.E. Karlstrom, S.G. Lucas, S. Williams, K. Zeigler, V. McLemore, and D.S. Ulmer-Scholle, editors. 2016. Geology of the Belen Area. New Mexico Geological Society Fall Field Conference Guidebook 67. 512 p.

Christopher P. Wolf, P.G.

Senior Geochemist

EDUCATION

M.S., Geochemistry, New Mexico Institute of Mining and Technology, 1998

B.S., Geology, New Mexico Institute of Mining and Technology, 1992

PROFESSIONAL REGISTRATIONS

Professional Geoscientist, Texas, No. 6230

PROFESSIONAL AFFILIATIONS

International Association of Geochemistry

American Water Resources Association

National Groundwater Association

New Mexico Geological Society

New Mexico STATEMAP Advisory Committee

AWWA Standards Committee on Wells (A-100)

Mr. Wolf specializes in water resource and hydrogeological studies including the design, installation, and evaluation of water supply wells. He applies his background in geology and geochemistry to his water-related projects, including hydrogeologic conceptual model developments, groundwater evaluation, analysis of water quality issues, well rehabilitation, deep exploratory wells and well field development. He has worked on water resources development and management projects with municipalities and tribes in the Southwestern U.S. for more than 23 years.

Hydrogeological and Geochemical Characterization for Water Supply Project, Santa Barbara, California
Evaluate surface water and groundwater resources in the Transverse Range. Performed geological field assessments of faults, fractures and folds in sedimentary rocks. Supervised a controlled source audio-frequency magneto telluric (CSAMT) geophysical survey of structural geology and hydrologic features; collected and analyzed surface water and groundwater chemistry including major ion composition and isotopes; installed and measured stream and spring flow at multiple sites. Prepared a hydrogeological conceptual model based on geology and hydrology at the site.

Geochemical and Hydrogeological Characterization for Water Supply Project, Sandia Park, New Mexico, Vidler Water Company
Evaluation of geology and geochemistry in geologically complex area of the Rio Grande Rift and Sandia Mountains. Evaluated bedrock geology including faulting and folding, lithology and stratigraphy. Determined water quality in a stratified aquifer system consisting of Paleozoic and Mesozoic clastic and carbonate units. Project included completing two supply wells in sandstone and carbonate aquifers, and evaluating aqueous geochemistry of multiple aquifer system. Prepared a hydrogeological conceptual model based on geology and hydrology at the site. Contributed to expert and rebuttal reports. Provided expert testimony on surface water, geology, and geochemistry during New Mexico Office of the State Engineer water right permit hearing and during the appeal in District Court.

Hydrogeological and Geochemical Evaluation for Aquifer Storage and Recovery Project, Pojoaque Regional Water Supply System, New Mexico
DBS&A assisted with a U.S. Bureau of Reclamation feasibility investigation of the potential groundwater and surface water sites for aquifer storage and recovery (ASR) of 4,000 acre-feet per year in the Tesuque aquifer. DBS&A also evaluated water quality data and hydrogeology of project sites, including geochemistry of groundwater and sediments, and geology, including local geologic structures, and surface geophysics.

Hydrogeological and Geochemical Evaluation for Aquifer Storage and Recovery Project, Albuquerque Bernalillo Water Utility Authority, Albuquerque, New Mexico
Evaluated water quality data and hydrogeology of aquifer storage and

recovery (ASR) project including geochemistry of groundwater, lithology, geologic structures and hydraulic characteristics of Santa Fe Group sediments.

Hydrogeological and Geochemical Characterization, Lower Rio Grande, New Mexico Interstate Stream Commission
Working with multiple state agencies on water quality issues in the Lower Rio Grande of New Mexico to evaluate hydrogeology and geochemistry of the Lower Rio Grande to determine potential mechanisms for salinization of the system. Used multiple geochemical tracers in surface water and groundwater to establish natural and anthropogenic sources and their associated chemical "fingerprint." Geochemical tracers included cation-anion ratios, stable isotopes (H, O, S, B), and strontium isotopes. Statistical evaluation of background water quality representing unique chemical end-members in bedrock and alluvial aquifers was used to calculate the contribution of salinity to the river. Observed salinization could not be solely explained by agriculture and evapotranspiration and deep groundwater recharging the river was identified as a dominant salinization mechanism.

Geochemistry of Horace Springs and Evaluation of Groundwater and Surface Water Interaction along the Rio San Jose, Pueblo of Acoma, New Mexico
Evaluated the contributions of bedrock aquifers that mix in the alluvial aquifer of the Rio San Jose and discharge at Horace Springs. Investigation included analyzing historic and recent water quality data, calculating ion ratios, performing mixing calculations to determine relative contributions to water quality at Horace Springs. We also investigated the interaction of groundwater and surface water in the alluvial aquifer of the Rio San Jose in western New Mexico. Installed piezometers, thermistors, and dataloggers to collect continuous data. Data collection includes evaluating spring, surface water and groundwater quality; spring discharge; measuring potentiometric surface along losing reach of stream; utilizing temperature as a tracer to monitor fluid flow in the shallow sediments of the river; and testing soil properties including hydraulic conductivity.

Geochemical and Hydrogeological Characterization, Ruidoso, New Mexico
Assist with the evaluation of a deep (>2,500 feet) brackish aquifer for production from two deep wells completed to 3,500 feet. Performed pump test analyses and set up pump controls and data loggers. Evaluated aqueous geochemistry of deep and shallow bedrock aquifers in the Sacramento Mountains to determine how the aquifers interact over time and potential sources for a spring that may be impacted from groundwater pumping in the deep aquifer. This study includes determining water-rock interactions based on aquifer mineralogy and water chemistry, establishing a chemical "fingerprint" for each water source, and calculating potential contributions of the aquifers on spring chemistry.

Publications and Presentations

Umstot, T.G., C.P. Wolf, M. Fort, R.M. Roberts, J. Wilson. 2017 A vertically compartmentalized, fracture-zone, sandstone aquifer system. NGWA Conference on Fractured Rock and Groundwater, October 02 - 03, 2017, Burlington, VT.

Wolf, C.P., 2016, Hydrogeology and geochemistry of Horace Springs, Pueblo of Acoma, New Mexico, in: The Geology of the Belen Area, Frey, Bonnie A.; Karlstrom, Karl E.; Lucas, Spencer G.; Williams, Shannon; Zeigler, Kate; McLemore, Virginia; Ulmer-Scholle, Dana S., New Mexico Geological Society, Guidebook, 67th Field Conference, pp. 397-403.

California State University, Sacramento
Consensus and Collaboration Program

Dave Ceppos, SGMA Program Manager

Years of Experience
CCP: 14 years
Total: 31 years
Billing Rate - $196/ hour

Discipline/Specialty
Facilitation/Mediation
Public Participation
Organizational Development
Public Policy
Natural Resources Planning

Education
Advanced Mediation Program, Pepperdine University, 2000

Introductory and Advanced Risk Communication, Berkeley and Columbia Universities, 1994-1995

Public Outreach, Facilitation, and Dispute Resolution, Emory University/Carter Center, 1989-1992

Post-Baccalaureate Research, Environmentally Related Behavior, University of Florida, Gainesville, 1985

B.LA. Landscape Architecture, University of Florida, Gainesville, 1985

Geographic Experience
California
Nevada
Oregon
Georgia
Florida
Washington, DC

Professional Affiliation(s)
Association for Conflict Resolution
Society of Wetland Scientists
Water Environment Federation

Summary of Experience

Dave Ceppos has a comprehensive background developing consensus based, stakeholder-driven, resource management processes. He specializes in water policy and natural resources facilitation, mediation, and strategic planning. He additionally has considerable management of public outreach and engagement processes, and field experience in watershed planning, ecological assessment, hydrology, hazardous waste management, and habitat restoration.

Example Project Experience

DWR - Sustainable Groundwater Management Act (SGMA)

Client: California Department of Water Resources (DWR) and StateWater Resoyrces Control Board. Location: Statewide. Years: 2014 – Present. Role: Program Manager / Managing Senior Mediator. Summary: Working as a senior advisor and member of the DWR SGMA Program Team. Coordinating and designing DWR's Local Assistance Program to provide in-kind facilitation support to emergent Groundwater Sustainability Agencies (GSA) throughout California (launched May 2015). Also a member of the strategy team for DWR's development of Boundary Designation Regulations. Facilitator and advisor for the Boundary Regulation Practitioner Advisory Panel. Program Manager and designer of the Boundary Regulations statewide public listening sessions in April, 2015. Presenter on behalf of DWR regarding their SGMA program for various meetings / conference throughout California. Advisor on outreach sections on DWR SGMA Strategic Plan.

Program Manager and Principal-in-Charge for the following projects:

- Siskiyou County – Shasta Valley Basin GSA
- Siskiyou County - Butte Valley Basin GSA
- Siskiyou County – Scott Valley Basin GSA
- Shasta County - Enterprise / Anderson Subbasins GSA
- Colusa County GSA and GSP (Colusa Subbasin)
- Glenn County GSA and GSP (Colusa Subbasin)
- East Butte Subbasin GSA
- West Butte Subbasin GSA
- Kaweah Delta Subbasin GSA
- Wyandotte Creek Subbasin GSA
- Vina Subbasin GSA
- Yolo County Subbasin GSA
- Sonoma Valley GSA and GSP
- Santa Rosa Plan GSA and GSP
- Petaluma GSA and GSP
- Ukiah Valley Basin GSA
- Santa Margarita Groundwater Agency GSP
- Madera Subbasin GSP
- Chowchilla Subbasin GSP
- Kern County Subbasin GSA and GSP
- Turlock Subbasin GSA
- Mid-Kaweah GSA

- Stanislaus SGMA Regional Groundwater Coordinating Committee
- Paso Robles Subbasin GSA
- Owens Valley Basin GSA
- Santa Clara River Valley East Subbasin GSA
- Upper Ventura River Basin GSA
- Soquel-Aptos Basin Groundwater Management Committee and GSA
- Santa Maria Basin GSA (adjudicated)
- San Luis Rey / Pauma Valley Basin GSA
- San Diego River Valley Basin GSA
- Borrego Valley Basin GSA and GSP

California Water Use Efficiency Program - SBx7-7 Water Conservation Act of 2009

Client: California Department of Water Resources (DWR). Location: Statewide. Years: 2010 – Present. Role: Program Manager / Managing Senior Mediator. Summary: Working with DWR Water Use Efficiency Branch, Bureau of Reclamation, California Urban Water Conservation Council, and Agricultural Water Management Council to develop and implement a comprehensive multi stakeholder process to address multiple, legislative mandates and projects. Manage an Urban Stakeholder Committee (USC), and Agricultural Stakeholder Committee (ASC) and six additional technical subcommittees. Work and coordinate directly with a range of technical specialists on water use engineering, economics, biological impacts, financing practices, regulatory constraints and development of draft and final State regulations. Strategic planning activities have resulted in the completion of urban and agricultural water methods and regulations, acted on by the USC, ASC, and California Water Commission. These include the adoption of the following (as mandated in SBx7-7) for the USC and ASC:

- Urban Target Methodologies
- Fourth Target Method
- Process Water Regulations
- Quantification of Agricultural Water Use
- Agricultural Water Use Regulations
- Agricultural Water Efficiency Practices

California Commercial, Industrial and Institutional (CII) Water Use Task Force

Client: DWR. Location: Statewide. Years: 2011 – 2013. Role: Project Manager / Managing Senior Mediator. Summary: SBx7-7 mandated the creation of the CII Task Force to identify and recommend best management practices and associated metrics and water use savings for California's CII sectors. In the context of strategic planning, and report to the State Legislature with their recommendations. Mr. Ceppos was the process designer, facilitator, and mediator of this 35 member group of interest specialists from a variety of water use sectors and academia. Activities included the development and incorporation of data from the following Subcommittees and Workgroups:

- Commercial Landscape Subcommittee
- Refining and Petrochemical Subcommittee
- Metrics Subcommittee
- High-Tech Workgroup
- Food and Beverage Manufacturing Workgroup

Demand Management Measures – Independent Technical Panel (ITP)

Client: DWR. Location: Statewide. Years: 2013 – 2016. Role: Project Manager and Managing Senior Mediator for this Bagley Keene Act group, founded by legislative mandate. Summary: The ITP is mandated to remain convened and to deliver a report to the legislature every 5 years with recommendations on new demand management measures, technologies and approaches to water use efficiency. Mr. Ceppos has been the process designer and facilitator of the ITP since its inception, designing meeting approaches and the group's governance Charter, and negotiating a set of recommendations and a Phase I report to the legislature about proposed changes to the Urban Water Management Planning Act. The Phase II ITP focus has been on landscape water use and associated recommendations to the Legislature and several State agencies on short and long-term water use modifications. The ITP finalized this report in April 2016.

Upper Truckee River TMDL Collaborative Stakeholder Process

Client: Lahontan RWQCB (Lahontan). Location: Upper Truckee River, Lake Tahoe and Northern California. Years: 2007-2008 . Role: Project Manager/Senior Mediator. Summary: Mr. Ceppos facilitated this community-based process with Lahontan and stakeholders of the Upper Truckee River, the goal of which was to agree upon standards for sediment TMDLs in the watershed and implement strategies to improve water quality in the watershed. A Planning Committee of the USFS, Desert Research Institute, Truckee River Watershed Council, and others was convened to direct stakeholder engagement.

American River Flow Management Standard (FMS)

Client: Sacramento Water Forum. Years: 2010 – 2012. Role: Project Manager, Principal Investigator and Managing Senior Mediator. Summary: The case regarded negotiating the last unresolved agreement associated with the historic Water Forum Agreement. The FMS has been a long standing unresolved situation from the original Water Forum effort. Environmental advocates had expected this standard to be resolved over a decade ago and since then water purveyors have acted on several system improvements allowed through the agreement while the FMS remained unresolved. Mr. Ceppos conducted an assessment of Water Forum signatories about the feasibility of a negotiation to resolve outstanding issues of a FMS. Recommended and convened several groups including a technical advisory team, steering committee, and focused work groups to address specific water management issues on the American and Sacramento rivers associated with creating a functional FMS. The project has focused since mid-2012 on a range of technical modeling issues that must be resolved before final negotiation can be completed.

North-of-Delta Offstream Storage Project

Client: DWR, US Bureau of Reclamation, Sites Reservoir Joint Power Authority. Location: Maxwell, California. Years: 2011 – Present. Role: Project Manager / Managing Senior Mediator. Summary: Working with DWR, Bureau, and the local Joint Power's Authority (JPA), Mr. Ceppos conducts outreach, develops strategic messaging, establishes and implements a comprehensive critical path in the analysis and environmental compliance process of the proposed Sites Reservoir and associated Integrated Regional Water Plan activities. He is the project manager for day-to-day activities on the effort. He also has been the lead facilitator for meetings between the various project agencies, and between member organizations of the JPA. He authored the public outreach plan for future activities, including affected landowner meetings, CEQA/ NEPA meetings, presentations and workshops with the Northern Sacramento Valley IRWM, and similar. He prepares media information, web-based content, and public notices of project events.

North Valleys Water Quality Negotiation

Clients: Pyramid Lake Paiute Tribe, Cities of Reno and Sparks- Nevada, US Bureau of Land Management, Washoe County, Nevada Division of Environmental Protection. Location: Reno / Sparks NV. Years: 2010 . Role: Project Manager/Senior Mediator. Summary: Mr. Ceppos worked with Tribal, State, Federal, and local government interests to resolve complicated water quality conflict associated with the treatment and discharge of imported water from Honey Lake in the Great Basin / Sierra Nevada region to the Truckee River. The primary concerns were total dissolved solids, dissolved oxygen, heavy metals, and endocrine disrupters. Topics of negotiation include special status species, local economies, and cultural sensitivities.

Upper Klamath Basin Working Group Restoration Planning Process

Client: U.S. Institute for Environmental Conflict Resolution. Location: Klamath Basin. Year: 2001 - 2002 . Role: Project Manager, Lead Facilitator and Process Designer. Summary: Mr. Ceppos developed a comprehensive situation assessment focused on assessing the organizational capacity of the Working Group, a 33-member collaborative process. Prepared recommendations and lead a collaborative, two-phase planning process to develop a consensus-based comprehensive restoration plan for the Upper Klamath Basin.

Headwaters Forest Reserve Management Plan

Client: U.S. Bureau of Land Management (BLM). Location: Eureka, CA. Year: 2001. Role: Task leader for public involvement program, lead facilitator/mediator for process, and part of resource planning team. Summary: Mr. Ceppos developed the public outreach and facilitation strategies for meetings in Eureka, San Francisco, and Sacramento, California. The project included the assessment of multiple recreational and other land uses and the development of the long-range management plan for the 7,400-acre Headwaters Reserve near Eureka, CA.

White House Conference on Cooperative Conservation

One of 24 senior practitioners from throughout the US asked to mediate / facilitate deliberations of 1,200 invited delegates at this conference held in St. Louis MO in September 2005. This was only the fourth Presidential conference on conservation and natural resources in U.S. history.

California State University, Sacramento
Consensus and Collaboration Program

Meagan Wylie, Lead Facilitator

Years of Experience
CCP: 5 years
Total: 13 years

Geographic Experience
California
New Jersey
Hawai'i

Education
Hawai'i Pacific University, Honolulu, HI, B.S. Marine Biology and Oceanography, *magna cum laude*, 2006

Professional Development Seminar Series (40 hours), Center for Collaborative Policy, Sacramento, CA. 2015

Non-Profit Management Solutions and Brandman University; Certificates in (2009-10):
- Succeeding as a Supervisor
- Producing Peak Performance
- Team Building
- Interviewing and Hiring for NGOs

Discipline/Expertise
Facilitation and Mediation
Participatory Planning
Stakeholder Engagement and Large Stakeholder Processes
Natural Resource Management
Water Resource Management
Community Outreach

Summary of Experience
Meagan Wylie is a Lead Mediator and Facilitator with the Center for Collaborative Policy (CCP). Working out of CCP's Southern California office, Ms. Wylie provides facilitation, project management, stakeholder outreach and coordination, public engagement, collaborative strategic planning services, and stakeholder assessments to local, state and federal agencies and non-governmental organizations (NGO).

Project Experience

Sustainable Groundwater Management Program: Borrego Valley Groundwater Basin: Client: Department of Water Resources. Location: Borrego Valley Groundwater Basin. Years: 2016-Present. Role: Facilitation and Project Management. The GSA is responsible for developing and implementing a Groundwater Sustainably Plan (GSP) for the Borrego Basin, with input provided by a formally established Advisory Committee (AC) to aid in the development of the planning and policy recommendations contained in the GSP. Ms. Wylie facilitates meetings of the AC, the GSA "Core Team" that includes representatives from the GSA agencies and GSP technical consultants, and completes related project management activities.

Owens Lakebed Master Project Development Process
Client: Los Angeles Department of Water & Power. Years: 2016. Location: California. Role: Associate Facilitator. Summary: The Los Angeles Department of Water and Power, responsible for dust mitigation on the dry Owens Lake bed, has convened a diverse advisory committee to help refine a proposed "master project" for the lakebed that would include dust control, habitat enhancement, surface water conservation by accessing groundwater for a portion of the dust control, and public access and recreation elements. The California State Lands Commission owns most of the land under the lakebed while the Great Basin Air Pollution Control District regulates air quality. The advisory committee includes these entities, as well as representatives of agriculture, local business, recreation and, local, state, federal and tribal governments. In December, 2014, the advisory committee reached consensus on refinements to the description of the proposed Master Project, including calling for the development of resource protection protocols which would enable all concerned to assess whether the use of groundwater for these dust control efforts would or would not be

viable. The advisory committee will remain intact for the foreseeable future to provide input as needed during development of the resource protection protocols. Ms. Wylie began supporting this group in 2016.

Sustainable Groundwater Management Program, Local Assistance Facilitation Support Services: Turlock Groundwater Subbasin. Client: State Water Resources Control Board. Location: Turlock Groundwater Subbasin. Years: 2017-Present. Role: Facilitation, Project Management, Documentation Preparation. Summary: The Groundwater Sustainability Agencies (GSAs) in the Turlock Subbasin of the San Joaquin Valley recognize a need for engaging the community early in the development process of Groundwater Sustainability Plan (GSP) planning. CCP is supporting the successful creation of a basin-wide communications committee (committee) that will effectuate productive stakeholder workshops and stakeholder engagement ultimately leading to the development of a robust GSP Communication Plan to be implemented through the adoption of a basin-wide GSP. Ms. Wylie has supported the convening of the committee, developed a committee charter, annual work plan, updates to the 2017 Draft Basin-Wide Communication Plan, and is helping prepare for a series of Public Workshops to be hosted in 2018.

