



# Groundwater Sustainability Plans Preparation for Fillmore Basin and Piru Basin

October 24, 2018

Prepared for



PO Box 1110  
Fillmore, CA 93016

Prepared by



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

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



October 18, 2018

Mr. Anthony Emmert, Executive Director  
Fillmore and Piru Basins Groundwater Management Agency  
P.O. Box 1110  
Fillmore, California 93016

Re: Request for Qualification and Proposals for Groundwater Sustainability Plans Preparation for  
Fillmore Basin and Piru Basin

Dear Mr. Emmert:

Daniel B. Stephens & Associates, Inc. (DBS&A) is enthusiastic about the opportunity to partner with the Fillmore and Piru Basins Groundwater Sustainability Agency (FPBGSA) to produce Groundwater Sustainability Plans (GSPs) that will build on existing sustainable practices and guide future groundwater management in the Fillmore and Piru Groundwater Basins in compliance with the Sustainable Groundwater Management Act (SGMA).

We offer a team of experts with exceptional knowledge of Fillmore and Piru Basin hydrogeology, who are experienced working on both sides of the table with regard to SGMA compliance, and are experienced with SGMA-related communication and consensus-building to facilitate development of a stakeholder community that is informed, involved, and supportive. While the Fillmore and Piru Basins are designated as high priority, our team believes that the local water demand and water quality challenges are manageable, and development of the GSPs for these basins should be straightforward. Our goal is to produce a GSP with the appropriate level of technical analyses and stakeholder input to ensure public acceptance and DWR approval with minimal additional study.

Our proposed Project Manager, Tony Morgan, P.G., C.H.G., knows the planning area and has unique experience from the public agency point of view that will enable him to anticipate and avoid challenges and pitfalls inherent in the SGMA process. Prior to recently joining DBS&A, he was a Deputy General Manager for Groundwater and Water Resources at United Water Conservation District (UWCD), where he led the District's SGMA compliance activities, including formation of groundwater sustainability agencies (GSAs), creation of GSPs, and conducting groundwater basin studies and groundwater management activities. Mr. Morgan will work closely with Tim Moore, P.G., C.H.G., Hydrogeologist, who has direct experience with hydrogeology of the Fillmore and Piru Basins', and is the primary author of the Biennial Report (UWCD, 2016) that summarizes the surface water and groundwater conditions in the Basins. Mr. Morgan and Mr. Moore have worked together on several groundwater projects, including the AB3030 plan updates for the Fillmore and Piru Basins.

Mr. Morgan will also work closely with Dr. Stephen J. Cullen, Ph.D., P.G., a 14-year veteran of DBS&A who has led and provided oversight for dozens of water resources projects in California. Dr. Cullen and Mr. Morgan have worked together on several groundwater modeling projects, including DBS&A's water balance modeling for the Fox Canyon Groundwater Management Agency (FCGMA), where Mr. Morgan was a Technical Advisory Group member.

The remainder of DBS&A's proposed technical staff have an average of nearly 10 years of experience with DBS&A. DBS&A's expertise is augmented by the addition of Stillwater Sciences, Inc. (SWS) and the Consensus and Collaboration Program (CCP) from California State University Sacramento to our team. Our proposed team members have broad expertise in all issues pertinent to groundwater planning,

*Daniel B. Stephens & Associates, Inc.*

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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, groundwater dependent ecosystems (GDEs), stakeholder participation, and community planning.

Our team provides several advantages to FPBGSA, including:

- ♦ Little to no learning curve about Basin conditions. For example, our proposed Project Manager, Tony Morgan, and Hydrogeologist Tim Moore, have extensive experience studying the geology, hydrogeology, and hydrology of these Basins, and Stillwater Sciences has unparalleled knowledge of the Santa Clara River ecosystem from their 15 years of experience working in these Basins
- ♦ Our stakeholder engagement specialist, CCP has, or is currently working with, over 30 groundwater basins or Groundwater Sustainability Agencies (GSAs) in California and is the recognized knowledgebase for GSP outreach campaigns
- ♦ Our proposed Project Manager and Hydrogeologist are local to the Basins
- ♦ Our proposed Project Manager has:
  - » Worked extensively with stakeholders in the Basins while crafting the Joint Power Authority (JPA) that became the foundation of the FPBGSA
  - » Led stakeholder information workshops in the Basins to inform the public on SGMA compliance issues
  - » Assisted the FPBGSA in its early stages with its agency formational and GSP conceptualization tasks
  - » Collaborated with stakeholders to update the AB3030 Groundwater Management Plan for the Basins

In short, **our team can advance the GSP creation process rapidly**—we can hit the ground running.