Sustainable Groundwater Management Program, Local Assistance Facilitation Support Services. Client: Department of Water Resources. Locations: San Luis Rey Valley Groundwater Basin, San Diego River Valley Groundwater Basin, Kern County Stakeholder Engagement, Upper Ventura River Basin. Years: 2016-2017. Role: Facilitation: The Sustainable Groundwater Management Act (SGMA) was signed into law in January 2015. It represents the most sweeping shift in groundwater management and policy in California's history. SGMA requires high and medium priority groundwater basins and subbasins to create Groundwater Sustainability Agencies (GSA). Ms. Wylie facilitated these formation efforts. The process included facilitating meetings and consultations with key stakeholder groups including Tribes and GSA-eligible entities, facilitating GSA formation workgroups, development of governance agreements, and public meetings for outreach and education about SGMA.

Tribal Engagement in the Sustainable Groundwater Management Act and Proposition 1
Client: California Department of Water Resources (DWR). Location: San Pasqual, Sacramento. Years: 2015. Role: Associate Facilitator. Summary: The Sustainable Groundwater Management Act of 2014 (SGMA) provides a framework for sustainable management of groundwater supplies by local authorities, with a limited role for state intervention only if necessary to protect the resource. The act requires the formation of local groundwater sustainability agencies (GSAs) that must assess conditions in their local water basins and adopt locally-based management plans. Proposition 1 (2014 Water Bond) will provide funding for various water projects and programs that will: (1) increase the state's supply of clean, safe, and reliable drinking water, (2) protect and restore rivers, lakes, streams, coastal waters, and watersheds, (3) improve water quality, security, and adaptation to climate change, and (4) improve statewide water system operations to increase drought preparedness and flood protection. DWR held workshops in Redding and San Pasqual for California Native American Tribes designed to provide an overview of and answer questions about the legislation; provide a tutorial on related websites and web-based tools; identify tribal needs for information, data, and technical assistance; and strategize for future tribal engagement. Along with the State Water Resources Control Board, Department of Fish and Wildlife, State Coastal Conservancy, Ocean Protection Council, other state agencies, DWR also held a two-day consultation meeting in Sacramento to review Water Bond funding opportunities and procedures with California Native American Tribes.

Independent Technical Panel (ITP) for Demand Management Measures
Client: Department of Water Resources. Location: Irvine, Sacramento, CA. Years: 2014 – 2016. Roles: Associate Facilitator, Project Management, Meeting Documentation. Summary: In 2007, the California Legislature passed AB 1420 which provisioned urban water supplier grant eligibility on the implementation of demand management measures. The bill also directed the California Department of

Water Resources (DWR) to convene an Independent Technical Panel (ITP) to provide information and recommendations to DWR and the Legislature on new demand management measures (DMM), technologies, and approaches. DWR convened the ITP in 2013, and they submitted their first legislative report on DMM in December 2014. Shortly thereafter in early 2015, the ITP engaged in efforts to address urban landscape water use efficiency throughout the state. After 30 two-day intensive meetings, the ITP finalized its second legislative report in May 2016. This report is comprised of 18 different recommendations, and can be accessed via the DWR website here: http://www.water.ca.gov/wateruseefficiency/sb7/committees/urban/u2/. Ms. Wylie assisted this high-profile group in facilitating weekly internal project team calls, supporting the two-day public workshops, document preparation, organization of meeting/workshop logistics, and preparation of meeting documentation, including summary reports and the ITP's final report to the legislature.

California Executive Order B-37-16 Implementation

Client: California Department of Water Resources (DWR). Location: Statewide. Years: 2016 – 2018. Role: Facilitator, Project Management. Summary: Working with DWR, State Water Resources Control Board (SWRCB), California Department of Food and Agriculture (CDFA), California Public Utilities Commission (CPUC), and California Energy Commission (CEC) (Collectively "Executive Order (EO) State Agencies"), assists CCP colleagues in convening weekly meetings among staff and executive level positions among diverse EO State Agencies, and in program management among project teams and EO State Agencies' staff and executives. Ms. Wylie will also facilitate select meetings between EO State Agencies and public stakeholders. Activities include mediating diverse project goals and objectives to meet EO directives on the management of California's water resources. The CCP project team works directly with EO State Agencies to reach agreement on frameworks for new statewide Water Use Targets, Water Loss Regulations, Water Shortage Contingency Plans, and Drought Planning.

San Diego IRWM Regional Water Data Management Program

Client: San Diego County. Location: San Diego, CA. Years: 2013 – 2015. Roles: Co-facilitation, Assistant Facilitation, Meeting Documentation, Stakeholder Outreach and Coordination. Summary: In 2011, the San Diego Integrated Regional Water Management (IRWM) Program was recommended by the Department of Water Resources to receive full funding for the development of a water data management program, including the establishment of a regional, web-based data management system (DMS). This project involves a collaborative, stakeholder-driven process that summarizes current data gathering efforts, assesses and prioritizes data management needs, and recommends basic design parameters for the DMS. Key audiences include water purveyors, water supply and wastewater districts, municipal stormwater divisions, and watershed and environmental organizations. Ms. Wylie assisted in the design and facilitation of Advisory Workgroup meetings, Stakeholder Workshops and Public Meetings, stakeholder outreach and coordination, organization of meeting/workshop logistics, and preparation of meeting documentation, including agendas, worksheets, and summary reports.

Urban Stakeholder Committee (USC) for Water Use Efficiency

Client: Department of Water Resources (DWR). Location: Irvine, Sacramento, San Diego, CA. Years: 2014 – 2016. Roles: Assistant Facilitation, Meeting Documentation. Summary: DWR formed the Urban Stakeholder Committee for Water Use Efficiency to meet some of the public process requirements of SB X7-7 (the Water Conservation Act of 2009). The USC is chartered to review technical material and documents, and to provide comments, data, and supporting information to DWR for implementing provisions of SB X7-7. Most recently the USC provided feedback to DWR and the Independent Technical Panel (ITP) on Demand Management Measures regarding the draft expedited revisions to DWR's Model Water Efficient Landscape Ordinance (MWELO). Both the ITP and USC are facilitated and coordinated by the Center for Collaborative Policy.

Borrego Water Coalition

Client: California Department of Water Resources. Location: Borrego Springs, CA. Years: 2013 – 2014. Roles: assistant facilitation, meeting documentation. Summary: Per an amended groundwater ordinance, in 2013 the San Diego County Board of Supervisors directed staff to work with the Borrego Water

District to develop a groundwater sustainability plan that addresses basin overdraft. Convened by the Department of Water Resources, the Coalition includes the District, agriculture, golf and tourism, lodging, schools, and the Anza-Borrego State Park. Ms. Wylie assisted in helping the group develop a work plan, identify objectives and management strategies, assess and rank strategies, develop a series of negotiated policy recommendations to the Borrego Water District that provide for bringing the basin into balance, and prepare for public meetings.

California State University, Sacramento
Center for Collaborative Policy

Alex Cole-Weiss, Associate Mediator

Years of Experience
Total: 4 Years

Education
M.S. Community Development
University of California, Davis
2016.

B.A. Geography
University of California, Berkeley, 2010. Minor: City and Regional Planning.

Discipline/Expertise
Community Development
Public Policy
Water Policy and Planning
Natural Resource Management
Tribal Engagement
Public Health
Strategic Planning
Facilitation
Community Outreach and Participation

Geographic Experience
United States
California

Trainings Attended
Group Facilitation Skills (24 hours), Community at Work, 2016.

Summary of Experience
Alex Cole-Weiss has expertise in community development, regional planning, and geography. She draws from a range of experiences with cooperative decision-making structures, political and social organizing groups, urban land use planning initiatives, and community food systems. Alex joined the Center in 2016 and works on projects related to public engagement, tribal outreach, natural resource management, environmental planning, transportation planning, and environmental justice. Her skills include stakeholder assessment, research, writing, conflict resolution, workshop planning, and meeting summaries and facilitation.

Project Experience

Owen's Lake Master Project Cultural Resources Task Force
Client: Los Angeles Department of Water & Power. Years: 2014-Present. Location: Owens Valley, CA. Summary: The Task Force, which focuses on four specific sites in Owens Valley that are particularly culturally sensitive, is charged with recommending to the Los Angeles Department of Water and Power and Great Basin Unified Air Pollution Control District how to balance dust control mitigation and protection of cultural resources on these four sites. The first task was to develop consensus among area tribes regarding how they would like to see that balance achieved; this has been accomplished. Second, the tribes presented their recommendation to the rest of the Task Force, considered feedback, and refined their recommendation as they deemed appropriate. The Task Force unanimously accepted the Tribes' recommendation for the first set of sites in December 2014. The co-conveners are now implementing the Tribes' recommendation for these four sites, while the Task Force has gone on to develop recommendations for a second set of sites. Alex joined the project in 2016 and supports meeting preparation and facilitation, including developing notes to summarize key meeting outcomes.

California State Rail Plan – Tribal Program
Client: California Department of Transportation (Caltrans), subcontracted through AECOM, Inc. Location: California statewide. Years: 2014 – Present. Role: Assistant Facilitator. Summary: The California State Rail Plan is due for an update in 2018. Caltrans is committed to ensuring early collaboration, communication, and consultation with California Native American Tribes.

Alex joined the project in 2016 and supports the development, revision, and implementation of a Native American Tribal Consultation and Outreach Plan (NATCOP) to provide an overview of activities to inform and engage with Tribes and obtain their opinions, comments, and suggestions for the State Rail Plan.

California State Water Plan Tribal Water Summit

Client: California Department of Water Resources (DWR). Location: Statewide. Role: Assistant Facilitator. Year: January 2017 – Present. The State Water Plan, updated once every five years, is designed to make projections about California's future water demand and recommend actions to meet the state's future water needs. Members of the Policy Advisory Committee include stakeholders drawn from state, federal and local government agencies; tribal governments; local water interests; agricultural interests; the environmental community; the academic community; business and industry; and the general public. Alex is responsible for attending client project meetings, as well as the Policy Advisory Committee, Tribal Advisory Committee, and Plenary meetings. She documents collaborative meetings, and drafts and manages client and stakeholder-related materials.

Landscape Conservation Cooperative - Tribal Traditional Ecological Knowledge Team

Client: California Landscape Conservation Cooperative (LCC). Location: Sacramento. Years: 2015 – Present. Role: Assistant Facilitator. Summary: The Center provides collaboration and facilitation support to the CA LCC for projects which include the Central Valley Landscape Conservation Project and the Tribal Traditional Ecological Knowledge (TEK) Team. Alex supports the organization and planning of projects, activities, and workshops to further the conservation goals of the CA LCC while maintaining diverse interests and concerns of California Native American Tribes.

AB 32 Environmental Justice Advisory Committee (EJAC)

Client: Air Resources Control Board (ARB), subcontracted by the Center for Continuing Education (CCE). Location: Sacramento. Years: 2016 – Present. Role: Assistant Facilitator. Summary: The first EJAC was convened in 2007 to advise the ARB in developing a Scoping Plan and any other pertinent materials for implementing AB 32. The EJAC comprises representatives from communities in the State with the most significant exposure to air pollution including, but not limited to, communities with minority populations or low-income populations, or both. The EJAC was reconvened in 2013 to advise the Board on the 2013 Scoping Plan Update. CCP provides collaborative problem solving facilitation and mediation services for the EJAC and ARB. Alex's role includes meeting facilitation, agenda preparation, note-taking, and assistance with preparation of community workshop materials.

Counties Cannabis Summit

Client: California State Association of Counties. Years: March 2017 – July 2017. Location: California. Role: Assistant Facilitator. Summary: The Counties Cannabis Summit brought together local government leaders with medical and adult use cannabis state agencies and regulators. The Summit included opportunities to learn about the medical and adult regulatory framework, cultivation and environmental issues, taxing, banking and financial impacts, how to work with the cannabis industry, and local licenses and land use. The Summit was an opportunity for elected officials to get to know senior agency and staff and develop relationships across California. Alex helped to coordinate and staff the Summit, including handling logistics, developing meeting materials, taking notes, and writing summary reports.

TEAM
ENGINEERING & MANAGEMENT, INC.
P.O. Box 1265, Bishop, California 93515-1265
760-872-1033 fax 760-872-2131

NAOMI JENSEN GARCIA
PRESIDENT / CHIEF EXECUTIVE OFFICER

EDUCATION

Bachelor of Science - With High Honors - in Environmental Science
University of California, Santa Barbara
Bishop Union High School, Bishop, California

REGISTRATIONS AND CERTIFICATIONS

California Environmental Protection Agency, Registered Environmental Assessor I #07782

EMPLOYMENT HISTORY

TEAM Engineering & Management, Inc., Bishop, California. President/CEO. 2015 - Present
TEAM Engineering & Management, Inc., Bishop, California. Senior Environmental Scientist. March 1999 - December 2014
White Mountain Research Station, Bishop, California. Scientist. 1998
Santa Barbara Flood Control District, Santa Barbara, California. Environmental Scientist 1996

PROFESSIONAL EXPERIENCE

After sixteen years of serving as TEAM's Senior Environmental Scientist and Manager of TEAM's Mammoth Lakes office, Naomi Garcia assumed leadership as President and Chief Executive Officer of TEAM in January 2015. Ms. Garcia has a broad range of experience in project management, multi-agency permitting, environmental site assessments, soil and groundwater monitoring programs, hazardous waste management and disposal, and preparation of regulatory compliance reports including CEQA and NEPA documents. Naomi has extensive experience successfully interfacing with local, state and federal agencies and interest groups related to permitting and regulatory compliance, and natural resource management.

During the course of Naomi's 19 years at TEAM, she has managed numerous groundwater monitoring projects in the Owens Valley basin, including monitoring of long term groundwater exportation projects and mitigation programs in the Rose Valley and Olancha/Cartago areas of Inyo County, as well as multiple groundwater quality monitoring projects in Inyo and Mono Counties. She has also contributed to several groundwater availability studies in the Eastern Sierra, including in the Tri-Valley region of the Owens Valley groundwater basin (2001-03 and 2006), as well as land use planning and compliance projects for numerous private land owners and agencies in the Owens Valley.

Ms. Garcia has experience working with local tribal groups in the Owens Valley, and has assisted Inyo County and other clients with formal tribal consultation processes. She has also effectively facilitated stakeholder meetings, most notably in her recent work with Great Basin Unified Air Pollution Control

District, working effectively with the Los Angeles Department of Water and Power, State Lands Agency, tribal representatives, BLM, and other state and federal agencies on the Owens Lake Dust Mitigation Project. Naomi has served as Project Manager on many environmental projects throughout Inyo and Mono Counties, including the Owens Valley. She has effectively managed natural resource assessments and regulatory compliance management projects. Ms. Garcia also has experience in stream-restoration, re-vegetation, erosion control, and wetland assessment and mitigation practices.

Naomi has effectively managed complex projects, working with professional affiliates on several major projects. She has experience with work plan preparation and budget management. Several of the projects she is involved in have required detailed task and budget management, and Naomi excels at meeting rigorous project deadlines and budget constraints. During her work on numerous environmental clean-up projects in the Eastern Sierra, Naomi has effectively communicated with the Lahontan Regional Water Quality Control Board (RWQCB) and other local and state agencies, with the objective of obtaining successful restoration of water quality objectives as cost-effectively as possible.

Recently, Naomi has served as TEAM's Project Manager in providing regulatory compliance management services for Inyo and Mono counties, at twelve active landfill facilities in the Eastern Sierra. In the course of these two projects, Naomi has worked with several affiliates as well as the Inyo and Mono County Environmental Health Department, Los Angeles Department of Water and Power, Lahontan RWQCB, CalRecycle (formerly the California Integrated Waste Management Board), and BLM. Her knowledge of the regulatory agencies and the multifaceted aspects of landfill permitting have been a valuable asset to Inyo and Mono counties in managing their solid waste regulatory compliance programs.

Ms. Garcia has extensive experience working with current and emerging technology, including computer technology and complex groundwater, surface water, and air quality monitoring devices. She can effectively manage inter-agency discussions and actively uses teleconference, powerpoint and webinar technology to communicate effectively and reduce travel costs associated with working in remote areas.

Naomi is a fourth-generation resident of the Eastern Sierra and has extensive knowledge of the region's unique physical and socioeconomic conditions. She is actively engaged in her community, volunteering in the Town of Mammoth Lakes and in Chalfant Valley, formerly serving as a commissioner to the Chalfant Valley Community Service District in the Tri-Valley Region of Mono County, and currently as a Board Member of the High Sierra Energy Foundation in Mammoth Lakes.

PROFESSIONAL AFFILIATIONS AND ACTIVITIES

Technical Advisor to the California Alpine Resort Environmental Cooperative
Board Member, High Sierra Energy Foundation
National Groundwater Association
Environmental Assessment Association - Certified Environmental Inspector
Member of the Sierra Business Council

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RICHARD SHORE

STAFF GEOLOGIST

EDUCATION

Bachelor of Science in Geological Sciences, with a Concentration in Engineering Geology and Hydrology
University of California, Santa Barbara, 2008

REGISTRATIONS AND CERTIFICATIONS

Geologist-In-Training, State of California 2018.
40-Hour OSHA HAZWOPER Certification, 2009 to present.

EMPLOYMENT HISTORY

TEAM Engineering & Management, Inc., Bishop, California. Staff Geologist. 2017 to present.
AECOM, Bakersfield, California. Field Geologist/Technician. 2010 to 2017.
Gold Coast Geoservices, Inc., Camarillo, California. Engineering Geologist. 2009 to 2010
DMI-EMK Environmental Services, Inc., Ventura, California. Staff Geologist 2009.
Fugro West, Inc., Ventura, California. Engineering Geology Aide. 2008 to 2009.

PROFESSIONAL EXPERIENCE

Richard Shore, Staff Geologist for TEAM Engineering & Management, Inc. (TEAM), has 10 years of experience in the geologic and environmental consulting fields. Richard has a broad array of professional experience conducting site assessments and investigations, hazardous materials remediation, underground storage tank removal and monitoring, Phase I and Phase II site assessments, and groundwater and soil investigations. Richard has particular expertise out in the field assisting clients with their groundwater monitoring well installations, groundwater, soil and soil-gas sampling and monitoring programs, as well as the installation, operations and maintenance of various groundwater and soil-gas remediation systems. Richard is proficient with a variety of environmental field instruments and computer software and programs. Mr. Shore also has experience in coordinating data-sharing and management programs with other external entities, including community service districts, federal agencies, and native American tribes. As a current resident of Bishop, CA, and former resident of Lone Pine, CA, Mr. Shore has extensive personal knowledge of the Owens Valley Groundwater Basin, the history of water usage and water agreements with the Los Angeles Department of Water and Power, and hands-on experience with water monitoring in the Owens Valley region. Additionally, Mr. Shore currently attends the monthly Owens Valley Groundwater Association meetings as a concerned member of the public to stay up to date on the latest issues affecting water rights and water usage in the Owens Valley basin.

Some of the projects currently worked on by Mr. Shore at TEAM include:

- Groundwater monitoring and reporting for a large-scale groundwater pumping project at the Crystal Geyser Water Bottling Plant in Cartago, CA, which includes groundwater sampling, groundwater level data collection, and operation and maintenance of electronic data collection systems.
- Groundwater monitoring, sampling, and reporting for 12 landfills throughout Mono and Inyo Counties. Tasks include the full scope of field and reporting activities, including groundwater sampling, groundwater data and statistical analysis, drafting of data tables, figures and graphs, complying with Waste Discharge Requirements for individual sites, and the associated reporting.
- Groundwater well installation and abandonment at the Pumice Valley Landfill in Mono County, California. Tasks include soil logging, sampling, well design and construction, and reporting.

Bruce Orr, Ph.D.
Senior Ecologist/Principal

Dr. Bruce Orr (Ph.D., Entomology/Ecology) has over 25 years of experience leading complex projects involving natural resource inventories, integrated natural resource management plan development, and federal and state regulatory processes. He has led numerous multi-disciplinary restoration feasibility and planning studies that incorporate hydrologic and water resource management planning, instream flow needs, and groundwater inputs in major watersheds throughout California (San Joaquin, Merced, and Santa Clara rivers), and is currently leading restoration planning projects on the Virgin and Gila rivers (Nevada and Arizona). Dr. Orr provides senior strategic support on many of Stillwater's large-scale regulatory, watershed management, and restoration projects.

AREAS OF EXPERTISE

- Riparian and Wetland Ecology
- Restoration Ecology
- Integrated Natural Resource Analysis and Management Planning
- Watershed Analysis
- Benthic Macroinvertebrate and Stream Ecology
- TMDLs

YEARS OF EXPERIENCE

At Stillwater: 22 years
In Total: 39 years

EDUCATION

Ph.D., Entomology (Aquatic Entomology/Aquatic and Wetland Ecology), University of California at Berkeley, 1991

BA, Biological Sciences and Environmental Studies (High Honors), University of California at Santa Barbara, 1979

SELECTED PUBLICATIONS

Orr, B.K., A.M. Merrill, and others. 2017. **Use of the biophysical template concept for riparian restoration and revegetation in the Southwest**. In: *Case Studies of Riparian and Watershed Restoration Areas: Learning from success and failure.* US Geological Survey Grand Canyon Monitoring and Research Center, Flagstaff, CO. USGS Open File

SELECTED PROJECT EXPERIENCE

Ecosystem Linkages and Ecological Flows Studies, Sacramento River, CA *(Clients: CALFED and The Nature Conservancy):* Dr. Orr led the Ecosystem Linkages Study and other studies as part of the Sacramento River Ecological Flows Study initiated by The Nature Conservancy in collaboration with ESSA Technologies, Stillwater Sciences, UC Davis, and UC Berkeley. The purpose of this study was to define how flow characteristics (e.g., the magnitude, timing, duration, and frequency) and associated management actions (such as gravel augmentation and changes in bank armoring) influence the creation and maintenance of habitats for a number of native species that occur in the Sacramento River corridor. Dr. Orr was the technical lead for studies focused on riparian and floodplain habitats and ecosystem linkages between river processes and species of interest.

Ecohydrologic Assessment and Restoration Prioritization, Planning, and Design, Virgin River, UT, AZ, and NV *(Clients: Walton Family Foundation, The Nature Conservancy, and Clark County Desert Conservation Program):* Dr. Orr was the project director for an ecohydrologic assessment to help identify and prioritize suitable riparian restoration locations along 120 miles of the flood prone, ecologically sensitive Virgin River—a major tributary to the Colorado River. The assessment supports the initial phases of the much greater Virgin River Restoration Framework involving numerous resource agencies, academic researchers, and local stakeholders all working towards the removal of the invasive tamarisk plant and restoration of critical habitat for listed species, including the endangered Southwestern Willow Flycatcher.

Restoration Feasibility Study and Riparian Vegetation Dynamics, Classification and Mapping Study, Santa Clara River Parkway, CA *(Client: California Coastal Conservancy)*: Dr. Orr led a team that sampled, classified, and mapped over 25,000 areas of riparian vegetation and floodplain habitats along the Santa Clara River in Ventura County. Additional studies explored the physical process drivers and human land and water use impacts on riparian-floodplain dynamics. The final Feasibility Report integrated these and other studies to present

Report 2017-1091.

Rasmussen, C.G. and **B.K Orr**. 2017 **Restoration principles for riparian ecosystem resilience**. In: *Case Studies of Riparian and Watershed Restoration Areas: Learning from success and failure.* US Geological Survey Grand Canyon Monitoring and Research Center, Flagstaff, CO. USGS Open File Report.

Beller, E.E., P. W. Downs, R.M. Grossinger, **B.K. Orr**, and M.N. Soloman. 2015**. From past patterns to future potential: using historical ecology to inform river restoration on an intermittent California rive**r. Landscape Ecology, DOI 10.1007/s10980-015-0264-7

Downs, P.W., M. Singer, **B. K. Orr**, and others. 2011. **Restoring ecological integrity in highly regulated rivers: the role of baseline data and analytical references.** Environmental Management. 48(4):847-64.

Orr, B.K., and others. 2011. **Riparian vegetation classification and mapping: important tools for large-scale river corridor restoration in a semi-arid landscape**. *In* J. Willoughby, **B. Orr**, K. Schierenbeck, and N. Jensen [eds.], Proceedings of the CNPS Conservation Conference: Strategies and Solutions, 17-19 Jan 2009.

Stella, J. C., J. J. Battles, J. R. McBride, and **B. K. Orr**. 2010. **Riparian seedling mortality from simulated water table recession, and the design of sustainable flow regimes on regulated rivers.** Restoration Ecology 18, supplement S2: 284-294.

Howald, A.M. and **B.K. Orr.** 2000. The flora of the Valentine Eastern Sierra Reserve, Second Edition. The Herbarium, U.C. Santa Barbara, CA.

strategies for habitat conservation, levee setback and removal, passive and active native plant revegetation, non-native species removal, fish passage improvement, and water quality treatment to improve ecosystem functions and increase the resiliency of the lower Santa Clara River to climate change impacts. Dr Orr is currently directing studies supporting riparian and aquatic invasive species control and river and riparian and floodplain restoration implementation and monitoring efforts being implemented by local stakeholders under Prop 84 funding.

Restoration Objectives and Strategies, San Joaquin River Restoration Plan, CA *(Client: Friant Water Users Authority and NRDC; U.S. Bureau of Reclamation)*: Dr. Orr co-managed a unique effort to develop a plan for restoring the San Joaquin River ecosystem in balance with beneficial uses of San Joaquin River water supplies. Stillwater developed restoration objectives and strategies to support the 2006 settlement agreement and led subsequent planning efforts under the SJRRP to restore the San Joaquin River below Friant Dam to support riparian vegetation and self-sustaining, naturally reproducing populations of salmon and other aquatic species. Dr. Orr was the technical team lead for riparian and floodplain wetland assessment and restoration planning. He was a senior member of the consultant team hired by the U.S. Bureau of Reclamation to provide technical support to the multi-agency team charged with implementing the restoration along 150 miles of the San Joaquin River.

Cache Slough Complex Conservation Assessment, Sacramento-San Joaquin Delta, CA *(Client: Department of Water Resources [DWR])*: Dr. Orr is project director for the consultant team providing support to DWR in the implementation of the Fish Restoration Program (FRP) in order to fulfill requirements contained within Biological Opinions of the USFWS (2008) and NMFS (2009) for continued water export operations of the SWP and CVP. For the Cache Slough Complex Conservation Assessment, Dr. Orr is working with DWR and DFW staff to support DWR in identifying and prioritizing tidal marsh restoration opportunities in the northwestern portion of the Delta. The assessment relies upon existing conceptual models to synthesize historical ecology of the Delta, current landscape and waterscape patterns, and effects of climate change and other factors. The assessment integrates knowledge from recent and ongoing restoration projects (Liberty Island, lower Yolo Bypass, Prospect Island, Calhoun Cut), as well as broader planning efforts (2008 Delta Vision Strategic Plan; 2010 Ecosystem Restoration Program Stage 2 Conservation Strategy; 2012 Bay Delta Conservation Plan).

Amy Merrill, Ph.D.
Senior Ecologist

Dr. Amy Merrill (*Ph.D., Wildland Resource Management*) is an ecologist with expertise in riparian and wetland monitoring and restoration design, quantifying ecosystem services, wetland and riparian biogeochemistry, and watershed management. Dr. Merrill is experienced in vegetation classification and mapping, planning riparian restoration and planting, assessing riparian effects on aquatic and terrestrial habitat, and watershed assessment. Dr. Merrill has led efforts to improve coordination and information exchange among meadow restoration practitioners in the Sierra Nevada and to develop consistent methods for monitoring meadow vegetation and hydrologic conditions.

AREAS OF EXPERTISE

- Riparian and Wetland Ecology
- Biogeochemistry and Restoration
- Plant Community Ecology
- Watershed Management

YEARS OF EXPERIENCE

At Stillwater: 12 years
In Total: 25 years

EDUCATION

Ph.D., *Wildland Resource Management*, University of California, Berkeley, 2001

M.S., *Natural Resource Management*, University of Michigan at Ann Arbor, MI, 1991

B.A., *Biology*, Hamilton College, Clinton, N.Y. 1983

PROFESSIONAL AFFILIATIONS

– Part-time faculty, U. of San Francisco
– California Native Plant Society
– Society of Wetland Scientists

SELECTED PUBLICATIONS

A.G. Merrill, A.E. Thode, A.M. Weill, J. Fites-Kaufman, A.F. Bradley, and T.J. Moody. In Press. **Fire and Plant Interactions** Chapter 8 in van Wagtendonk, J.W. and S.L. Stephens (editors); **Fire in California Systems, Second Edition**. U.C. Press.

Orr, B.K., A.G. Merrill, Z.E. Diggory, J. C. Stella. 2017. Use of biophysical

SELECTED PROJECT EXPERIENCE

Central Valley Habitat Exchange Tool Development and Piloting (*Client: Environmental Defense Fund*): Dr. Merrill leads the Stillwater effort to develop and pilot tools for quantification habitat extent and quality for multiple species for use in volunteer and regulatory markets. Dr. Merrill leads tool development, field demonstrations of the tool, and is overseeing tool application at over 25 pilot sites.

Feasibility Study for a Water Transaction Program in the California Walker River Basin *(Client: Shannon Peterson, ltd. And the Mono County Resource Conservation District*): Dr. Merrill supported a feasibility analysis for a volunteer water transaction program in the East and West Walker River Valleys. Dr. Merrill did this by building and populating a model of interactions among water sources, water reservoirs, natural and agricultural vegetation, crop production and terrestrial and aquatic habitat.

CEQA Analysis for Water Transaction Program in the California Walker River Basin *(Client: Panorama Environmental under contract with Mono County*): Currently, Dr. Merrill is leading a Stillwater effort to assess the natural resources impacts of a Water Transaction Program for the County building on the Feasibility Study by gap-filling missing field data on vegetation, habitat quality and vulnerability, and soil conditions. Dr. Merrill is also contributing to the carbon/GHG impacts assessment in partnership with Panorama Environmental.

Santa Clara River Parkway Floodplain Restoration Feasibility Study, CA *(Client: California Coastal Conservancy)*: Dr. Merrill examined riparian vegetation dynamics in relation to historic and on-going changes in stream conditions to identify dominant controllers on the distribution of riparian vegetation and articulate linkages between these variables and storm events associated with the El Niño Southern Oscillation (ENSO). The results of this field, GIS, and statistically based analysis informed recommendations for restoration strategies and restoration sites along the 116-mile reach of the Lower Santa Clara River.

Building the Scientific Foundation for a Carbon Sequestration Protocol for Mountain Meadow Restoration *(Clients: CalTrout, Foothill*

template for riparian restoration and revegetation in the Southwest. *IN* Case studies of riparian and watershed restoration in the southwestern United States—Principles, challenges, and successes: U.S. Geological Survey Open-File Report 2017-1091, 116 p.

Becker, D., S. Cashen, A.S. Cheng, D. Ganz, J. Gunn, R.J. Gutierrez, M. Liquori, A. Merrill, W. Price, D. Saah. 2015. **Legislated collaboration in a conservation conflict: a case study of the Quincy Library Group, California**. Chapter 19 in Conflicts in Conservation. S. Redpath, J. Young, R. Gutierrez, K. Wood (editors). Cambridge University Press, UK.

Pinchot Institute. July 2013. **Independent Science Panel Report to Congress. Herger-Feinstein Quincy Library Group Forest Recovery Act.** Becker, D., S. Cashen, A.S. Cheng, D. Ganz, J. Gunn, R.J. Gutierrez, M. Liquori, A. Merrill, W. Price, D. Saah.

Weixelman, D., B. Hill, D. Cooper, E. Berlow, J. Viers, S. Purdy, A.G. Merrill, and S. Gross. 2011. A Field **Key to Meadow Hydrogeomorphic Types for the Sierra Nevada and Southern Cascade Ranges in California**. Gen. Tech. Rep. R5-TP-034. Vallejo, CA. U.S.F.S, PSW, 34 pp.

Merrill, A.G. and T.L. Benning. 2006. **Ecosystem type differences in nitrogen processes and controls in the riparian zone of a montane landscape.** *Forest Ecology and Management*. 222(1-3):145-161.

Merrill, A.G., T.L. Benning, J. Fites-Kaufmann. 2006. **Factors controlling structural and floristic variation of riparian zones in a mountainous landscape of Western US.** *Western North American Naturalist*. 66(2).

Conservancy, Truckee River Watershed Conservancy, South Yuba River Citizen's League): Dr. Merrill is leading a group of projects with the sequential goals of measuring carbon sequestration in the field at 15 meadows in various states of degradation before and after restoration. Dr. Merrill led the design and coordinated implementation of carbon-related data collection and will lead development of a quantification model to underpin a carbon offset protocol for the hydrologic restoration of degraded mountain meadows.

Rice culture in the Sacramento-San Joaquin Delta to mitigate past agricultural impacts, improve water quality and sequester carbon *(Grant: USDA AFRI):* Dr. Merrill is a principal investigator on this USDA AFRI funded 5-year project to develop and field-test methodologies and benefits of growing rice in the subsided Delta lands. Dr. Merrill is co-leading development of Delta-wide effects of rice farming on potential carbon sequestration, water conveyance and subsidence.

Elk River Recovery Assessment and Pilot Sediment Removal Implementation Project, CA *(Client: Regional Water Quality Control Board)*: Dr. Merrill was the technical lead for designing and implementing methods to gather and analyze field and spatial data needed to support an assessment of the effects of riparian vegetation on fine sediment deposition (filtering) in the Elk River floodplain. This data was incorporated into a model of the potential effects of altering flood distribution and riparian vegetation on fine sediment removal from surface water in the Elk River.

San Geronimo Watershed Enhancement Plan, CA *(Client: County of Marin*): Dr. Merrill was the technical lead for the riparian assessment of existing conditions and provided riparian buffer and set back recommendations to protect riparian functions (flood attenuation, sediment and nutrient buffering, wildlife habitat and corridors, large woody debris recruitment potential).

Redwood Creek Watershed Assessment, CA *(Client: National Parks Service*): Working with the client and stakeholders, Dr. Merrill led the effort to identify, articulate, and prioritize important natural resource issues in the watershed and possible actions that could be undertaken to ensure a balance between aquatic, terrestrial, and human uses.

Cow and Mill Creek Riparian Mapping and Condition Assessment *(Client: US Fish and Wildlife Service):* Teaming with Aerial Information Systems, Dr. Merrill designed and coordinated efforts to map and assess the conditions of riparian habitat in these two important Upper Sacramento tributaries. Riparian vegetation was mapped to the alliance level. Stillwater worked with the local watershed groups to develop recommendations for priority areas for restoration, preservation, and enhancement.

Christian Braudrick, Ph.D.
Fluvial Geomorphologist

Dr. Christian Braudrick (*Ph.D., Earth and Planetary Science*), has worked on rivers for nearly 20 years as an environmental consultant and researcher. Dr. Braudrick uses mechanistic understanding of river processes to better understand how rivers respond to environmental changes in order to inform land use decisions and stream restoration planning. Dr. Braudrick's research interests focus on the controls on channel planform and how rivers respond to changes in sediment supply including from dam removal. His work often uses the results of numerical models and sediment budgets to assess morphological impacts to streams.

AREAS OF EXPERTISE

- Fluvial Geomorphology
- Hillslope Geomorphology
- Sediment Transport

YEARS OF EXPERIENCE

At Stillwater: 5 years
In Total: 20 years

EDUCATION

Ph.D., Earth and Planetary Science, University of California, Berkeley, 2013

M.S., Geology, Oregon State University, 1997

B.A., Earth Science, University of California, Santa Cruz, 1993

AWARDS

-Horton Research Grant, American Geophysical Union

-Outstanding Graduate Student Instructor UC Berkeley

-NSF Earth Science Postdoctoral Scholarship

PROFESSIONAL AFFILIATIONS

-American Geophysical Union

SELECTED PUBLICATIONS

Braudrick, C.A., W.E. Dietrich, G.T. Leverich, and L.S. Sklar (2009), **Experimental evidence for the**

SELECTED PROJECT EXPERIENCE

Slide Creek Bypass Reach Habitat Enhancement, North Umpqua River, Oregon *(Client: PacifiCorp)*: Dr. Braudrick helped design and monitor an on-the-ground restoration project for PacifiCorp's North Umpqua Hydroelectric Project. This enhancement project involved creating spawning habitat with gravel and boulder augmentation in a steep, confined mountain stream, as well as pre- and post-implementation surveys and monitoring. Monitoring included topographic surveys, low-altitude aerial photography, installation and monitoring of scour chains, and facies mapping.

Downstream effects of Soda Springs Dam, North Umpqua River, Oregon *(Client: PacifiCorp)*: Dr. Braudrick synthesized a sediment budget and other geomorphic, geologic, and hydrologic data to infer the effects of Soda Springs Dam on channel morphology and aquatic habitat as part of the relicensing of the North Umpqua Hydroelectric Project.

Pelton-Round Butte Hydroelectric Project Relicensing, Oregon *(Client: Portland General Electric)*: Dr. Braudrick helped design a gravel augmentation and sediment monitoring program for gravel transport downstream of the Pelton-Round Butte hydroelectric project and was the sediment transport lead during the relicensing negotiation.

Lake Chelan Project Relicensing, Utah *(Client: Chelan County Public Utilities District)*: Working with stakeholders, Dr. Braudrick helped evaluate potential habitat enhancement sites downstream of Lake Chelan Dam. This required integrating geomorphic analysis and habitat suitability criterion in a short reach downstream of the canyon mouth.

Marmot Dam Decomissioning, Sandy River, Oregon *(Client: Portland General Electric)*: Dr. Braudrick analyzed sediment transport modeling results to assess the geomorphic effects of different dam removal alternatives, and communicated these analyses to the stakeholders in the Decommissioning group. This led to a settlement and the eventual removal of the dam in 2007.

Fish Passage Monitoring Post Dam Removal, Sandy River, Oregon

conditions necessary to maintain meandering in coarse-bedded rivers, Proceedings of the National Academy of Science, 106, 16936-16941.

Cui, Y., J.K. Wooster, **C.A.** Braudrick, and B.K. Orr (2014). **Marmot Dam Removal Project, Sandy River, Oregon: Lessons Learned from Model Predictions and Long-term Post-Removal Monitoring.** *Journal of Hydraulic Engineering*, 140, 04014044.

Cui, Y., G. Parker, **C. A. Braudrick,** W. E. Dietrich, and B. Cluer (2006) **Dam Removal Express Assessment Models (DREAM). Part 1: Model development and validation**, *Journal of Hydraulic Research*, 44, 291-307.

Y. Cui, **C. A. Braudrick**, W. E. Dietrich, B. Cluer, G. Parker (2006) **Dam Removal Express Assessment Models (DREAM). Part 2: Sample runs/ sensitivity tests**, *Journal of Hydraulic Research*, 44, 308-323.

Braudrick, C. A. and G. E. Grant (2001) **Transport and deposition of large wood debris in streams: A flume experiment**. *Geomorphology*. 41: 263-283.

Braudrick, C. A. and G. E. Grant (2000) **When do logs move in rivers?** *Water Resources Research*. 36: 571-583

Braudrick, C. A., G. E. Grant, Y. Ishikawa, and H. Ikeda (1997) **Dynamics of Wood Transport in Streams: A Flume Experiment.** *Earth Surface Processes and Landforms*. 22: 669-683.

TEACHING EXPERIENCE

Lecturer–UC Berkeley
Geomorphology (Fall 2012)
The Water Planet (Summer 2002, Spring 2011, 2012, 2013, 2016)

(Client: Portland General Electric): In response to concerns by the stakeholder group, Dr. Braudrick helped develop a five-year monitoring plan following dam removal to determine the potential for fish passage impairment following dam removal. This monitoring plan used data from a suite of cross sections to determine changes to channel complexity.

Saeltzer Dam Removal Modeling and Monitoring, Clear Creek, California *(Clients: CALFED and UC Davis)*: Dr. Braudrick designed and implemented a study to evaluate the downstream effects of sediment following the removal of Saeltzer Dam on Clear Creek, CA. This study included collecting hydrology, sediment grain size, and cross section data before and after dam removal. This data was used to inform (prior to dam removal) and verify a sediment transport model in the first year following dam removal.

A preliminary evaluation of the potential downstream sediment deposition following the removal of Iron Gate, Copco, and JC Boyle Dams, Klamath River, CA *(Client: American Rivers)*: Dr. Braudrick helped conduct a preliminary evaluation of downstream sediment deposition following dam removal on the Klamath River using results from the Dam Removal Express Assessment Model and a site visit.

Arroyo Mocho Vegetation Monitoring (*Client: Zone 7*): Working collaboratively with plant ecologists, Dr. Braudrick mapped and described the channel dynamics of a 1-mile long reach of Arroyo Mocho, near Livermore, CA where native riparian vegetation was planted in 2014. Following the 2016-2017 floods, extensive bar growth and bank erosion created fresh surfaces to support recruitment of native willow and cottonwood seedlings. Dr. Braudrick helped to develop recommendations to maximize shading of the channel in this dynamic reach.

Channel network dynamics in headwater streams *(Client: NCASI)***:** Dr. Braudrick helped map the geomorphic and hydrologic extent of steep headwater streams in the North Umpqua Basin, OR. This network extent was then compared to amphibian surveys to determine the degree to which amphibian presence was tied to summer low flow extent.

Dynamics of large woody debris in streams *(Oregon State University)***:** As a Master's student, Dr. Braudrick developed and tested theories for the entrainment, transport, and deposition of wood in streams. This theory was tested in a laboratory flume experiments designed and conducted by Dr. Braudrick.