The primary contact person for this work will be Tony Morgan, P.G., C.H.G. He can be reached with the following information:

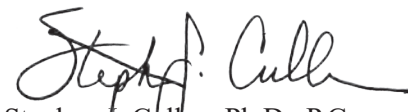
Address: 3916 State Street, Suite 1A | Santa Barbara, California 93105  
Phone Number: (805) 683-2409 x 1403  
E-Mail Address: [tmorgan@geo-logic.com](mailto:tmorgan@geo-logic.com)

Thank you for the opportunity to provide quality assistance to the FPBGSA. Tony Morgan and Stephen Cullen can be reached at (805) 683-2409 x 1403 if you have any questions or need additional information.

Sincerely,

DANIEL B. STEPHENS & ASSOCIATES, INC.

  
Tony Morgan, P.G., C.H.G.  
Project Manager  
Principal Hydrogeologist  
Vice President

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

## **2. Statement of Qualifications**

## STATEMENT OF QUALIFICATIONS

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 250 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 the FPBGSA with complying with SGMA. Our team has broad expertise in the issues pertinent to groundwater sustainability planning, including groundwater resources assessments and safe yield evaluations, analysis of water management alternatives, 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.

Our proposed Project Manager, Tony Morgan, P.G., C.H.G., has exceptional knowledge of SGMA from both the consultant's and the GSA's point of view and direct knowledge of the Fillmore and Piru Basins that will allow him to anticipate and guide the FPBGSA through technical and administrative challenges inherent in SGMA compliance. As the former Deputy General Manager for the 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 include:

- ◆ 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 the JPA that became the FPBGSA.

- ◆ Serving as Lead Technical Representative to the 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.
- ◆ 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 being classified as "critically overdrafted" by the California DWR.
- ◆ Serving on the SGMA TAG for the FCGMA to advise the Board of Directors on technical aspects of the three GSPs (Oxnard, Pleasant Valley, and Las Posas Basins) currently under development.
- ◆ Serving on a subcommittee of the FCGMA SGMA TAG that worked with The Nature Conservancy (TNC) and DWR to develop a GDEs Guidance Framework manual for the identification, evaluation, and consideration of GDEs.

The DBS&A team has the scientific expertise and bench strength to expertly assist FPBGSA, as needed, in the development of an accurate hydrogeologic conceptual model and water budget for the Basins. Our hydrogeologists and modelers have leveraged their experience in developing groundwater budgets and numerical models, and estimating sustainable yield; the technical underpinning for GSAs working toward compliance with SGMA.

DBS&A has over 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.



In addition to our SGMA experience, DBS&A staff have developed groundwater plans for stakeholder groups in compliance with SGMA-type regulations in other states for many years. DBS&A staff have supported 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. As a result of this and related experience, we have strong in-house capabilities to perform planning and technical studies required by SGMA.

Because of this experience, Mr. Morgan and our proposed team will be able to expertly navigate the FPBGSA 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 GSPs to DWR, and putting into place and implementing a process for GSP revisions based on DWR's review comments.



### **3. Proposer's Background**

## PROPOSER'S BACKGROUND

### A. Company Ownership

DBS&A was incorporated in New Mexico in 1984, and is now a wholly-owned subsidiary of Geo-Logic Associates, Inc. (GLA). GLA, established in 1991, is a privately held, multi-disciplinary, California corporation that provides civil, geo-environmental, and water resources services to clients in the U.S. and internationally. GLA's Chief Executive Officer is Gary L. Lass, P.G., C.E.G., C.H.G.; its President is Nicole Sweetland, Ph.D., P.G.

During the last 27 years, GLA has steadily built the firm to increase its expertise and diversify its services. Between 1991 and 2018, GLA grew from 5 employees in one office to a staff of 250 employees operating out of 27 offices in 8 states. In 2015, GLA acquired DBS&A, which added 100 employees, followed by the 2016 acquisition of Clear Creek Associates, a Scottsdale, Arizona-based hydrogeology firm.

### B. Number of Employees

DBS&A employs a staff of 100, and as an affiliate of Geo-Logic Associates, Inc., has access to 250 professionals in

25 offices in the U.S. and abroad. DBS&A and affiliates employ 80 professionals in our 11 California offices (Anaheim, Costa Mesa, Grass Valley, Morgan Hill, Oakland, Ontario, Petaluma, Roseville, San Bernardino, San Diego, and Santa Barbara).

### C. Location Where Majority of Work Will Be Done

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

Phone Number: (805) 683-2409

### D. Project Team Organization/Locations

As depicted in the organizational chart (Figure 1) below, DBS&A has assembled a team of professionals that will work under the leadership of Mr. Tony Morgan, P.G., C.H.G., as Project Manager, and Dr. Stephen J. Cullen, P.G., as Principal-in-Charge. The primary office location of each individual is indicated in the matrix shown on page 15; however, we expect that approximately 75% of the work will be performed by DBS&A staff located in Santa Barbara and Costa Mesa offices.

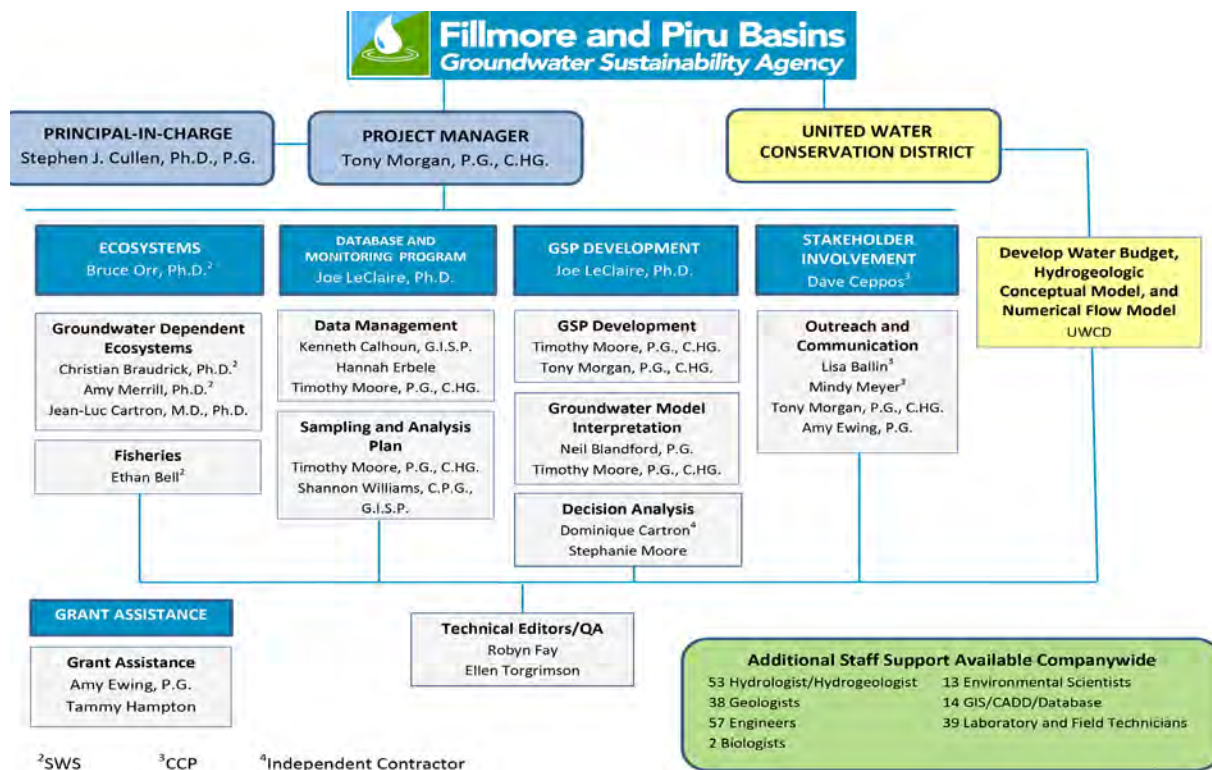


Figure 1. Organizational Chart





## E. Proposer's Point of Contact

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 our subcontractors. Mr. Morgan's contact information is:

Tony Morgan, P.G., C.HG.  
3916 State Street, Suite 1A  
Santa Barbara, California 93105  
tmorgan@geo-logic.com  
O. (805) 683-2409 C. (805) 290-3862

## F. Length of Time Providing Services Described in RFP

DBS&A has over 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 staff have worked on state-mandated Salt and Nutrient Management Plans (SNMPs) for the sustainable management of water quality in groundwater basins. The SNMPs were for the Santa Ana Watershed and the Central Valley. 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.