Mike Davis
Environmental Scientist

Mike Davis *(M.S., Fish and Wildlife Management)* is a fisheries scientist and water quality specialist with 10 years of experience, including 4 years focused on fisheries and aquatic resources issues in the Owens Valley and eastern Sierra Nevada. Mr. Davis has served in project management, technical, and field lead roles on a variety of fisheries research and monitoring projects in desert rivers, streams and springs throughout Mono, Inyo and San Bernardino counties. He has experience with multi-year physical and biological stream restoration projects in the Owens Valley, including implementation of native aquatic species monitoring programs and analysis of restoration outcomes in Fish Slough, Inyo County. He is also experienced working with key Owens Valley agency staff and stakeholders to design and implement threatened species monitoring programs, fish habitat assessments, and aquatic habitat restoration projects.

AREAS OF EXPERTISE

- Fisheries science and management
- Arid river/stream restoration
- Water quality and fish habitat assessment

YEARS OF EXPERIENCE

At Stillwater: 2 years
In total: 10 years

EDUCATION

M.S., Fish and Wildlife Management, Montana State University, 2016.

B.S., Biology, California State University, East Bay, 2010.

B.A., Geography, University of Colorado, Boulder, 2010.

PROFESSIONAL AFFILIATIONS

Member of the American Fisheries Society

PUBLICATIONS

Davis, M., T. McMahon, M. Webb, M. Jaeger, J. Ilgen and K. Cutting. 2017. Winter survival, habitat use and hypoxia tolerance of Montana Arctic grayling in an ice-covered, high-elevation lake prone to winterkill. Manuscript in review.

SELECTED PROJECT EXPERIENCE

Fish Slough Aquatic Habitat Restoration and Native Species Monitoring Program, Inyo County, CA* *(CDFW):* Mr. Davis planned and led multiple years of intensive native species sampling and habitat characterization of all aquatic habitat in Fish Slough and reported on and presented findings to support the USFWS Owens Pupfish Recovery Plan. He also led field crews in the implementation of novel methods of emergent vegetation management using specialized watercraft to facilitate recovery of endangered desert fishes.

Owens, Long and Bridgeport Valleys Native Species Monitoring, CA* *(CDFW):* Mr. Davis worked as field lead for a multi-year assessment of all aquatic habitat of the Owens, Long and Bridgeport Valleys. Objectives included description of native species distribution and abundance, habitat availability and water quality at over 60 sites. Work was performed with larval fish traps, minnow traps, multiple pass electrofishing depletion surveys and boat electrofishing for Owens pupfish, Owens speckled dace, Owens tui chub, Owens sucker, resident salmonids, centrarchids and ictalurids.

Benton Hot Springs Ranch Ponds Habitat Restoration, Benton, CA* *(Client: Eastern Sierra Land Trust):* Mr. Davis collaborated with agency, nonprofit and private stakeholders to plan and implement a restoration project for Long Valley speckled dace habitat degraded by an impoundment and emergent vegetation encroachment (*Typha* spp. and *Schoenoplectus acutus*). He led field crews in the removal and disposal of emergent vegetation using specialized watercraft and conducted removals of non-native fishes from the project site.

Eastern Sierra Watershed Project: Lower Owens River Studies* *(Eastern Sierra Institute for Collaborative Education):* Mr. Davis led area students in the collection of stream morphology and stream flow data in the Lower Owens River following implementation of restoration flows.

Watershed-Scale Assessment of Aquatic Habitat, Fish Barriers and

CONFERENCE PRESENTATIONS

Davis, M., T. McMahon, M. Webb, M. Jaeger, J. Ilgen and K. Cutting.2015. Winter survival and habitat as limiting factors for Arctic grayling at Red Rock Lakes National Wildlife Refuge. Oral presentation at American Fisheries Society National Meeting, Portland, OR.

Davis, M., and S. Parmenter. 2012. A restoration model for Owens pupfish and Mohave tui chub refuge persistence. Oral presentation at Desert Fishes Council Meeting, Furnace Creek, CA.

Species Distribution, Deep & Holcomb Creeks, CA* *(CDFW):* Mr. Davis worked as field lead for a watershed-scale assessment of available riverine habitat, fish barriers and species distribution to inform potential reintroduction of a federally endangered desert fish species. He planned and coordinated logistics needed to perform larval fish trapping and backpack electrofishing surveys in remote, backcountry settings along the Pacific Crest Trail.

Amargosa River Fisheries Monitoring and Post-Tamarisk Treatment Habitat Assessment, Shoshone, CA* *(Client: Bureau of Land Management):* Mr. Davis managed, designed and implemented a fisheries monitoring and habitat use study in two Areas of Critical Environmental Concern in the Mojave Desert. Work included overnight deployment of minnow traps and aquatic habitat characterization in a remote setting in the Mojave Desert. Objectives included analysis of native fish habitat selection and assessment of restoration outcomes following a tamarisk control project.

Buckley Ponds Fish Rescue and Recreational Fishery Establishment, Bishop, CA* (*CDFW*): Mr. Davis worked with Los Angeles Department of Water & Power staff to rescue fish from Buckley Ponds prior to construction dewatering. He subsequently worked with LADWP staff to collect catchable size game fish from Tinemaha Reservoir and translocate them to the newly constructed Buckley Ponds in Bishop.

Winter Habitat and Survival as Limiting Factors for Arctic grayling at Red Rock Lakes National Wildlife Refuge, Bozeman, Montana* *(Graduate Research Assistant at Montana State University, Bozeman)* Mr. Davis led a 3-yr field and laboratory study to assess winter survival, winter habitat selection and hypoxia tolerance of a native Montana salmonid. During this study he implemented a novel method of characterizing dissolved oxygen dynamics in a high-elevation watershed, developed a predictive spatial model of suitable fish habitat, estimated overwinter survival of grayling and identified important characteristics of grayling habitat selection using an information theoretic approach.

Golden Trout Habitat Assessment and Relative Abundance Surveys, Golden Trout Wilderness, CA* *(U.S. Forest Service)*: Mr. Davis assisted with multiple pass snorkel surveys for Golden trout in a high-elevation headwater stream and led a field effort to establish a stream temperature monitoring array of over 50 water temperature data loggers.

Lahontan Cutthroat Trout Population Distribution Study, Silver Creek, CA* *(CDFW)*: Mr. Davis served as field lead for a presence-absence backpack electrofishing survey for Lahontan cutthroat trout in Silver Creek, Mono County, CA.

Integrated Regional Water Management Program Implementation, Mammoth Lakes, CA* *(Client: Inyo-Mono Integrated Regional Water Management Program):* Mr. Davis provided data mining, policy research, cartographic and spatial data analysis support for the Inyo-Mono IRWMP's Implementation Grant application. He was also responsible for preparing grant application documents and supporting materials.

Crane Valley Native Species Monitoring, CA *(Client: PG&E):* Mr. Davis is providing field lead and analysis support for the Willow Creek Native Species Monitoring effort, which included an assessment of fish population trends and habitat variations. This hydro implementation monitoring project includes seasonal monitoring of hardhead, foothill yellow-legged frog, and pond turtle populations within a tributary to the San Joaquin River.

Ecological Benefits of the Tulare Lake Storage and Floodwater Protection Project *(Client: GEI Consultants and Semitropic Water Storage District):* Mr. Davis served as project manager during evaluation of the ecological benefits of the Tulare Lake Storage and Floodwater Protection Project for the State of California's Water Storage Investment Program. Mr. Davis led staff in the development of an annual winter-run Chinook salmon population model that predicted adult salmon returns from augmented flow releases from Shasta Dam.

Reservoir and Riverine Water Quality Monitoring, Upper American River and Chili Bar Projects, El Dorado County, CA *(Client: Sacramento Municipal Utility District and Pacific Gas and Electric Company)*: Mr. Davis is assisting a multi-season assessment of water quality, including bacteria and in situ monitoring, at over 25 sites in nine UARP and Chili Bar reservoirs and multiple river reaches. His responsibilities include leading field data collection and compiling and analyzing study results.

Soulajule Reservoir and Arroyo Sausal Control Study (*Client: Marin Municipal Water District*): Mr. Davis is providing scientific analysis support for implementation of a plan to identify and pilot test management methods for controlling methylmercury and blue-green algae production in Soulajule Reservoir, California. He has provided key expertise for analyses of fish community composition and food web structure to inform assessment of methylmercury biomagnification pathways within the reservoir.

** Denotes project completed prior to joining Stillwater Sciences.*

ALISON LECHOWICZ

EXPERIENCE

- 10 years utility rate consulting experience: 7 years as Principal and Financial Analyst at Bartle Wells Associates, 3 years as Financial Analyst at Carollo Engineers
- Testified as an expert witness at the CA Public Utilities Commission in electric rate cases of Pacific Gas & Electric, Southern California Edison, and San Diego Gas & Electric
- Municipal Securities Rulemaking Board, Series 50 – Municipal Advisor Representative

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EDUCATION

Columbia University
Master of Public Administration

University of California, Berkeley
Bachelor of Science
Conservation & Resource Studies

REPRESENTATIVE ASSIGNMENTS

Kings River East Groundwater Sustainability Agency (Fresno County): Conducted a Proposition 26 groundwater fee study to recover SGMA compliance costs and GSA formation costs over the next three years. Estimated water use of growers based on landuse and crop type and allocated costs.

McMullin Area Groundwater Sustainability Agency (Fresno County): Worked with the GSA's engineer to draft a 5-year budget and rate plan under Proposition 218. Developed detailed cost estimates for Board administration and GSP development. Calculated a $19/acre fee for parcels within the GSA. Conducted the Prop 218 printing and mailing of public notices.

Root Creek Water District (Madera County): Financial plan for the District's groundwater basin and agricultural water service. Developed an acreage assessment for district overhead. Water, sewer, and storm drain rates, and development fees for the municipal service area.

City of Clovis: Water rate study. Review of capacity, volume, and peaking costs. Rate design included cost allocation to three volume tiers. Reviewed the City's recycled water costs and associated irrigation fees. Evaluated canal maintenance expenses.

City of Modesto: Developed drought and non-drought water rates. Reviewed an average cost approach (same pricing for all service areas) vs. individualized rates for each service area. Provided rate expert litigation support in wastewater rate litigation regarding cannery customer rates.

Provided below is a sampling of Alison Lechowicz's project experience since 2010. Prior to 2010, Ms. Lechowicz worked for a civil engineering firm conducting water and wastewater master planning assignments.

Client	Project	Date Completed
City of Alameda	Sewer Financial Plan and Rate Study	May 2015
City of Anderson	Water Rate Study	Ongoing
Town of Apple Valley	Water System Acquisition Feasibility Analysis	July 2011
City of Berkeley	Sanitary Sewer Rate Study	June 2015
City of Carmel-by-the-Sea	Bond Refinancing	October 2010
CA City County Street Light Association	Rate economist and expert witness	March 2010 to present (ongoing)
City of Chula Vista	Wastewater Capacity Fee Study Salt Creek Sewer Basin Impact Fee Study	May 2014 June 2015
City of Clovis	Water User Rates and Fee Study	February 2016
City of Colfax	Sewer Rate Affordability Review	June 2010
City of Colusa	Development Impact Fee Study Water System Valuation	June 2011 September 2014
Contra Costa Water District	Water Rate Study	February 2015
Colusa County Water District #1	Water Rate Study	April 2011
City of Cotati	Water and Sewer Rate Study	February 2013
Denair Community Services District	Water Rate Study	November 2013
Town of Discovery Bay	Water and Sewer Rate and Capacity Fee Studies	Multiple studies since 2012
City of Emeryville	Sewer Rate Study	November 2016
City of Hemet	Water and Sewer Rate Studies and System Valuations	July 2015
Home Gardens Sanitary District	Sewer Rate and Capacity Fee Study	May 2015
City of Huntington Park	Water and Sewer Rate Study	November 2011
Indian Wells Valley Water District	Bond Refinancing	December 2012
Irish Beach Water District	Capital Improvement Assessment	March 2011
Kings River E. GSA	Groundwater Fee Study	February 2018
City of Kerman	Water and Wastewater Rate Studies	Ongoing
City of Lancaster	Streetlight Valuation	June 2014
City of Lindsay	Water Rate Study	June 2015
McMullin Area Groundwater Sustainability Agency	Groundwater Fee Study	June 2018
City of Modesto	Water and Sewer Rate and Capacity Fee Studies	Multiple studies since 2010
City of Morgan Hill	Water and Sewer Rate Studies	November 2011

Client	Project	Date Completed
Napa Berryessa Resort Improvement District	Water and Sewer Assessment	July 2012
Nipomo Community Services District	Sewer Rate Study	Ongoing
Newhall County Water District	Water Rate Litigation Support	November 2012
Novato Sanitary District	Capacity Fee Study Sewer Rate Study	March 2016 April 2016
City of Palmdale	Sewer Service Charge Analysis	May 2011
City of Rio Dell	Wastewater Rate Study	May 2014
Root Creek Water District	Water, Sewer, and Storm Drain Rate Study and Financial Plan	April 2016
City of San Fernando	Water and Wastewater Rate Study	Ongoing
City of Santa Clarita	Sewer Maintenance Feasibility Study	June 2014
Saticoy Sanitary District	Bank Loan Financing	September 2013
San Diego County Water Authority	Cost Allocation Review	May 2011
Sewerage Agency of Southern Marin	Long Range Plan Update	June 2010
South Tahoe Public Utility District	Sewer Bond Refunding	September 2012
Stege Sanitary District	Financial Plan & Sewer Rate Study Financial Plan & Sewer Rate Study Updated	June 2010 June 2014
Sunnyslope County Water District	Water and Sewer Bond Refinancing	October 2014
Tahoe Truckee Sanitation Agency	Sewer Fee Ordinance Review	May 2010
City of Tehachapi	Water and Sewer Capacity Fees	Ongoing
Templeton CSD	Water and Wastewater Rates and Capacity Fees	Ongoing
Triunfo Sanitation District	Water Infrastructure Financing Automated Meter Financing	February 2011 May 2014
Tulare Lake Drainage District	Project Financing Project Financing	March 2012 January 2013
City of Williams	Development Impact Fee Study & Comprehensive Fees	July 2011

CATHERINE TSENG

EXPERIENCE

- 10 years consulting experience: Vice President at Bartle Wells Associates
- 2 years civil servant: City of Oakland
- Specializes in utility rates, capacity charge, and financing plans for public works projects, and Proposition 218 compliance
- Certified Independent Professional Municipal Advisor

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catherinetseng

EDUCATION

Columbia University
Master of Urban Planning

University of California, Berkeley
Bachelor of Arts
Architecture

REPRESENTATIVE ASSIGNMENTS

City of Davis: Water financial plan and rate study assessing various conservation-oriented water rate structures and developed drought surcharge. Worked closely with citizens' advisory committee to develop recommendations to City Council.

City of Vacaville: Cost of service water rate study to eliminate operating deficit and implemented water conservation surcharge to recover lost revenue.

City of Benicia: Raw water rate study to develop rate method for the Valero Refinery. Prepared water rate study and capacity fee study. Developed drought rates to fund additional water supply.

Town of Yountville: Long-range financial plan for the water and wastewater enterprise to phase out subsidies from the general fund. Developed recycled water for contract negotiations with customers.

Sausalito-Marin City Sanitary District: Wastewater Facilities Financial Plan to fund capital projects and reconcile past expenses. Developed multiple funding strategies for contract negotiations with a partner agency.

City of Menlo Park: Water rate study to fund wholesale water rate increases and drought surcharge implementation. Water capacity charge study.

Glendale Water and Power: Comprehensive water rate cost of service study and drought rate review.

Provided below is a sampling of Catherine Tseng's project experience since 2006.

Client	Project	Date Completed
Alameda County Water District	Water Development Fee Study	January 2012
City of Anderson	Water Rate Study	Ongoing
Armona Community Services District	Water and Sewer Rate Study	March 2008
City of Benicia	Raw Water Rate Study and Update Water Rate and Connection Fee Study and Update Drought Rate Study	August 2013 and Sept 2015 February 2013 September 2014
Big Bear Area Regional Wastewater Agency	Wastewater Rate Study	April 2007
Big Bear City Community Services District	Water, Sewer, and Solid Waste Rate Study	May 2015
Coastside County Water District	Water Financing Plan Water Rate Study	August 2009 January 2010
Crestline Sanitation District	Wastewater Rate Study	June 2015
City of Davis	Water Rate Study Water Rate Study Update	March 2013 September 2014
Diablo Water District	Water Bond Financing Bond Refinancing	August 2010 April 2013
City of Dixon	Sewer Rate Study	October 2013
El Dorado Irrigation District	Development Impact Fee Study Water Rate Study	October 2008 January 2009
Elk Grove Water District	Water Financial Plan and Rate Study	December 2007
Fairbanks North Star Borough	Bond Refinancing	November 2011 and September 2013
City of Hillsborough	Water and Sewer Rate Study	December 2006
City of Hanford	Water Financing	December 2007
Humboldt Bay Municipal Water District	Water Financial Plan	April 2011
Indian Wells Valley Water District	Water Rate Study Bond Financing Water Rate Cost of Service and Development Impact Fee Study	January 2007 August 2009 January 2012 and 2015
City of Menlo Park	Water Rate Study Recycled Water Analysis	May 2015 October 2015
Mid-Peninsula Water District	Water Rate Study	June 2015
Montara Water & Sanitary District	Water and Sewer Rate Studies	Multiple studies since 2006
Montecito Water District	Drought Rate Study	February 2015
City of Monterey	Sewer Rate Study	December 2011
City of Mountain View	Water and Sewer Rate and Capacity Charge Study	September 2014
Novato Sanitary District	Bond Financing	October 2011

Client	Project	Date Completed
Olivehurst Public Utilities District	Water Rate Study and Updates	2007, 2009 and 2014
City of Patterson	Water and Sewer Rate and Capacity Fee Studies	Multiple studies since 2010
Riverdale Public Utilities District	Water and Sewer Rate Study	June 2008
Running Springs Water District	Water, Sewer, Fire and Ambulance Rate Studies	July 2010
City of San Bruno	Water and Sewer Rate Study	April 2012
City of San Fernando	Water and Wastewater Rate Study	Ongoing
Sanitary District No. 5 - Tiburon	Financial Review	September 2013
Sausalito-Marin City Sanitary District	Wastewater Facilities Financing Plan	May 2016
Selma Kingsburg Fowler Sanitation District	Capital Improvements Program Study	March 2008
Solano County Water Agency	Reserve Fund Study	May 2007
Sonoma County Water Agency	Sewer Service Charge and Volumetric Sewer Rate Study	August 2012
City of Tulare	Bond Financing	2010, 2012, 2013, and 2015
Union Sanitary District	Sewer Capacity Fee Study	October 2010
City of Vacaville	Water and Drought Rate Study	October 2015
Town of Yountville	Water and Sewer Rate Study Recycled Water Rate Study	February 2011 April 2012

Rose Valley Groundwater Model

Rose Valley, California

Client

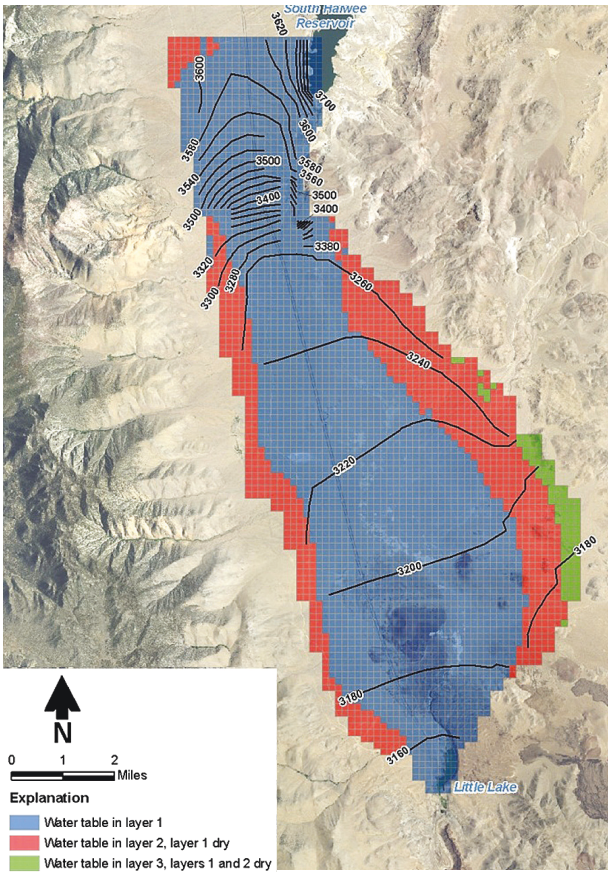
County of Inyo, California

Highlights

- Revised and updated an existing groundwater flow model
- Applied distributed parameter watershed model to estimate recharge

For the County of Inyo Water Department, DBS&A made substantial revisions and updates to an existing groundwater flow model of Rose Valley, California, immediately south of Owens Valley. The model was used to assess the impact of proposed groundwater pumping on groundwater discharge to a shallow lake (Little Lake) at the south end of the valley. The model revisions and updates were made in accordance with Mitigation Monitoring and Reporting Program of Conditional Use Permit (CUP) 2007-003, which permits the extraction of groundwater from wells on the Hay Ranch in Rose Valley. The water is extracted by Coso Operating Company (Coso) for injection at the Coso geothermal field in the northwest area of the China Lake Naval Air Weapons Station.

DBS&A implemented a number of substantial updates and changes to an existing model, including:



Color-coded layers illustrate the water table in the map above.

- Review of the conceptual model and adjusting model boundary conditions in the southern end of the valley to improve the simulation of groundwater discharge processes
- The Distributed Parameter Watershed Model (DPWM) was applied to estimate groundwater recharge, independent of the groundwater numerical model and helped provide a basin water budget
- The model grid was refined in the horizontal and vertical dimensions
- The thicknesses of the geologic units were adjusted based on the available well and geophysical logs
- Model hydraulic properties and layering were adjusted to better match the observed water levels in the valley

The model was recalibrated to historical transient conditions beginning in 1915 accounting for seepage from Haiwee Reservoir, previous pumping for irrigation for Hay Ranch and the Los Angeles Department of Water and Power, and project pumping that occurred through 2010.

The updated model was used to reevaluate future Coso pumping amounts and associated drawdown trigger levels at monitor wells that could occur without exceeding a 10 percent reduction in groundwater outflow to Little Lake.

The model and associated predictions have been updated multiple times as part of the adaptive management approach implemented under the permit.

Development of Groundwater Budgets for Groundwater Sustainability Planning

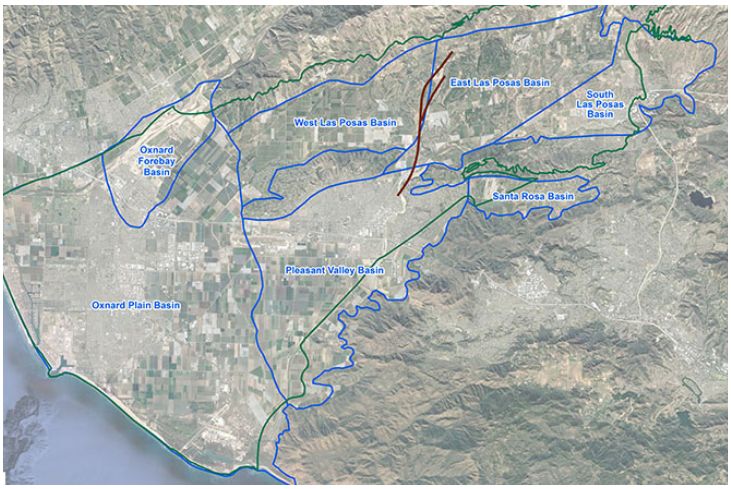
Ventura County, California

Client

Fox Canyon Groundwater Management Agency

Highlights

- Preparing historical groundwater budgets for four groundwater basins
- In compliance with SGMA
- Applying DPWM to evaluate groundwater recharge by deep percolation of precipitation



Groundwater budgets are essential tools for understanding how to achieve and maintain groundwater basin sustainability

The Fox Canyon Groundwater Management Agency (FCGMA) selected DBS&A as part of a team to develop a Groundwater Sustainability Plan (GSP) in compliance with California's Sustainable Groundwater Management Act (SGMA). SGMA provided the FCGMA the authority to act as the Groundwater Sustainability Agency (GSA) to manage the development of the GSP. DBS&A prepared quantitative groundwater budgets for three groundwater basins within the Agency's jurisdiction: (1) Las Posas (separately for east and west management areas); (2) Pleasant Valley; and (3) Oxnard. The groundwater budgets calculated annual groundwater inflows and outflows and change-in-storage over a 30-year period (1985 to 2015).

Quantitative groundwater balances developed for each basin included accounting for deep percolation of precipitation, deep percolation of irrigation, lateral groundwater inflow including seawater intrusion, percolation of recharge from wastewater treatment plants, artificial recharge, recharge from septic systems, recharge from underground water infrastructure, groundwater extraction, riparian evapotranspiration, lateral groundwater outflow, and groundwater discharge to streams. Each component of the groundwater balances was developed using standard methods based on available data.

Deep percolation of irrigation and precipitation was estimated by use of the DBS&A Distributed Parameter Watershed Model (DPWM). Modifications were made to the DPWM for this project in order to allow for changing land-use over time. Land use and crop-coverage changes during the model run were made based on review of available agricultural surveys, including from the Farmland Mapping and Monitoring Program (FMMP) and the County agricultural commissioner.

Safe Yield Study for Sustainable Groundwater Management in the Santa Paula Groundwater Subbasin

Ventura County, California

Client

United Water Conservation District

Highlights

- Retained pursuant to court-stipulated requirements to identify sustainable groundwater management practices
- Determined safe yield
- Applied Distributed Parameter Watershed Model (DPWM) to evaluate groundwater recharge by deep percolation of precipitation
- Method considered and quantified gains from and losses to surface water
- Estimating safe yield based on results of calibrated hydrologic balance

DBS&A assisted the United Water Conservation District (UWCD) in Ventura County, California in meeting California State Court-ordered responsibilities in the Santa Paula Groundwater Subbasin (Basin) resulting from a stipulated judgment. The judgment recognized that multiple parties have an interest in the Santa Paula Basin, and in the proper management and protection of both the quantity and quality of this important groundwater supply. UWCD's responsibility is to collect, collate, and verify data required under the monitoring program, to engage in groundwater management and replenishment activities, and to commence actions to protect the water supplies. To facilitate collaborative basin decision-making among parties to the judgment, an independent, technically sound, and defensible estimate of the groundwater safe yield was required.

The Santa Paula Basin is a court adjudicated groundwater basin.

DBS&A developed a technical approach for determining the safe yield of the Basin. DBS&A's project team performed preliminary water balance calculations for groundwater inflow from the Fillmore Basin, groundwater recharge by deep percolation of precipitation, and average decline of groundwater in storage. Groundwater inflow was preliminarily calculated to be 61,700 acre-feet per year (ac-ft/yr) using Darcy's Law, and estimated hydrogeologic parameters (hydraulic conductivity, gradient, and cross-sectional area) based on previous aquifer test results and published studies. Groundwater recharge from deep percolation of precipitation was estimated to be between 7,400 ac-ft/yr and 23,800 ac-ft/yr based in part on DBS&A's previous analysis of the Ojai Basin, and mapped average annual precipitation isohyetals within the subwatershed contributing overland flow to the Basin. Based on these preliminary findings, deep percolation of precipitation may be a significant contributor to Basin recharge; this is currently under rigorous evaluation.

Safe Yield Study, Santa Paula Basin continued page 2

In DBS&A's experience, uncertainty in the hydrologic balance can be reduced to acceptable levels given sufficient data availability, and by constraining the overall water balance to observed changes in groundwater levels and storage. Our project team compiled and analyzed available data to compute the hydrologic balance using standard methods and innovative approaches that we have successfully applied in similar local groundwater basins and throughout California. Challenges in computation of the water balance were overcome in part by grounding the safe yield analysis in a detailed hydrogeologic characterization that evaluated confining conditions and other aquifer properties. The hydrogeologic characterization is based, in part, on correlation of various types of well log data, and is summarized in a series of hydrogeologic cross sections.

Hydrologic data limitations are also addressed through application of an advanced watershed model that has been recognized for estimating key components of the groundwater/surface water balance using state-of-the-art methods (Distributed Parameter Watershed Model, DPWM). The overall groundwater balance is constrained by comparison to estimated changes in groundwater storage. Safe yield of the Basin is being estimated based on the sum of groundwater inputs (e.g., underflow from Fillmore Basin, recharge by deep percolation of precipitation, irrigation and City of Santa Paula waste water treatment plant effluent recharge) minus natural groundwater discharge (e.g., groundwater outflow to the Mound Basin and Oxnard Forebay Basin, groundwater discharge to the Santa Clara River). Safe yield of a groundwater Basin should not be taken as the sum of all groundwater inflows; rather, sustainable groundwater extraction is limited to less than long-term annual recharge because of natural system discharge. Safe yield is being estimated based on results of the calibrated hydrologic balance, and is being reported for representative precipitation conditions, including the average, median, 25th- and 75th-percenticle conditions during the hydrologic base period.

Sustainable Groundwater Management Plan Comparative Analysis

Atascadero Subbasin, Atascadero, California

Client

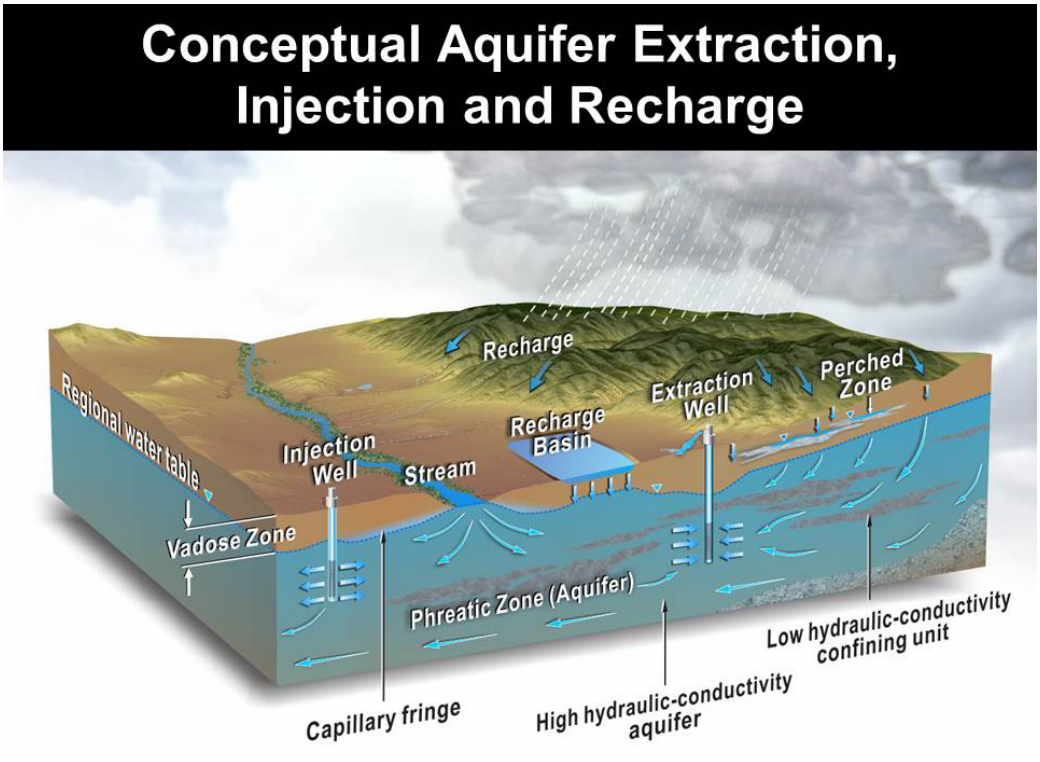
Atascadero Mutual Water Company

Highlights

- Developed conservation plan
- Presented to City Council

DBS&A examined the existing AB3030 Paso Robles Groundwater Basin Management Plan (the "3030 Plan"), and documents referenced therein. The objective was to evaluate whether they will provide a solid foundation and basis for the development of a groundwater sustainability plan (GSP) for the Atascadero Subbasin. Many of the required GSP plan elements are specified by the Sustainable Groundwater Management Act (SGMA), Section 10727.2. DBS&A made the determination that many of the requirements have already been addressed, in whole or part, in the 3030 Plan (or in documents referenced therein).

DBS&A conducted a detailed analysis comparing the groundwater planning elements provided in the 3030 Plan with the elements required by Section 10727.2. DBS&A's evaluation included a detailed description of the degree to which the 3030 Plan already contained information that addressed the required GSP element, and provided recommendations as to how the information contained in the in the 3030 Plan can be efficiently augmented to develop a GSP.



Sustainable groundwater management relies on a credible groundwater budget

Groundwater Management Planning for Sustainability

Upper and Lower Ventura River Basin, Ventura County, California

Client

Ventura County Watershed Protection District

Highlights

- Identified key data gaps
- Prepared approach to GWMP development
- Prepared groundwater budget for the Subbasins

The Upper and Lower Ventura River Groundwater Subbasins extend along the Ventura River Valley from the mouth of the River at the Pacific Ocean to just south of Matilija Canyon. Water users in the Ventura River Watershed have no access to imported water, and are dependent upon maintaining an adequate supply of usable quality local water resources; therefore, protection of local groundwater is vital, and an adequate understanding of groundwater storage volume and water quality trends is necessary.

DBS&A prepared a groundwater budget for the Subbasins and an approach to a groundwater management plan (GWMP), which constitute the first steps in building a sufficient understanding of groundwater resources and planning for long-term protection. The general approach for the groundwater budget was to estimate the magnitude of all groundwater inputs and outputs within each of the Subbasins, based on available data and hydrogeologic analyses. The resulting budget provides an estimate of the net gain or loss of the volume of groundwater in storage within the Subbasins per year.

The primary groundwater inputs are infiltration and surface water recharge from Lake Casitas and the Ventura River, while the primary outputs are municipal and agricultural extractions, groundwater discharge to surface water, and discharge to the Pacific Ocean. As a component of the groundwater budget analysis, DBS&A estimated return flow to groundwater from irrigation and septic systems. Importantly, DBS&A identified several key data gaps in the groundwater budget, and provided recommendations to reduce uncertainty associated with these data gaps.

The Upper and Lower Ventura River Groundwater Subbasins extend along the Ventura River Valley.

The intention of a GWMP is to provide a framework to manage groundwater to ensure a long-term sustainable, reliable, good-quality water supply suitable to the political, legal, institutional, hydrogeologic, and economic conditions and constraints that exist in a groundwater basin. DBS&A prepared an approach to development of a GWMP for the Subbasins, including specifications for public participation, inter-agency involvement, coordination with the Ventura River Watershed Council, literature review and technical analysis, establishment of management objectives, and development of a monitoring program.

Hydrogeologic Evaluation, Watershed-Scale Recharge Evaluation, and Groundwater Model Development for the Ojai Basin

Ojai Valley, Ventura County, California

Client

Ojai Basin Groundwater Management Agency

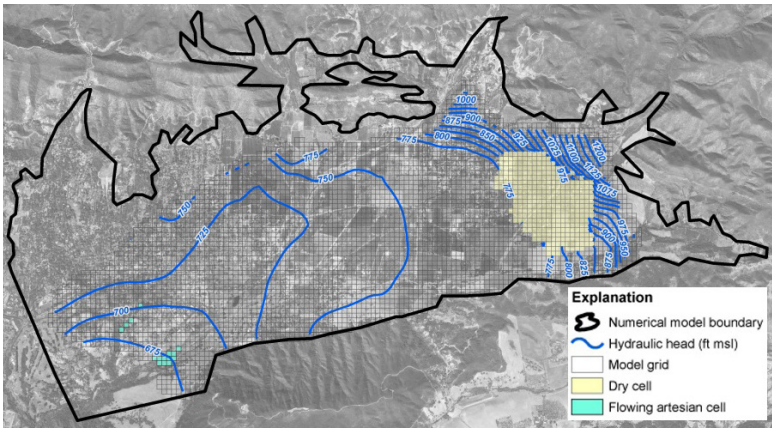
Highlights

- Groundwater basin modeling
- Aquifer conceptual model development
- Water supply and demand analysis
- Stakeholder coordination
- Groundwater balance estimation

DBS&A worked with the Ojai Basin Groundwater Management Agency (OBGMA) to solicit and obtain California Department of Water Resources grant funding to perform an extensive hydrogeologic evaluation of the Ojai Basin, and develop a state-of-the-art numerical groundwater model to assist in groundwater management activities. Water levels in the Basin respond quickly and dramatically to climactic conditions, with shallower and higher-elevation portions of the alluvial Basin becoming dry during drought conditions, and the semi-confined portions of the alluvium near the Basin exit exhibiting flowing artesian conditions following wet periods. Use of the advanced MODFLOW-SURFACT groundwater modeling code allowed for simulation of drying/rewetting cycles that would not be possible with the standard MODFLOW code.

Prior to numerical groundwater modeling, DBS&A estimated spatially heterogeneous precipitation-related recharge using its Distributed Parameter Watershed Model (DPWM). DPWM modeling was based on historic climactic records, topography, vegetation type, and overlying soils properties. Precipitation-related recharge was estimated to be greatest in the alluvial fan head regions of the Basin, and within the upper reaches of ephemeral creeks. Temporally and spatially variable DPWM-estimated recharge data was formatted for direct input into the MODFLOW-SURFACT groundwater model using the "recharge" groundwater model boundary condition.

Well owners in the Basin report pumpage volumes to the OBGMA on a semi-annual basis, and this data was used to determine variable groundwater extraction rates for more than 100 wells, including municipal, domestic, and agricultural wells.



Model-simulated groundwater elevation contour map representative of model Layer 4, for the model stress period corresponding to January-March 1992.

Water flux between the alluvial aquifer and underlying bedrock aquifers was assigned based on available hydrogeologic data using the "general head" boundary condition. Groundwater discharge to surface creeks is an important component of the water balance of the Basin, and was incorporated using the "drain" boundary condition. Groundwater consumption via evapotranspiration was assigned in the model based on GIS layers of previously mapped riparian corridors.

Hydrogeologic Evaluation, Watershed-Scale Recharge Evaluation, and Groundwater Model Development for the Ojai Basin ***continued page 2***

The groundwater model was calibrated to groundwater elevation data from 18 well hydrographs covering a base period of 39 years. Calibration parameters included hydraulic conductivity and storage parameters, which were adjusted within a reasonable range based on the available aquifer-testing data. Importantly—because use of the DPWM increased confidence in estimated precipitation-related recharge values—these parameters were not adjusted during model calibration. Reducing the number of calibration parameters improved confidence in the groundwater model calibration and reduced the probability of non-unique calibration solutions.

Prior to finalization of the model and related documentation, DBS&A solicited feedback from stakeholders in the Basin. Independent hydrogeologists with Golden State Water Company (the municipal water provider in the Basin) reviewed the draft report in detail. Stakeholder comments were addressed by refining model parameters and providing additional detail in the model documentation. The model has been used to evaluate the Basin response to several possible future alternative scenarios and climactic conditions, and to evaluate a proposed aquifer storage and recovery (ASR) project. The groundwater model will be an integral tool in updating the Basin's Groundwater Management Plan (GWMP).

Effects of River Operations on Surface Water, Groundwater, and Groundwater Dependent Ecosystems

Kern County, California

Client

City of Bakersfield

Highlights

- Developed surface water balance model
- Conducted robust analysis relatively inexpensively
- Supported EIR and subsequent legal proceedings

DBS&A assisted the City of Bakersfield Water Resources Department with an Environmental Impact Report in compliance with the California Environmental Quality Act (CEQA) to evaluate potential impacts to local surface water and groundwater for proposed alterations to Kern River operations. The City seeks to release up to an additional 305,000 acre-feet per year of water to the river channel to promote recreational opportunities and to enhance recharge to the underlying groundwater aquifer. The City owns the water for this program but has previously leased it to agricultural districts that diverted and used it for irrigation.

Results of the study indicate that the program would improve aquifer conditions.

DBS&A conducted water balance model calculations for seven separate reaches within a 15-mile-long study area. DBS&A developed a spreadsheet-based mass balance model that accounts for all of the inputs and outputs of the river water balance. The model was calibrated to historic flow data obtained from weirs located at the top and bottom of each of the seven reaches. The surface water assessment included characterization of flow depth, flow width, flow distance, and infiltration rates over a range of release volumes. GIS tools, flow data from multiple weirs, and aerial photographs from numerous time periods were used to develop a correlation between release rate and wetted stream channel area (area through which infiltration can occur).

The model was calibrated using historic flow data obtained from weirs.

Results of the study showed that the program would provide sustained recreational flows during summer months, while significantly enhancing recharge to the underlying aquifer. The project balances economic development for the community through protection of municipal water supply with environmental stewardship. Groundwater elevations beneath the river and within the area surrounding the city would be significantly enhanced, protecting future yields and improving water quality and well production efficiency within municipal well fields. DBS&A's modeling provides the City with the confidence to proceed with the project's development for successful implementation. The City is now pursuing the project described in the EIR.