Specific to SGMA compliance, our team members have been involved in multiple activities, including developing water balance models for the Oxnard, Pleasant Valley, Las Posas, and Arroyo Santa Rosa Basins, formation of GSAs, developing and implementing SGMA-compliant groundwater monitoring programs, and leading SGMA stakeholder interaction programs.

In addition to our SGMA experience, DBS&A staff have developed groundwater plans for stakeholder groups in compliance with SGMA-type regulations in other states for many years. As a result of this experience, we have strong in-house capabilities to perform planning and technical studies required by SGMA.

## G. Resumes for Key Staff

Brief biographies for key DBS&A team members are presented below, and detailed resumes provided in Appendix A. The qualifications and depth of our team's expertise are shown at-a-glance in the matrix following the biographies.

As depicted in the organizational chart on page 5, task leaders are assigned to manage tasks associated with GSP development, 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 available to successfully develop the GSPs.

### 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 as a Deputy General Manager for Groundwater and Water Resources of UWCD, he has been involved in a broad range of projects related to groundwater supply development and management. In recent years, Mr. Morgan has applied his expertise to SGMA compliance activities, including the formation of GSAs, creation of GSPs, and conducting the associated groundwater basin studies.

He has had direct involvement in the operation of a local 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 UWCD's role in the formation of GSAs in three groundwater basins and coordination of UWCD's role with the FCGMA. He served as the UWCD's representative on groundwater and water resource matters before multiple entities, including the FCGMA, 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. Mr. Morgan also serves 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 FPBGSA 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 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 and 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 proposed 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 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 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. Cullen has recent experience working on the GSP groundwater balances for FCGMA. He has also 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 (State Water Board).

#### JOSEPH LECLAIRE, PH.D.—DATA MANAGEMENT TASK LEADER, GSP DEVELOPMENT, 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 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.

#### TIMOTHY MOORE, P.G., C.HG.—GSP DEVELOPMENT/ SAMPLING AND ANALYSIS PLAN/DATA MANAGEMENT



Mr. Moore is a hydrogeologist with eight years of professional experience. His project experience includes complex, multi-basin, hydrogeologic characterization, including the use of surface geophysics, groundwater

monitoring and analysis, well installation oversight and aquifer testing design, database design and management, and technical report writing. While in college, he worked for environmental testing laboratories





for almost four years, giving him the foundation for the data-driven approaches he applies in his projects.

Since the enactment of SGMA, Mr. Moore has been actively involved in several SGMA-related projects, including serving as technical staff to the FPBGSA in Ventura County, California.

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#### KENNETH CALHOUN, G.I.S.P.—DATA MANAGEMENT

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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 the implementation of various GIS software, global positioning system (GPS), and remote sensing technologies for GIS project management. Mr. Calhoun served 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 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 monitoring wells and approximately 250,000 records of chemistry data. He also developed a 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 an 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.

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#### HANNAH ERBELE—DATA MANAGEMENT

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As a water resource scientist, Ms. 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 the 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.

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#### SHANNON WILLIAMS, C.PG., GISP—SAMPLING AND ANALYSIS PLAN

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Ms. Williams is a Hydrogeologist with 10 years of experience in soil and groundwater investigations. She has written Sampling and Analysis Plans (SAPs) and Quality Assurance Project Plans (QAPPs) for soil and groundwater investigation

and remediation projects with the Navy Base Realignment and Closure (BRAC) Program, as well as several Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites throughout the western U.S. Ms. Williams has served as site supervisor for large-scale groundwater sampling events, working to ensure SAP and QAPP procedures are followed. Ms. Williams recently constructed cross sections along the Ventura River and Ojai Valley to provide the geologic base to be used in developing an integrated surface water/groundwater model for evaluation of management options. She is proficient in ArcGIS, regularly compiling geologic information into maps, performing spatial analysis, and creating Collector maps that allow field staff to record accurate sample locations in the field.





**NEIL BLANDFORD, P.G.—GROUNDWATER  
MODEL INTERPRETATION**

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.