Inyo County Landfill

Inyo County, California

Client

Inyo County Recycling and Waste Management Program

Highlights

- Preparation of five-year permit review application packages
- Revision of:
  - Report of facility information
  - Solid Waste Facility Application
  - Report of Waste Discharge
  - Joint Technical Document
- Preliminary Closure and Post-Closure Maintenance Plan
- Preparation of annual closure fund deposit calculation
- Groundwater monitoring, landfill gas monitoring, landfarm SAP, CAP CQA and implementation, and surveying coordination with subconsultants

Bishop-Sunland Landfill

The County of Inyo owns and operates a waste management system comprised of five active landfills, including Bishop-Sunland, Independence, Lone Pine, Shoshone, and Tecopa Landfills, one closed landfill at Keeler, and four transfer stations, including Big Pine, Homewood, Keeler, and Olancha. DBS&A (through affiliate, GLA), provides a wide range of services supporting the County's development, operation, permitting, environmental monitoring, compliance, and closure of their system of landfills and transfer stations.

Tasks for all five of the active sites have included: the preparation of five-year permit review application packages for submittal and approval to all regulatory agencies. This included revising the report of facility information, solid waste facility applications, report of waste discharge information/joint technical documents, and preliminary closure and post-closure maintenance plans. We are currently working on permit revision packages in support of these sites to address operational, tonnage, site life, ownership, compliance, and cost estimate updates.

DBS&A also prepared the source control evaluation plan, corrective action plan, stormwater pollution prevention plans, AB-32 greenhouse gas generation reports, annual cost estimate inflation and annual closure fund deposit calculations for submittal to CalRecycle, corrective action plans, installation of landfill gas wells, and coordinates sub-contractor work for groundwater monitoring, landfill gas monitoring, landfarm sampling and analysis plan, construction quality assurance and implementation of corrective action plans, and aerial topographic surveying.

In addition, DBS&A assisted the County of Inyo in obtaining a land patent for the Shoshone and Tecopa Landfills from the Bureau of Land Management.

Groundwater Modeling for Santee Basin Groundwater Recharge and Replenishment Project

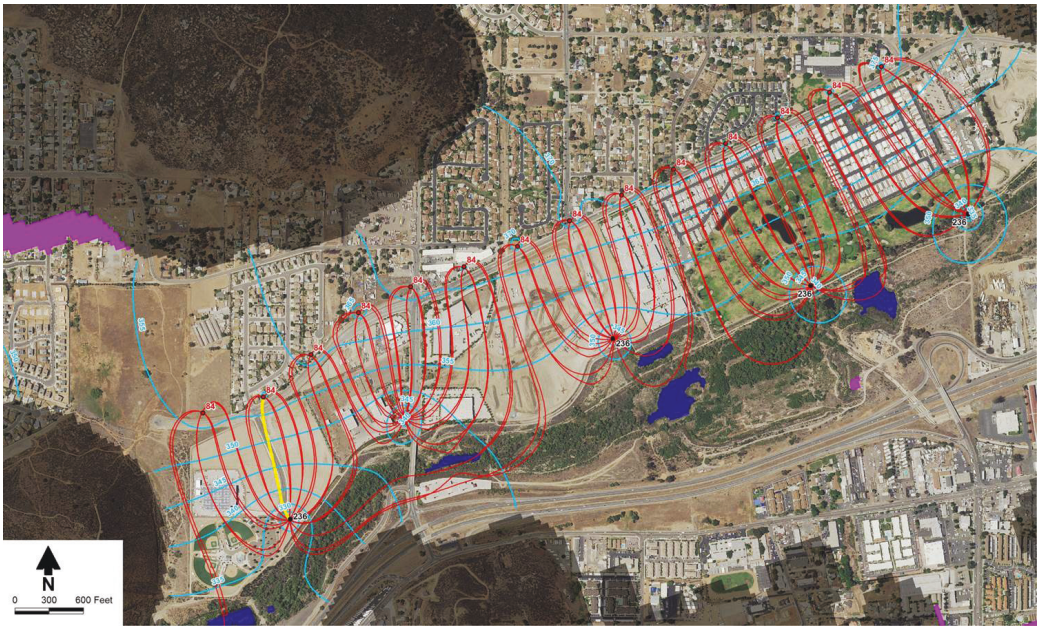
Santee, California

Client

Padre Dam Municipal Water District

Highlights

- Water reuse program implementation
- Knowledge of regulatory compliance requirements
- Groundwater modeling



Simulations evaluated groundwater flow and groundwater interaction with surface water (ponds), residence time, and flowpaths multiple recharge and recovery scenarios

DBS&A conducted a groundwater modeling study to evaluate the feasibility of the Santee Basin Groundwater Recharge and Replenishment Project (GRRP) for the Padre Dam Municipal Water District. This effort included evaluation of hydrogeologic conditions in the Santee Basin based on existing data and reports, which led to a recommended change in the initially selected project location.

For the updated project location, we conducted screening-level analytical groundwater flow modeling followed by more detailed three-dimensional groundwater flow and advective transport modeling to demonstrate GRRP feasibility. The simulations evaluated groundwater flow and groundwater interaction with surface water (ponds), residence time, and flowpaths for multiple groundwater recharge and recovery scenarios. We presented the results of the groundwater modeling to the Independent Advisory Panel (IAP), and assisted Padre Dam with responding to IAP comments.

The groundwater model was used to demonstrate project feasibility at the current stage of project implementation, and will be improved upon using additional site data as it is collected. The sequential modeling approach developed and implemented by DBS&A resulted in an expedited schedule and cost savings.

San Antonio Creek Spreading Grounds Rehabilitation

Ventura County, California

Client

Ventura County Watershed Protection District, Ojai Valley Groundwater Basin

Highlights

- Diverted stream flow to spreading grounds and recharge wells
- Design maintained instream flow for steelhead habitat
- Used 3-D model to quantify recharge benefits to the basin
- Worked cooperatively with many stakeholders

The San Antonio Creek Spreading Grounds Rehabilitation Project (Project) aimed to increase groundwater storage and recharge in the Ojai Valley Groundwater Basin by rebuilding the abandoned diversion works, rehabilitating the spreading ground basins, and constructing aquifer recharge wells adjacent to San Antonio Creek just southwest of the confluence of the Gridley and Senior Canyons in the Ojai Valley. The $1.5 million Project is funded with a $1.3 million Proposition 50 Implementation Grant from the State of California and approximately $200,000 in local match contributions from stakeholders working cooperatively, including the Ojai Basin Groundwater Management Agency, the Ojai Water Conservation District, the Golden State Water Company, the Casitas Municipal Water District, and the Ventura County Watershed Protection District. In conjunction with DBS&A hydrogeologists, the group bore the idea of spreading grounds rehabilitation as a means of augmenting basin yield.

Within the Ojai Valley, the public water supply is derived from local groundwater sources and surface water. Groundwater supplies are extracted via wells and recharged primarily by rainfall; susceptible to inconsistent precipitation and excessive pumping during droughts. Surface water supplies are drawn from Lake Casitas and the Ventura River; sources at risk due to growing local demand and limits on removal due to southern steelhead habitat requirements and the planned removal of the Matillija Dam. As a result of these vulnerabilities, an extended drought could have jeopardized the health, safety, and welfare of the Ojai Valley by limiting its municipal water supply, restricting its economy, and hampering its preparedness for wildfires. Successful completion of the Project helped to address the threat of critical water supply shortages in the Ojai Valley and improve local water supply reliability throughout the Ventura River Watershed.

DBS&A played a pivotal role in the assessment of the hydrology, geology, and the design of diversion works; intake pipelines; and water conveyance for the Project as consultant to the Ventura County Watershed Protection District (VCWPD). DBS&A completed a 100-percent design for diverting a portion of the precipitation that is typically lost downstream to rehabilitated spreading grounds and aquifer recharge wells under contract with the VCWPD for the Project. This resulted in greater groundwater storage and production from local water supply wells and less reliance on already limited surface water supplies. Installation of a depth-discrete monitoring well near the spreading grounds monitored the effectiveness of this important groundwater project and helped to develop a better hydrogeologic understanding of the Ojai Valley Groundwater Basin.

Safe Yield Study and Water Master Plan

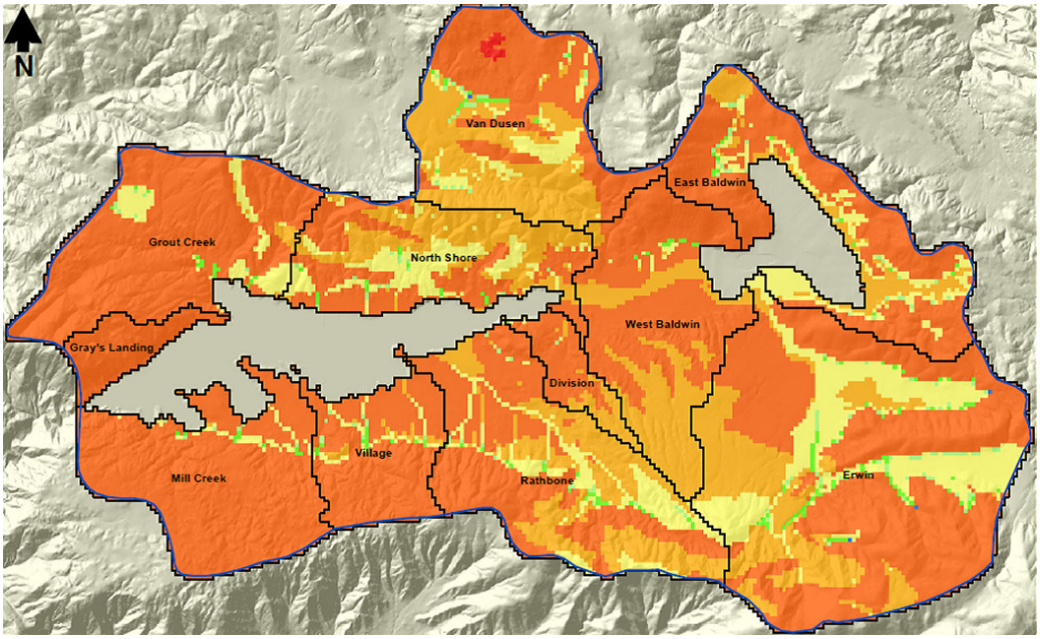
Big Bear City, California

Client

Big Bear City Community Services District

Highlights

- Evaluated groundwater recharge and safe yield
- Performed water master planning
- Developed detailed water system hydraulic computer model
- Articulated 20-year Capital Improvement Program
- Used basin-wide soil-water balance analysis method
- Prepared drought contingency plan
- Presented master plan at Board of Directors meeting
- Developed groundwater supply management and forecasting tools



Modeled spatial distribution of recharge with the Big Bear Valley Watershed

DBS&A led a hydrogeologic and engineering team to perform a groundwater safe yield study and water master planning for the Community Services District of Big Bear City, California. The District required an update to its water master plan that would accommodate steady growth and proactively plan for future water supply needs.

The water master plan included analysis of population and water use trends, sources of water supply, and the operations of the existing water system. DBS&A's team also developed a detailed water system hydraulic computer model that was used to analyze the strengths and weaknesses of the existing water system and proposed system improvements. The plan also articulated a Capital Improvement Program that described and estimated the cost of the infrastructure needed to provide adequate water supplies during the 20-year planning horizon.

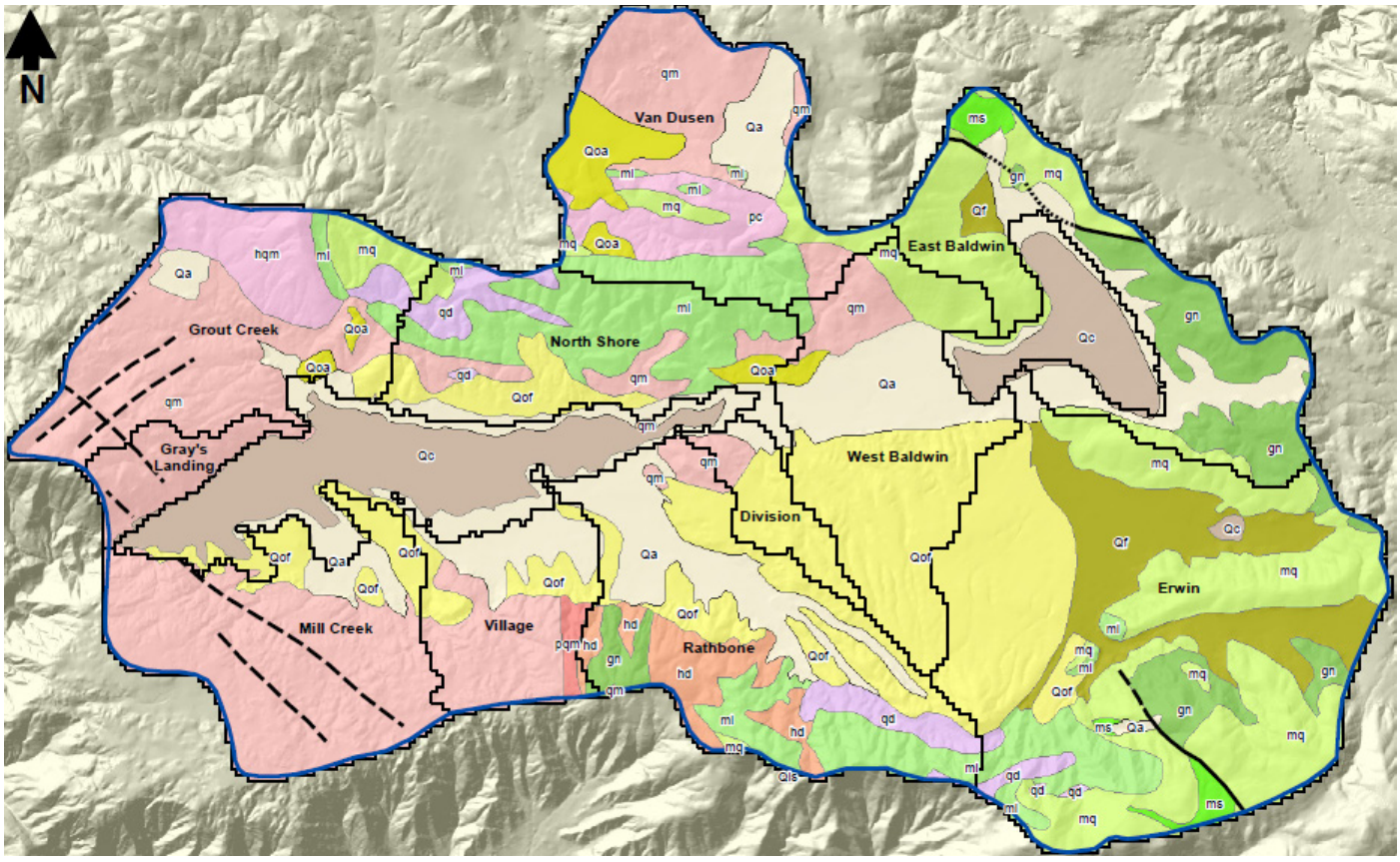
Of particular note, DBS&A evaluated natural recharge to groundwater within the Big Bear Valley groundwater basin. BBCCSD relies entirely on groundwater to provide water supplies to its customers. The objective of the recharge evaluation was to quantify the portion of precipitation that recharges the basin and provide the basis for quantifying the basin safe yield.

Safe Yield Study and Water Master Plan continued page 2

DBS&A's recharge evaluation analyzed the surface and shallow subsurface using historical data sets spanning two decades. The approach consisted of a basin-wide soil-water balance analysis (Distributed Parameter Watershed Model) using site-specific data collected during the investigation, including precipitation and other climatic parameters, soil hydrologic parameters, geology, land use, and vegetation. DBS&A also identified previously unknown basin underflow losses as part of the field work conducted in the study. Safe yield results improved on previous estimates of recharge and perennial safe yield. DBS&A subsequently used statistical methods to leverage the modeling results into useful water supply management and forecasting tools.

Following DBS&A's report of natural recharge at Big Bear, the U.S. Geological Survey released a hydrogeologic evaluation of the Big Bear Valley (Scientific Investigations Report 2012-5100) that included a model-estimated natural recharge value within 10 percent of DBS&A's DPWM-estimated value.

Associated with the master planning effort, DBS&A also prepared a drought contingency plan for the District for the purpose of preserving the District's limited potable water resources during times of declared water shortages. The document discusses (1) the District's four water supply shortage stages and their declaration processes, (2) the measures and restrictions for each of the District's four water supply shortage stages, and (3) the expected water savings due to each of the District's four water supply shortage stages. The document also discusses coordination with other regional water planning agencies, public notification procedures, enforcement, exceptions, and water connection limitations during a declared water shortage.



Bedrock Geology within the modeled Big Bear Valley Watershed domain

Evaluation of Aquifer Recharge to Indio Water Authority Service Area

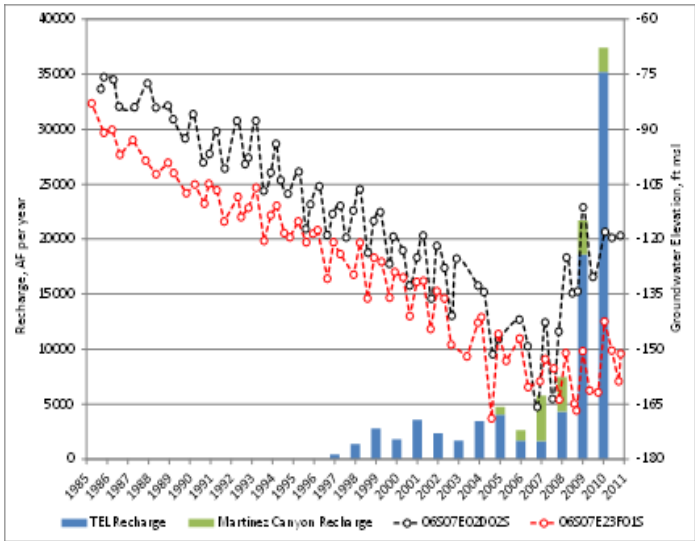
Indio Water Authority, Indio, California

Client

Coachella Valley Water District

Highlights

- Evaluated contribution of groundwater from spreading pond facilities to groundwater recharge
- Reviewed groundwater model assumptions, calibration, predictive simulations, and limitations
- Developed a preliminary approach and cost assessment for a proposed groundwater replenishment program



Example of a tracer test study

On behalf of the Indio Water Authority (IWA), DBS&A critically reviewed the Coachella Valley Model and the anticipated contribution of groundwater from spreading pond facilities operated by the Coachella Valley Water District (CVWD) on groundwater recharge in the IWA service area. The Coachella Valley Model was developed by CVWD, and has been used for groundwater management planning and estimates of groundwater recharge from several water spreading pond facilities. Importantly, the groundwater model is used to set recharge assessments (fees) water users such as IWA pay to CVWD to support the groundwater spreading facilities.

DBS&A provided IWA with an independent evaluation of model assumptions, calibration, predictive simulations, and resulting limitations of CVWD's conclusions regarding groundwater recharge assessments. DBS&A also evaluated historical water-level data from throughout the valley to assess any benefit to the IWA service area from the groundwater spreading facilities. DBS&A found that model boundary conditions and several unrealistic assumptions may artificially impact the recharge assessments, and that model calibration was generally poorest in the IWA service area. Observed increases in groundwater levels within the IWA service area were found to more likely correlate with decreased pumping rates than operation of the spreading facilities.

DBS&A was later asked to develop a preliminary project approach and cost assessment for development of a proposed artificial groundwater replenishment program to be operated by IWA using blended wastewater treatment plant (WWTP) effluent and surface water supplies. The project scope included feasibility evaluation, water resource impact assessment, injection well siting and design, permitting, injection well construction, development of a monitoring and reporting program, design and siting of monitoring wells, and a tracer test study.

Integrated Regional Water Management Plan

Ventura County, California

Client

Brownstein Hyatt et al. (formerly Hatch & Parent)/Golden State Water Company

Highlights

- Assisted to secure Proposition 50 funding
- Detailed needs and descriptions for rehabilitation of spreading grounds
- Evaluated hydrogeologic conditions

DBS&A contributed to the preparation of Ventura County's Integrated Regional Water Management Plan to account for surface and groundwater issues in three major watersheds in Ventura County, California.

This plan was integral in assisting the Watersheds Coalition of Ventura County to secure Proposition 50 funding from the State Department of Water Resources. DBS&A's specific involvement was in detailing the need and descriptions, including preliminary design and grant application writing, for the rehabilitation of spreading grounds in the upland Ojai Groundwater Basin and the locating and preliminary design of several depth-discrete water monitoring wells to evaluate hydrogeologic conditions in the Ventura River Watershed.

Ambient Water Quality Recomputation for Santa Ana Watershed Groundwater Management Zones

Southern California

Client

Santa Ana Watershed Project Authority

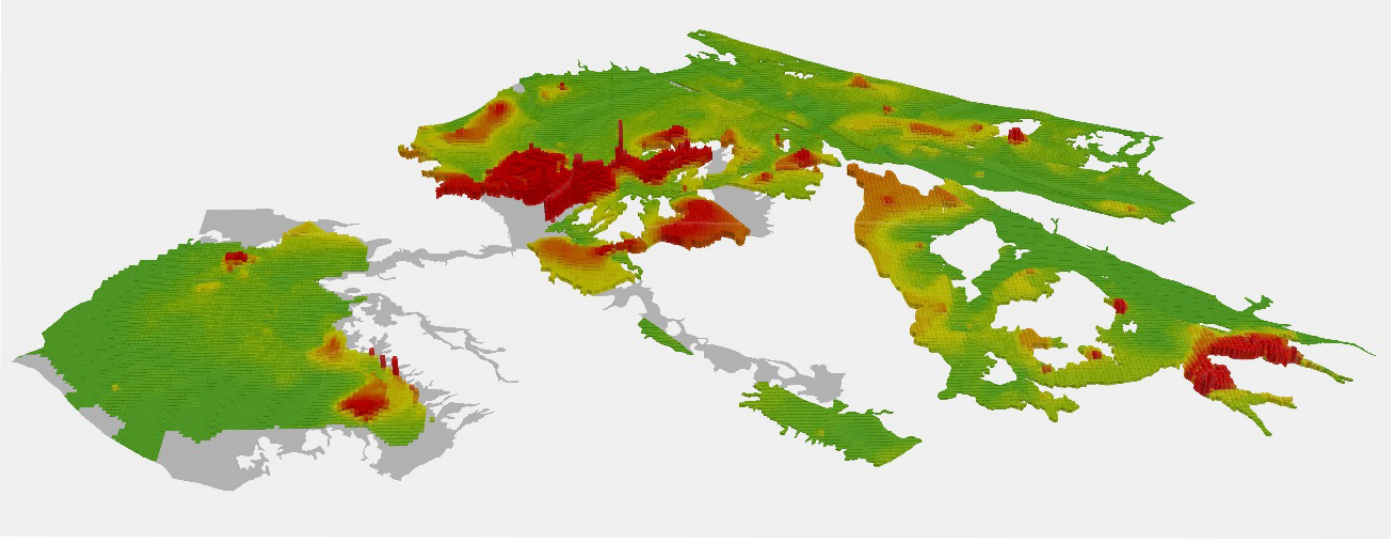
Highlights

- Computed current AWQ for TDS and nitrate-nitrogen in all 40 groundwater management zones
- Collected, processed, and stored groundwater quality and groundwater levels data in a centralized database
- Helping to achieve compliance with the Basin's Groundwater Sustainability Plan under SGMA

The Water Quality Control Plan (Basin Plan) for the Santa Ana River Basin requires the implementation of a watershed-wide total dissolved solids (TDS) and nitrogen groundwater monitoring program to determine ambient water quality in groundwater, assess compliance with groundwater quality objectives, and determine if assimilative capacity exists in groundwater management zones (GMZs). The Basin Plan requires that the ambient water quality (AWQ) be computed every three years.

The Santa Ana Watershed Project Authority (SAWPA) selected DBS&A as part of a team to execute this project for the period of 1996 to 2015. Groundwater quality and quantity are both critically important in achieving a sustainable groundwater management plan and demonstrating compliance with the Basin Plan. SAWPA is a joint powers authority comprised of five member agencies: Eastern Municipal Water District, Inland Empire Utilities Agency, Orange County Water District, San Bernardino Valley Municipal Water District, and Western Municipal Water District.

DBS&A computed current AWQ for TDS and nitrate-nitrogen in all 40 groundwater management zones in the Santa Ana River watershed for the period 1996 to 2015 and interpreted the results. The recomputation involved collecting, processing, and storing all groundwater quality and groundwater levels data from 1996 to 2015 in a centralized database. The subsequent process of recalculating AWQ included:



The Basin Plan requires a watershed-wide TDS and nitrogen groundwater monitoring program to determine ambient water quality in groundwater, assess compliance with groundwater quality objectives, and determine if assimilative capacity exists in groundwater management zones.

AWQ Recomputation for Santa Ana Watershed Groundwater Management Zones continued page 2

- Developing groundwater-quality point statistics for nitrate and TDS
- Estimating regional TDS and nitrate–nitrogen in groundwater, which required preparing groundwater quality and groundwater elevation contour maps in the management zones with requisite data
- Computing the volume-weighted ambient TDS and nitrate-nitrogen concentrations using the data generated from the contour maps and geospatial tools
- Preparing interpretive tools for the recomputation of AWQ, including:
  - Spatial analysis of groundwater quality change by comparing the distribution of AWQ statistics across management zones
  - Temporal analysis of groundwater quality change comparing basin-scale trends to trends observed in individual "key" well locations
  - Forward-looking analysis of AWQ wells lost over time as wells are decommissioned, destroyed, or are otherwise no longer monitored (well attrition analysis)

Assessing watershed-scale groundwater quality has assisted SAWPA and the task force members in working to achieve sustainable groundwater management and compliance with the Basin's Groundwater Sustainability Plans (GSPs) under California's Sustainable Groundwater Management Act (SGMA).

Under the DWR Facilitation Support Services program, CCP provided GSA formation support and associated Tribal engagement to develop the Owens Valley Groundwater Authority. More specifically, CCP worked with the DWR Tribal Policy Advisor and Inyo County to conduct outreach to all California Native American Tribes in the Basin to further explore potential representation issues and provided individual, in-person meetings with the Bishop, Lone Pine, Big Pine, and Fort Independence Tribes, as well as the Owens Valley Indian Water Commission personnel. This task also included phone meetings with the Benton Tribal Chair and Environmental Coordinator. CCP provided support to joint meetings of the Tribes to confirm decision-making approaches and confirm Tribal perspectives as they relate to the larger GSA formation effort.

Likewise, CCP conducted telephone consultations with LADWP to explore the agency's role and thoughts on coordination related to the SGMA-recognized Settlement Agreement.

CCP facilitated Inyo County-based GSA-eligible entities and GSA Formation Work Group meetings to negotiate GSA governance structure. Thereafter, CCP supported GSA Governance Development including development of agreements and documents outlining GSA structures and governance methods. CCP coordinated and facilitated SGMA Public Meetings to provide outreach and education about SGMA implementation, including GSA formation and GSP development, across the Owens Valley Basin.

Under the leadership of Project Manager Meagan Wylie, CCP is supporting the Borrego Valley Groundwater Sustainability Agency (GSA) in the implementation of their Groundwater Sustainability Plan (GSP). CCP (under Ms. Wylies' leadership has supported the Borrego stakeholders since the inception of their GSA in all matters of internal governance, public engagement, SGMA education and similar. Currently CCP works with the GSA's Core Leadership Team, the GSP Consultant Team, the full GSA Board and the GSA's citizen Advisory Committee supporting implementation of the GSP. The Core Team acts as the daily leadership group setting the GSP schedule and process, managing consultant activities, and advising the decision making Board of Directors. The AC provides input throughout GSP development and implementation. All input from interested parties and the public at large is received at the AC meetings and used to help formulate recommendations made to the CT and ultimately the GSA. In support of this work, Ms. Wylie facilitates AC discussions including topics such as: GSA governance; Basin Setting and associated water budget; Management Areas; Sustainable Management Criteria e) Basin Monitoring; Proposed Projects; and Management Actions. Ms. Wylie works with the Core Team to ensure agenda topics are coordinated with the GSP timeline as development of the GSP progresses.

Similarly, the GSA and its CT are responsible for collaborating on public outreach including coordinating activities of the AC. As part of this task, the facilitator will be responsible for coordinating and facilitating group discussions for each GSA and Core Team meeting. The facilitator will work with the GSA and CT to ensure each discussion is coordinated with the GSP timeline as development of the GSP progresses. The CT is anticipated to meet two times per month, either in person or via conference call, as appropriate for the planned discussion. The CT planning meetings will take place to setup AC agendas, discuss issues expected to be covered at the AC meetings, meeting logistics, etc. CCP anticipates conducting 14 meetings and has prepared a cost estimate based on that number. The actual number of meetings is subject to change based on emerging project conditions.

COLUSA SUBBASIN

Under the leadership of CCP SGMA Program Manager Dave Ceppos, CCP is supporting the Colusa Subbasin Groundwater Sustainability Agency (GSA) in the implementation of their Groundwater Sustainability Plan (GSP). CCP has supported the Colusa stakeholders since the inception of their two GSAs (Colusa Groundwater Authority and Glenn Groundwater Authority respectively) in all matters of internal governance, public engagement, SGMA education and similar.

Currently CCP is working with the GSAs to develop a Stakeholder Communication and Engagement Plan to inform the public and encourage active involvement in the development of the GSP, and to provide a workforce projection tool for the GSAs to manage workloads and staff assignments in support of the required engagement responsibilities under the GSP regulations. In this work, CCP is working with the GSA to broaden the range of active stakeholder groups from a diverse group of beneficial uses and users and to understand their interests and concerns related to the GSP components. This includes development of stakeholder interview questions, development of stakeholder survey questions, managing a stakeholder survey process and conducting stakeholder interviews at public meetings and other venues. As stated above, CCP is planning, coordinating, and facilitating public workshops, and developing stakeholder outreach materials and public notices for said meetings.

In support of internal GSA governance for both GSAs, CCP provides the following support:

- Facilitate discussions regarding revision of Joint Powers Agreements (JPA) with a potential focus on governance such as bylaws, as well as budget and membership topics
- Facilitate creation and initial meetings of Subcommittees or Technical Advisory Committees including Committee “charges” and governance
- Facilitate development of Work Plans and details to complete GSP work
- Facilitate development of technical recommendations to be provided to the GSA Boards
- Facilitate discussions about an interagency agreements for the Subbasin
- Advise on agenda development for all meetings

MADERA AND CHOWCHILLA SUBBASINS

CCP has provided GSA formation and GSP development support to the adjacent Madera and Chowchilla Subbasins under both DWR facilitation support services, and through current private sector technical consultant services. The facilitation goals for both Subbasins regarding GSP development is to assist GSAs in reaching consensus on potentially contentious water management topics arising from diverse beneficial uses and users of groundwater. An additional goal of facilitation support is to ensure consistent stakeholder outreach and communication messaging by all GSAs within the Subbasin.

More specifically, CCP worked with the GSAs to identify and assess stakeholder individuals and groups from a diverse range of beneficial users affected by SGMA compliance and then developed a Stakeholder Communication and Engagement Plan for each Subbasin. The Stakeholder Communication and Engagement Plan includes Subbasin key messages, venues for stakeholder engagement, methods and tools for engaging stakeholders, schedule of notices to stakeholders (i.e. a messaging calendar), and summaries of process for reporting Communication and Engagement highlights to GSA workgroups

This work also includes meetings with the GSA Workgroups and the Coordination Committee of the GSAs (see below) to define and agree on key messages, coordinate with GSA staff to identify venues, engagement resources, and confirm the messaging calendar.

Likewise, CCP is supporting the setup of each Subbasin's Coordination Committee. This includes defining the Coordination Committee roles and responsibilities, membership, timelines. The Coordination Committee is tasked primarily with developing: 1) Coordination Agreements, including policy and data decisions; and 2) work plans and timeline for completion of GSP coordination tasks.

ADDITIONAL RELEVANT EXPERIENCE

Borrego Valley Groundwater Basin: CCP has been the facilitator and SGMA implementation specialist for the Borrego Valley since SGMA inception. Services include designing governance for the GSA Board and Core Team, facilitation and program management, coordination with technical consultants, and implementation of GSP work activities.

Owens Lakebed Master Project Development Process: CCP has facilitated the Owens lakebed advisory committee to help refine a proposed "master project" for the lakebed that would include dust control, habitat enhancement, surface water conservation by accessing groundwater for a portion of the dust control, and public access and recreation elements.

SGMA Statewide Facilitation Support Services: CCP has facilitated and managed 32 local assistance cases including GSA formation and governance and GSP development in locations as far north as Siskiyou County on the Oregon border, San Diego County on the Mexico Border, several coastal groundwater basins, numerous subbasins in the Central Valley and Owens Valley east of the Sierra Nevada.

SGMA Statewide Public Engagement: CCP has led the development and delivery of public engagement for a wide range of statewide SGMA public education provided by the DWR and SWRCB including initial public outreach meetings about the law and subsequent focused public meetings about: GSP Regulations, Basin Boundary Modification, State Fee Assessment, GSP Development, and similar
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GROUNDWATER AND SURFACE WATER MONITORING AND REPORTING FOR THE HAY RANCH HYDROLOGIC MONITORING AND MITIGATION PLAN, ROSE VALLEY, INYO COUNTY

Client: Coso Operating Company (COC)
Key Agency: Inyo County Water Department (ICWD)
Dates of Work: 2009-present

Project Description:
TEAM has served as the objective, third-party monitor for management of the Inyo County Hay Ranch Conditional Use Permit CEQA EIR's Hydrologic Monitoring and Mitigation Plan (HMMP). TEAM has reported to the Inyo County Water Department to monitor the Rose Valley groundwater basin's response to pumping at the Hay Ranch property by COC. Project duties include: monitoring and sampling groundwater wells; designing, installing and monitoring surface water flow measurement devices; developing basin-wide hydrographs; project database management; and monthly, quarterly and annual project reporting.

In May 2009, TEAM responded quickly to requests from COC and ICWD to begin baseline groundwater monitoring in Rose Valley and to allow the project to meet its goal of initiating groundwater pumping in 2009. TEAM manages a network of more than 20 pressure transducers and surface flow measuring flumes, and conducts monthly monitoring events at 30 monitoring points including locations at private residences and businesses, China Lake Naval Air Weapons Station, and BLM property. Quarterly groundwater samples are collected and analyzed for inorganic constituents.

TEAM's reputation for professionalism and objectivity has enabled project stakeholders, be they project proponents or opponents, to accept the credibility of the hydrologic data collected for the Hay Ranch Project's HMMP. This project has consistently been managed under budget and within all project deadlines.

Project References:
Dr. Robert Harrington, Director, ICWD (760-878-0003)
Chris Ellis, Site Manager, Coso Operating Company (760-764-1300 x207)

LAKE AND STREAMBED ALTERATION AGREEMENT FOR ROUTINE MAINTAINANCE ACTIVITIES BY THE INYO COUNTY ROAD DEPARTMENT, INYO COUNTY PUBLIC WORKS

Client: Inyo County Public Works
Key Agency: California Department of Fish and Wildlife
Dates of Work: 2018

Project Description:
TEAM is currently assisting Inyo County Public Works with development of a long-term Agreement with California Department of Fish and Wildlife, under their Lake and Streambed Alternation Program, for routine maintenance conducted by the Inyo County Road Department. The project included development and management of a County-wide GIS data system of intersection of surface water features with Inyo County Maintained Mileage, identification of sensitive environmental resources associated with road-stream intersections, and preparation of a CEQA Initial Study/Mitigated Negative Declaration including mitigation measures for protection of sensitive resources in Inyo County.

Project References:
Ms. Ashley Helms, Inyo County Public Works (760.878.0200)

INYO COUNTY LANDFILL MONITORING AND REPORTING SERVICES, INYO COUNTY RECYCLING AND WASTE MANAGEMENT

Client: Inyo County Recycling and Waste Management
Key Agencies: LRWQCB, Inyo County Environmental Health Department, CalRecycle
Dates of Work: 2009-present

Project Description:
TEAM is currently in an ongoing, multi-year contract with Inyo County Recycling and Waste Management, to provide monitoring and reporting services associated with six (6) Inyo County Landfills. From 2009 to 2016 TEAM conducted the landfill gas and groundwater sampling and reporting for Inyo County as a key subcontractor to DBS&A (through affiliate Geo-Logic Associates), and in 2016 was selected as prime contractor for a three to five-year contract. In addition to the groundwater sampling and reporting, TEAM conducts quarterly landfill gas monitoring at the six Inyo County sites, operates and monitors an active landfill gas collection and treatment system, and assists with a variety of other landfill sampling and compliance tasks for Inyo County.

We also remain a key subcontractor to DBS&A (through Geo-Logic) for landfill engineering and permitting support in a separate, as-needed contract. The projects for Inyo County have involved navigating a complex regulatory framework with multiple agency communication including the Inyo County Environmental Health Department, CalRecycle, Bureau of Land Management, LADWP, and LRWQCB.

As part of the specialized professional team serving Inyo County, TEAM has also served as the liaison to the County and helped coordinate this multi-faceted project at the local level. Our location in Bishop has allowed us to respond quickly and effectively to Inyo County's evolving compliance needs as well as to conduct on-site landfill field work cost-effectively. TEAM personnel have worked effectively with the LRWQCB Victorville Branch Office, as well as staff from ICEHD, BLM, CalRecycle and LADWP regarding matters related to this project. TEAM also conducted groundwater monitoring for the Mono County Landfills, including those in the Tri-Valley area of the Owens Valley Basin, from 2011 to 2018. TEAM has also facilitated sharing of groundwater data from both Inyo and Mono Landfills with the Counties and DWR through the CASGEM data management system.

Project References:
Richard Benson, Assistant County Administrator, Inyo County (661-706-7080)
Fred C. Aubrey, Solid Waste Supervisor, Inyo County (760-873-5577)
Jerry Oser, Inyo County Environmental Health Department (760-873-7866)

OTHER RELEVANT PROJECTS

Environmental Consulting and Tribal Liaison Services for the Cultural Resource Task Force, Owens Lake Dust Mitigation Program, Great Basin Unified Air Pollution Control District, Inyo County, 2015-present

TEAM provides environmental consulting services to Great Basin Unified Air Pollution Control District (GBUAPCD), in cooperation with the Los Angeles Department of Water and Power (LADWP). Services include evaluation of sensitive biological and cultural resources associated with dust control measures on Owens Dry Lake, and serving as a tribal liaison to the GBUAPCD for the Cultural Resource Task Force monitoring committee. As part of this project, TEAM has facilitated stakeholder meetings and worked effectively with LADWP, Tribal Historic Preservation Officers from Bishop, Big Pine, Independence, Lone Pine, and Timbisha Tribes, the Native American Heritage Commission, California State Lands, BLM, and the EPA.

Mono County Surface and Groundwater Availability Assessments, Mono County Planning Department, 2005-2007

TEAM completed surface water and groundwater availability assessments for the Mono County Planning Department. The watersheds and associated communities that were assessed included the West Walker River watershed (Antelope Valley); Mono Basin (Mono City and Lee Vining) and the Owens River Basin (Crowley Lake area and the Tri-Valley area of eastern Mono County). The cornerstone of each assessment was to gather and review pertinent documents and data. The water availability assessments evaluated both surface water and groundwater availability from volumetric, water quality and regulatory perspectives. The groundwater assessments included the evaluation of groundwater recharge for each area based on the sub drainages as presented in Mono County's geographic information system. Other groundwater budget parameters that were evaluated including an assessment of existing groundwater pumping in each area, spring flows, evapotranspiration and groundwater inflow and outflow from each area. Water rights issues were also assessed as part of this comprehensive evaluation. Each of the assessments provided Mono County with guidance and recommendations for handling future water supply, water quality and related water rights issues.

Tri-Valley Groundwater Management District Hydrologic Consulting and CEQA Support for the US Filter Tri-Valley Surplus Groundwater Program, Mono County, 1999-2001

TEAM provided hydrologic consulting support to the Tri-Valley Groundwater Management District and MHA Environmental Consulting, Inc. (MHA), during the preparation of an Environmental Impact Report pertaining to US Filter's Tri-Valley Surplus Groundwater Program. TEAM's role in this project was to develop a model of the Tri-Valley hydrologic system in Mono County and to help evaluate the potential hydrologic effects of the proposed groundwater export project. During this project, TEAM worked with MHA and TVGMD to develop the appropriate documents to comply with CEQA including preparation of an Environmental Impact Report.

TEAM's involvement in this project was valuable due to our extensive experience analyzing the hydrogeologic effects of projects in the unique hydrological system of the Tri-Valley region of

Mono County, and our understanding of existing water rights and water supply demands in the area. TEAM worked closely with local residents and landowners to gather water level data to adequately assess the groundwater availability, and coordinated with interdisciplinary experts to meet all the requirements and timelines prescribed by the EIR process, from Initial Study through final EIR approval and Notice of Determination.

Hydrologic Assessment and NEPA Documentation for Dry Creek Watershed, for Mammoth Mountain Ski Area's Land Exchange with the United States Forest Service, 2006-2008

TEAM conducted a water resources evaluation for a proposed land transfer between Mammoth Mountain Ski Area and the Inyo National Forest, in cooperation with Mammoth Community Water District and the USFS Inyo National Forest. The work involved developing a conceptual model and preliminary numerical groundwater flow model of the Dry Creek watershed, conducting field investigations to evaluate hydrogeologic parameters identified to be sensitive in the numerical model, and finalizing the numerical groundwater flow model by updating parameters and boundary conditions based on data obtained from field investigations and incorporation of 15 years of available groundwater level data.