**“[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 anywhere in the western United States...”**

**~Greg L. Bushner, R.G.  
Vice President of Water Resource Development  
Vidler Water Company**

Mr. Blandford has extensive experience in groundwater management plans having served as Principal Investigator for a 21-county regional water plan update in Texas, and senior technical resource for 8 regional water plans covering more than 50 percent of the State of New Mexico. All of these plans required extensive stakeholder involvement and some were completed under expedited time frames. Mr. Blandford also served as Principal Investigator for the hydrogeologic evaluation and feasibility modeling of indirect potable reuse (IPR) as part of the 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.

**STEPHANIE MOORE, P.G.—DECISION ANALYSIS**

Ms. Moore is a Senior Hydrologist with 20 years of experience, including 8 years with the U.S. Geological Survey (U.S.G.S.). She has spent most of her career working on technical and policy matters involving groundwater/

surface water interaction, vadose zone hydrology, and stormwater. Ms. Moore has led numerous projects involving complex technical, regulatory, and legal issues. Her technical and managerial experience includes strategic planning, project management, work plan and cost estimate preparation, technical reporting, fieldwork, public involvement, and interaction with municipal, state, and federal regulatory officials.

Ms. Moore uses quantitative, computational hydrogeology; design and management of scientific investigations and long-term monitoring programs; and statistical analyses to help policy makers understand and interpret technical data and make decisions that optimize water resources.

Ms. Moore has extensive experience with Managed Aquifer Recharge (MAR), having designed and led the Albuquerque Bernalillo County Water Utility Authority’s MAR program for six years, and participated in MAR studies in Arizona, California, Nebraska, New Mexico, and Utah. She has worked with clients to design and implement long-term monitoring programs, and uses geochemical and isotopic analyses to understand water quality impacts. Stephanie has used decision analysis methods to help stakeholders evaluate, rank, and select the best set of alternative management strategies based on their community’s unique key performance indicators.

Stephanie is an advocate of water resources and environmental education for citizens of all backgrounds. She has taught hydrogeology to a variety of audiences, from Attorneys General to elementary school students to Master Naturalists. In 2014, faculty of UNM’s Center for Water and the Environment invited Ms. Moore to design the curriculum for and teach a new, dual-credit introductory water resources class



in the Civil Engineering Department: Introduction to Sustainability and Water Resources Engineering.

Ms. Moore has authored more than 15 peer-reviewed publications. She has served on the Board of Directors for the American Groundwater Trust and currently serves on the Board of Directors for the Colorado River Alliance (of Texas).

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#### JEAN-LUC CARTRON, PH.D.—GROUNDWATER DEPENDENT ECOSYSTEMS/BIOLOGICAL PEER REVIEWER

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Dr. Cartron has more than 20 years of experience in project management, ecological research, and biological surveys. He is the main author or editor of several prize-winning books and has written numerous peer-reviewed

articles on birds, riparian ecosystems, indicator species, and anthropogenic impacts mainly on terrestrial wildlife. His project experience includes work on several habitat conservation plans related to water supply projects, including the Bay Delta Conservation Plan, the largest federal Habitat Conservation Plan nationwide. The Bay Delta supplies water for 25 million Californians in the San Francisco Bay Area, the Central Valley, and southern California. It helps to produce nearly half the nation's domestically-grown fresh produce. Co-equal goals of the plan were to restore and protect the ecological health of the Bay Delta and restore and protect water supplies. Responsibilities included the preparation of sections for the conservation strategy and the effects analysis for both terrestrial species and fish; the analysis of modeling results for fish; the development of metrics and conservation targets for the effectiveness; and system monitoring and adaptive management. Modeling was conducted both with and without inclusion of predicted climate change effects.

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#### AMY EWING, P.G.—GSP DEVELOPMENT/STAKEHOLDER INVOLVEMENT/GRANT ASSISTANCE

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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 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.

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#### TAMMY HAMPTON, CGW—GRANT ASSISTANCE

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Ms. Hampton is an accomplished and experienced funding specialist. She is a Certified Grant Writer (CGW) for the GLA chain of companies, and is credentialed by the American Grant Writer's Association. She has developed strong professional

relationships with regulatory agency representatives, and acts as a liaison between general contractors, municipal officials, and funding agencies during the grant/loan procurement and administration process.



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**ROBYN FAY AND ELLEN TORGRIMSON—  
TECHNICAL EDITORS/QA**

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Ms. Fay and Ms. Torgrimson have 15 and 25 years of experience, respectively, in editing, writing, coordinating and producing technical documents in adherence to company style and standards of quality. They review technical reports, editing for clarity, readability, organization, grammar, mechanical style, consistency, and format. Both, Ms. Fay and Ms. Torgrimson are exceptionally familiar with engineering and scientific terminology and project methods as well as English language grammar and style and consistency issues. For projects that require production of large documents, such as water resource plans, they ensure a single voice or writing style throughout the document. They have produced dozens of water plans for local, regional, and state agency clients.

**Subconsultant Staff**

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**BRUCE ORR, PH.D.—ECOSYSTEMS TASK LEADER**

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Dr. Orr has over 30 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, assessing 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). Dr. Orr provides senior strategic support on many of Stillwater's large-scale regulatory, watershed management, and restoration projects. Dr. Orr is the Stillwater project director and senior scientist advisor for GDEs to provide technical expertise in riparian ecology and groundwater interactions on several projects currently underway in support of GSP development. He has been working in the Santa Clara River Watershed since 2003, and is currently leading an effort funding by the US Fish and Wildlife Service (USFWS) and California Department of Fish and Wildlife (CDFW) to update riparian and floodplain vegetation classification and mapping for

the lower 50 miles of the Santa Clara River, including the Fillmore-Piru Basins, and is working with wildlife biologists, hydrologists, and modelers to improve our understanding of vegetation and habitat dynamics along the river and how these dynamics affect key GDE-dependent wildlife species, such as southwestern willow flycatcher, yellow-billed cuckoo, and least Bell's vireo.

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**CHRISTIAN BRAUDRICK, PH.D.—GDE/FLUVIAL  
GEOMORPHOLOGIST**

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Dr. 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, which is highly relevant to the understanding of GDEs. Dr. Braudrick 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. He is currently assisting development of an approach for assessing GDEs under the SGMA for the DWR and for the Madera and Chowchilla GSAs. He is an expert in groundwater and surface water hydrology for GDEs.

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**AMY MERRILL, PH.D.—GDE/SENIOR ECOLOGIST**

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Dr. Merrill is an ecologist with over 25 years' experience in riparian and wetland monitoring and restoration design, quantifying ecosystem services, wetland and riparian biogeochemistry, and watershed management. Amy is experienced in riparian 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 has participated in or led classifications and/or mapping efforts of riparian vegetation in multiple watersheds in California, including the Cosumnes, Lake Tahoe Basin, Cow and Mill Creeks (tributaries to the upper Sacramento River), the lower Tuolumne, and the lower San Joaquin Rivers. Dr. Merrill led Stillwater's riparian vegetation dynamics assessment for the lower Santa Clara River that was conducted for the Coastal Conservancy. Currently, Amy is leading an effort to assess and refine existing





GDE vegetation maps for the Chowchilla and Madera groundwater basins in support of development of GSPs. Amy links mapping and impacts assessment for GDEs.

### **ETHAN BELL—GDE/SENIOR FISHERIES BIOLOGIST**

Mr. Bell is a fisheries biologist with particular expertise with steelhead. He has provided technical expertise on a wide variety of interdisciplinary projects, including instream flows, large-scale watershed assessments, fish passage analysis, population dynamics modeling, limiting factors analysis, restoration design, endangered species consultation, and hydroelectric relicensing and compliance. He is also instrumental in coordinating and managing passive integrated transponder (PIT)-tag based field studies, analyzing collected data, as well as researching and writing reports. Ethan studied GDEs for the Ventura County Public Works Agency on a groundwater recharge project. He was the fisheries lead to study of the effects of a stormwater diversion and infiltration from the city of Piru on potential steelhead passage in lower Piru Creek. He reviewed scientific literature on steelhead fish passage requirements, assessed the hydrologic effects of the proposed stormwater diversion, and evaluated the conditions that would influence fish passage opportunities. Ethan has also led the analysis and instream flow recommendation development for a number of Southern California watersheds. These projects have been both site-specific (e.g., development of Big Sur Steelhead Management Plan), as well as a county-wide assessment in San Luis Obispo County. Ethan has completed a number of research projects on steelhead ecology, energetics, and population dynamics, most recently for a population in Topanga Creek (Malibu County). He is currently providing technical support to UWCD's HCP development, based on his expertise on steelhead, other aquatic species, and their habitat needs in the Santa Clara River and its tributaries. Ethan links groundwater and surface water flows with the health of the aquatic ecosystem.