Key hydrologic data were gathered to support this investigation including groundwater level measurements, estimates of Dry Creek stream flow at several locations, and completion of 48-hour constant discharge and recovery tests on wells owned by the Mammoth Community Water District. Additionally, three new groundwater monitoring wells were installed in the lower portions of the watershed in the vicinity of the Owens River. These wells provided important information regarding conditions and aquifer materials in the lower watershed where data were absent.

Fish Slough Aquatic Habitat Restoration and Native Species Monitoring

Location
Bishop, California

Date
2010 - 2013

Spring-fed critical habitat for the federally endangered Owens pupfish in Fish Slough, Inyo County, California.

Aquatic habitat in Fish Slough, and the native species that inhabit them are highly dependent on groundwater-fed springs and continue to be limited by a legacy of man-made impoundments, an altered hydrograph and introduction of non-native predatory fishes. Key Stillwater team member Mike Davis led a comprehensive restoration and monitoring program designed to promote recovery of the native aquatic community, including the federally endangered Owens pupfish.

Mr. Davis and his collaborators implemented novel physical and biological restoration approaches in Fish Slough to restore a natural hydrograph, channel morphology and aquatic and riparian community composition. A restoration model developed in Fish Slough now serves as a broadly-applicable model for other groundwater-dependent desert spring and stream ecosystems recovering from non-native species introductions and altered hydrology.

To assess recovery status and detect threats to key biota, Mr. Davis and collaborators completed annual monitoring of all aquatic species and associated habitat in Fish Slough, including focused analysis of spatial distribution, population dynamics, and genetic variability of federally endangered Owens pupfish and Owens speckled dace. This multi-year monitoring included detailed temporal mapping of the highly-dynamic, groundwater-fed aquatic habitat of Fish Slough, and special-status invertebrate and water quality sampling.

Reference:
Steve Parmenter
Senior Environmental Scientist
CA Department of Fish and Wildlife
Steve.Parmenter@wildlife.ca.gov
(760) 872-1123

Feasibility Study for a Water Transaction Program in the California Walker River Basin

Location
East and West Walker Basin, CA

Client
Shannon Peterson, ltd.

Flood irrigation provides lush grazing lands in the West Walker Basin near Bridgeport, California.

Stillwater was part of this small winning team to perform a feasibility analysis for development of a volunteer water transaction program in the East and West Walker River Valleys (also known as Antelope and Bridgeport Valleys) for the Mono County Resource Conservation District (RCD), funded by the National Fish and Wildlife Foundation (NFWF). Our role was to assess the potential impacts of altering the amount and timing of irrigation and releases from local reservoirs on natural resources and agricultural production. To do this, Stillwater scientists first developed a conceptual model illustrating the interactions among water sources, water reservoirs, natural and agricultural vegetation, crop production and terrestrial and aquatic habitat. Stillwater presented the model with the team to the RCD and local water interests to gather insights and to ensure that all concerns were included in our initial strategy. Using several existing but incomplete maps, Stillwater scientists then developed an existing vegetation map, constructed a basin-wide water balance model, and used evapotranspiration data provided by project partners at the Desert Research Institute of the University of Nevada at Reno to model the effects of four water rights transaction scenarios on vegetation production, wildlife habitat (e.g., sage grouse and other potentially impacted species), and fisheries in the Walker Basin, California. These findings were used by project partners at Ecosystem Economics and McDonald, Carano Wilson Law Partners to assess potential economic, legal, and social impacts a water transaction program might have. With these other team members, Stillwater met with and presented the draft findings to the RCD and local water interests; thoughts and comments provided through discussion and written submittals were incorporated into the final report. The final technical report was submitted to the RCD in October 2014 and is currently being used to move forward on this effort. The intent is that a water transactions program within the California portion of the Walker River Basin would complement the ongoing water leasing and sales efforts in Nevada currently led by the National Fish and Wildlife Foundation (NFWF). As an extension of this project, Stillwater is currently planning to work with a groundwater hydrologist at the University of Nevada at Reno to build a more data-rich ground water and vegetation response model to better estimate potential impacts to vegetation and associated economic impacts of water transactions in Bridgeport Valley. Both projects are funded through the National Fish and Wildlife Foundation.

Reference:
Shannon Peterson Ciotti
Shannon Peterson, Ltd
541-973-5608
shannontpeterson@gmail.com

Contract amount = $68,241

Stillwater Sciences

Instream Flows for a Semi-Arid Stream

Location
Santa Maria River, Santa Barbara & San Luis Obispo counties

Client
California Ocean Protection Council and California Department of Fish and Game

While the mainstem Santa Maria River is dry most of the year, the watershed supports a population of anadromous southern steelhead, a federally endangered species. Currently a self-sustaining population of rainbow trout (the resident life-history of *Onchorynchus mykiss*) is found in the upper Sisquoc River portion of the watershed, and anadromous spawning of adult steelhead (the ocean-going life-history of *O. mykiss*) is observed in some wet years, during the limited time when flows connect the Sisquoc River to the Pacific Ocean via the Santa Maria River. Continuous flow opportunities to the Pacific appear to be increasingly rare, and may be limited by groundwater extraction and flow regulation at Twitchell Dam. In 2008 California Department of Fish and Game (CDFG) identified the Santa Maria River as a high priority river for instream flow analysis to support a legally mandated flow recommendation to the State Water Resources Control Board. To assist CDFG in meeting its requirements, the Ocean Protection Council contracted Stillwater Sciences to conduct the instream flow study.

Instream flow study

The goal of the study was to develop flow recommendations that more closely support the historical timing, frequency and duration of migration opportunities for anadromous steelhead. A combination of field measurements and hydraulic calculations were used to identify the flow magnitude required for adult and juvenile steelhead passage between the ocean and habitat in the Sisquoc River. The recommended duration of these flows was developed based on docu-mented steelhead migration speeds, migration distances within the watershed, and location of a critical passage reach along the migration route. The recommended frequency of ecologically meaningful flows was based on analyses of pre-Twitchell Dam hydrologic conditions.

A groundwater model was developed to express downstream surface flow as a function of upstream flow, antecedent flow, depth to groundwater, and releases from Twitchell Dam. In this way, the flow recommendations were able to account for the surface water infiltration that occurs between the confluence of the Sisquoc and Cuyama rivers and the mainstem Santa Maria River.

The study found that the estuary outlet conditions are not limiting steelhead passage because the volume of flow required for fish passage is greater than that required to keep the estuary mouth open. The study also found that the estuary is unlikely to

Reference:
Michael Bowen
Project Manager
California Coastal Conservancy
(510) 286-0720
mbowen@scc.ca.gov

Contract amount = $600,000

Stillwater Sciences

provide important juvenile steelhead rearing habitat, because under open-mouth conditions, the estuary is almost entirely drained and therefore offers no off-channel or other impounded areas that are critical for rearing juvenile steelhead.

Stakeholder Outreach

Stakeholder outreach during the study provided opportunities for stakeholders to voice their concerns, exchange information, and have questions answered. In addition, it ensured that the study used the best available information and benefited from the knowledge of local stakeholders. Although contentious, Stillwater used these meetings and others with particularly concerned entities, to discuss issues and solutions as well as to provide whatever clarification or explanations necessary regarding the scientific studies. By the final meeting, even the most vocal entities expressed appreciation for Stillwater's open and intelligent communication style.

Santa Clara River Parkway Floodplain Restoration Feasibility

Location
Lower Santa Clara River, Ventura County, California

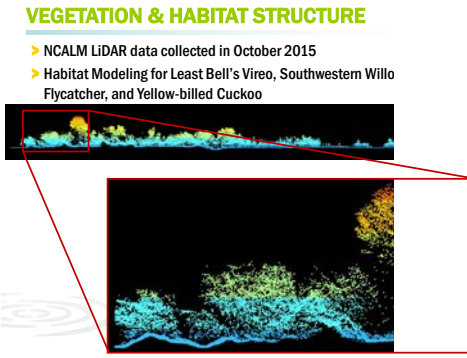
Client
California Coastal Conservancy

The Santa Clara River provides a unique opportunity for conservation and restoration in Southern California. It supports 18 species of threatened and endangered plants and animals.

The Santa Clara River Parkway project seeks to partially ameliorate historical impacts in the lower Santa Clara River and conserve existing riparian habitats by acquiring and restoring existing habitat and flood-prone property from willing sellers. Stillwater Sciences conducted The Feasibility Study to assist the Coastal Conservancy and its partner The Nature Conservancy (TNC) in the identification of the opportunities and constraints associated with the acquisition, management, and eventual restoration of Parkway lands.

Several studies were conducted to assess baseline conditions including (a) an evaluation of geomorphic processes, including the magnitude, frequency, and spatial characteristics of hillslope, fluvial, and estuarine geomorphic processes (b) detailed riparian vegetation mapping and analysis of riparian habitat dynamics for approximately 15,000 acres of riparian habitat within the 500-year floodplain; and (c) an analysis of 11 focal species and their life history and habitat requirements. Wherever possible, the analysis was conducted within a GIS framework integrating our understanding of physical processes to predict how vegetation and suitable habitats would establish for the focal species. A final Feasibility Report integrated these and other studies to present strategies for habitat conservation, levee setback and removal, passive and active native plant revegetation, non-native species removal, fish passage improvement, and water quality treatment to improve ecosystem functions and increase the resiliency of the lower Santa Clara River to climate change impacts.

Stillwater continues to play an active role in restoration planning and implementation. We supported the development of a spatially-explicit strategic plan for the treatment of nonnative, invasive arundo (*Arundo donax*) and restoration of parcels in the lower Santa Clara River Parkway. Stillwater supported Parkway partners by identifying (a) effective and appropriate arundo treatment approaches for Parkway lands; (b) maintenance requirements, costs, and permits associated with those methods; and (c) specific areas for the application of treatment methods and priorities for treatment on existing Parkway parcels. Stillwater also assessed levee setback scenarios along the lower Santa Clara River, with the goal of characterizing the influence of levees and potential levee setback scenarios effects on flood risk, hydrogeomorphic conditions, and ecological conditions. Modeling results evaluating hydraulic conditions at different flood magnitudes and under a range of potential levee setback conditions are being used to evaluate, prioritize and inform meeting Parkway program objectives for riparian conservation/restoration, and flood risk management.



Stillwater scientists are currently working with USFWS, USGS, and other partners in the Santa Clara River Parkway to use LiDAR and other remote sensing and field-based data to model habitat suitability and develop strategic conservation plans for Least Bell's Vireo, Southwestern Willow Flycatcher, and Western Yellow-billed Cuckoo.

Reference:
Peter Brand
Project Manager (retired)
Coastal Conservancy
510.520.3018
thepeterbrand@icloud.com

Contract amount = $1.3 million

Stillwater Sciences

Central Valley Habitat Exchange Program Pilot for Swainson's Hawk Habitat

Location
Central Valley and Delta, CA

Client
Environmental Defense Fund

Swainson's hawk use riparian trees, such as this cottonwood, for nesting in the Central Valley.

Stillwater scientists are developing a tool for quantifying Swainson's hawk habitat as part of the Central Valley Habitat Exchange. The Central Valley Habitat Exchange (Exchange) is an initiative to use market mechanisms to increase the amount of high quality habitat in the Central Valley and Delta. Through the Exchange, habitat will be traded as habitat credits, assigned according to acreage and habitat quality, that willing landowners can sell to private and public investors. Landowners are then compensated according to the habitat acres (habitat quality x acres) they provide for the program. The Exchange is intended to support a regulatory and voluntary market, such that investors could be government agencies addressing the need for mitigation or mandates, or private parties wanting to support conservation. Critical to creation and maintenance of such a market is the establishment of a well-grounded and transparent system for assigning and tracking habitat credits. Stillwater Sciences was hired to construct the tool for quantifying habitat credits for the Swainson's hawk pilot project, with the goal of demonstrating the mechanics and effectiveness of using this type of exchange program to fulfill regulatory requirements or to document conservation investments. Swainson's hawk is a state-listed as threatened, summer resident of the Delta and Central Valley that uses riparian forests, grasslands and agricultural lands during its California residency.

Stillwater Sciences has provided technical support to EDF throughout this pilot project. During the initial phase, Stillwater worked with policy and scientific advisors to develop the structure and approach for quantifying credits, to identify potential pilot sites, and to articulate agency needs in relation to the Exchange. Stillwater ecologists helped to coordinate and lead meetings, conference calls, and site visits with agency personnel and Swainson's hawk experts. During summer 2014, Stillwater ecologists piloted the tool at three sites, generated site quality scores and habitat credits for each pilot site under existing and potential restored conditions, and provided summary reports on these findings to the team. The tool was then reviewed by agency advisors and has been updated with information from the pilot studies and review. Stillwater is using a 'living document' to record the decision making process in selecting the attributes and metrics used in the tool, the scientific basis for each decision, the response curves used to develop sub-scores for each metric, and the rationale for how each attribute is weighted and combined to generate an overall habitat quality score. Currently, Stillwater is working with the EDF team and local agencies to support adoption of the tool into existing programs, as well as supporting EDF and Exchange partners in expanding the Exchange quantification tools to develop credits for a broader range of habitat types.

Reference:
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Environmental Defense Fund
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Contract amount = $110,000

Stillwater Sciences

ROOT CREEK WATER DISTRICT

Water, Sewer, and Storm Drain Rate Studies and Financial Plan
Groundwater/SGMA Fees
Fiscal Policy Manual

The Root Creek Water District (RCWD) was formed to manage groundwater supplies within its basin and provide new utility services for a development area. As a condition of approval, Madera County required RCWD to secure imported water supply, achieve sustainable yield, and comply with the Sustainable Groundwater Management Act (SGMA). Moreover, developers contributed facilities to the District (water, sewer, and storm drain infrastructure) for new residents. A financial master plan was needed to meet SGMA requirements, reimburse the developer, and cover municipal utility operating costs.

Ms. Lechowicz served as project manager and lead financial analyst providing rate studies, financial planning, development impact fee studies, and public approval assistance to the District. Ultimately, the final report included a portfolio of financial tools: loans, community facilities district bonds, acreage assessments, and connection fees. We found that RCWD needed each of these mechanisms to fund a various elements of District expenses.

Ms. Lechowicz provided public approval assistance to the District by explaining requirements to the Board, developing a schedule, drafting public notices, and certifying the results. The annual assessments on land were approved by a majority of the landowners via a mailed ballot election (votes weighted based on total assessment amount per parcel). In addition, groundwater pumping fees were adopted to recover the costs of managing the basin and are competitive with the District's surface water/imported water costs.

Most recently, L&T was engaged to draft RCWD's Fiscal Policy Manual. The manual includes policies and best practices for budgeting, accounting, debt issuance, and raising revenues. In August 2017, Ms. Lechowicz provided a training to the Board covering the Policy Manual.

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CITY OF CLOVIS

Water Rate Study & Miscellaneous Fee Study

Alison Lechowicz served as project manager and lead financial analyst to conduct a Water Rate Study for the City of Clovis. The assignment also included an evaluation of the City's water utility Proposition 26 fees - meter testing fee, after hours turn on fee, and same day turn-on for water shutoffs.

The City of Clovis is located in Fresno County and provides water service to a population of over 100,000. In 2016, Alison Lechowicz completed a water service cost allocation and rate design study. Prior to the study, the City did not have a study or administrative record establishing its cost of service or justifying its water rate tiers. Following the San Juan Capistrano court case, the City was concerned that its water rates may be subject to legal challenge.

Ms. Lechowicz recommended a modified base-extra capacity cost allocation method. Functional cost categories consist of customer service, quality, volume (commodity), average day demand, peak day demand, peak hour demand, and recycled water service. Customer service, quality, and average day demand costs are recovered from fixed charges. Volume costs are allocated to all tiers. Peak day demand costs are allocated to tier 2 and peak hour demand costs are allocated to tier 3. A key task in the rate study was to determine new water tier blocks and to justify the cost of each tier. The City's free water allowance was phased out.

The study also included an evaluation of water utility Proposition 26 miscellaneous fees including meter testing fee, after hours turn on fee, and same day turn-on for water shutoffs. Ms. Lechowicz developed a worksheet that automatically imports the hourly rates of utility staff, materials and supplies, and administrative overhead. The worksheet was critical in demonstrating a cost of service basis for the fees.

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CITY OF MODESTO

State Revolving Fund Loan Application
Water and Sewer Rate and Capacity Fee Studies, Prop 218 Mailing

Alison Lechowicz has worked for the City of Modesto on various engagements dating back to 2010. Ms. Lechowicz developed the credit review package for the City's Clean Water State Revolving Fund loan including the tax questionnaire, the financial assistance application, a proposed financial plan, and a pro forma loan coverage projection. Her efforts were successful in securing a loan of $125 million from the State of California for the City's Phase 2 Tertiary Wastewater Treatment Plant.

In response to litigation by a large industrial wastewater customer, Ms. Lechowicz met with City staff and attorneys to develop and refine the cost of service analysis for the City's Cannery Segregation Line (Can Seg) used to serve large food processors. The analysis was used in settlement talks with the Can-Seg customers.

In 2015, Alison was retained to develop a new wastewater rate structure consistent with the settlement agreement. Working closely with an accountant hired by the City's large industrial customers, Ms. Lechowicz developed a separate large industrial rate structure and capacity fee schedule for cannery customers as well as new rates for all other customers reflecting the City's tertiary treatment stream and secondary treatment "scalping."

More recently, Alison served as project manager and lead financial analyst to conduct water and wastewater rate studies for the City. In 2016, Ms. Lechowicz delivered a drought water rate study to the City. The study considered fixed and variable costs, new operating programs, long-term capital repairs, and cost differentials between central-city service areas and outlying service areas. Alison's work used American Water Works Association recommended best practices and new rates were adopted by City Council August of 2016. As part of the rate approval process, Alison drafted the public notices, had them translated into Spanish, developed a mailing list, and coordinated printing and mailing.

Ms. Lechowicz was rehired by the City to assist the City with its water and wastewater budgeting process for fiscal year 2018.

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CITY OF DAVIS

Water Rate Study and Update

Catherine Tseng served as the lead financial analyst for the City of Davis' water rate study in 2012 and for the water study update in 2014. After decades of debate on how to improve groundwater quality and reliability, the City of Davis decided on a $330 million regional surface water treatment project to draw water from the Sacramento River in cooperation with the neighboring City of Woodland. Davis previously relied completely on groundwater for its total supply of water which has led to salinity concerns as well as concern the long-term viability and damages of over-pumping.

The City established a 15-member Water Advisory Committee (WAC), comprised of residents appointed by the City Council to provide substantial input on the water rate study. The committee reviewed project financing alternatives and considered numerous water rate structures. For each alternative, Catherine analyzed the impact on the water fund's finances and reserves, estimated the effects of consumption and elasticity effects, and calculated the impact on customers' bill.

The WAC ultimately recommended a new rate structure called the consumption-based fixed rate (CBFR) that recovered a portion of the water system's fixed costs based on each customer's actual water use. In March 2013, the City Council adopted the CBFR water rate structure along with rate increases through 2017/18 to fund the surface water project as well as operating and capital needs. However, in June 2014, the CBFR rate structure was repealed through a ballot initiative, and thus, the City required a new water rate study.

Working with another citizens' advisory committee, Catherine assisted with the development of a new water rate structure that addressed the decline in overall water consumption due to the drought. In September 2014, the City ultimately adopted a uniform tier consumption rate structure that varies by customer class. After two years of construction, the City's Regional Water Treatment Facility began operations and delivering high-quality water beginning in June 2016.

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TOWN OF DISCOVERY BAY CSD

Water and Sewer Rate Studies
Water and Sewer Capacity Fee Studies
Community Center Financial Plan

Alison Lechowicz has served as the Town of Discovery Bay Community Services District's financial and administrative consultant since 2012. The Town of Discovery Bay Community Services District is located in the Bay-Delta region and provides water and wastewater services to a population of 14,000. Ms. Lechowicz has conducted two water and sewer rate studies compliant with Proposition 218. The studies evaluated operating and capital expenditures, financing alternatives including cash, bonds, and State Loans, cash flow, rate design, and bill impacts. Alison also conducted several development impact fee studies for the Town and met with developers in their office to explain the fees.

July 2016, Alison completed an update of the 2013 study. The 2016 update was needed to reflect current drought conditions, growth projections, and a new meter roll-out program. The final report provided a more comprehensive review of the Town's fire protection service charges and fixed vs. volume cost allocation to comply with recent legal rulings.

On another assignment, Alison drafted a financial plan for the Town's Community Center. The plan considered revenues from landscape and lighting assessments, General Fund appropriations, and rental fees. Most recently, Ms. Lechowicz provided financial advice related to the Town's water meter financing. The Town is interested in debt-financing the installation of water meters for older neighborhoods. Ms. Lechowicz provided options for recovery of debt service costs from customers over 3, 5, and 10 years. In addition, Alison provided general advice about debt service coverage ratios, fund reserves, and compliance with continuing disclosure requirements. For all assignments, Ms. Lechowicz conducted public presentations and drafted public notices.

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