### **DAVE CEPPOS—STAKEHOLDER INVOLVEMENT TASK LEADER**

Mr. Ceppos is Sacramento State University's, Consensus and Collaboration Program (CCP's) SGMA Program

Manager and is a Managing Senior Mediator with CCP. Mr. Ceppos is recognized statewide as a water policy specialist on a range of topics including water use and efficiency (WUE), flood damage reduction, water quality, and groundwater planning. In this context, he has a comprehensive background developing and mediating collaborative problem solving, stakeholder-driven, resource management processes on a range of water policy issues throughout the western US. He is a senior strategic advisor to DWR and the State Water Board on SGMA implementation, 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 numerous articles on regional collaboration and capacity building. Mr. Ceppos has worked in the region near the Fillmore-Piru Basin as the Senior SGMA Program Manager for the Upper Ventura and Santa Clara River Valley East GSA efforts.

### **LISA BALLIN—STAKEHOLDER INVOLVEMENT**

Ms. Ballin has supported facilitation, public policy, and mediation in a wide range of policy areas. Prior to joining CCP, she focused on environmental planning and analysis. She conducted objective environmental reviews for myriad projects and plans that involved community concern, intense scrutiny, controversy, and/or conflict. She addressed public comments expressed by stakeholders. She has wide ranging knowledge of environmental issues spanning scientific, quantitative, and technical subjects; qualitative issues; and policy matters. She is an avid researcher and analytical thinker and is skilled at communicating technical information in a clear, concise, and effective manner. Ms. Ballin received mediation training from the Ventura Center for Dispute Settlement and the US Institute for Environmental Conflict Resolution. She has mediated at Ventura and Los Angeles County Superior Courts, Days of Dialogue, and for the Inland Valleys Justice Center. Ms. Meyer focuses on southern California projects and was the CCP SGMA Project Coordinator for the Upper Ventura and Santa Clara River Valley East GSA efforts.

### **MINDY MEYER—STAKEHOLDER INVOLVEMENT**

Ms. Meyer is a mediator and facilitator whose practice in private, public, and non-profit sectors centers on using





collaborative strategies to build sustainable outcomes. She uses innovative methods and designs to support diverse groups in reaching agreement. She has worked with local, state, and federal government entities in groups as large as 250 people. Ms. Meyer has extensive experience in the areas of: consensus building and dispute resolution, strategic planning and implementation, public outreach design, organization development, leadership and team development, and training. Ms. Meyer is an effective project manager who achieves desired results and submits agreed-upon deliverables on time and within budget. She quickly learns the needs, complexities, and challenges of each project and its stakeholders and is adept in building trusting relationships. Ms. Meyer is based in Santa Monica and focuses on southern California casework including having been the CCP SGMA Project Manager for the Upper Ventura and Santa Clara River Valley East GSA efforts.

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#### DOMINIQUE CARTRON, J.D.—DECISION ANALYSIS

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Ms. Cartron is an independent contractor to DBS&A, and will work with the Project Manager to support the Decision Analysis Process. She has 21 years of experience specializing in water resources management planning and strategy

development, long-term water supply planning, regional water plans, water rights permitting, water price studies, and 40-year water development plans for municipalities and small water systems. From 2014 to 2017, Ms. Cartron served as project manager for the update of New Mexico's 16 Regional Water Plans completed for the

NM Interstate Stream Commission in 2017. Ms. Cartron was the project manager for the technical, legal, and economic evaluation of the Middle Rio Grande Regional Water Plan's 44 water management strategies. She has extensive experience leading technical planning projects, participating in decision support processes, identifying tools and approaches for water resource decision making and facilitating and presenting at public meetings. She has been the project manager for regionalization studies and projects in McKinley County over the last 10 years and recently has conducted extensive public outreach for identifying, evaluating, and ranking water management projects, programs and policies for the regional water plans and the regionalization projects. Ms. Cartron facilitated 45 public meetings in 6 water planning regions during the regional water plan update process. She has worked with over 50 small water systems in New Mexico as part of the public involvement process for regionalization and water planning projects in multiple counties and is currently working with Williams Acres Water and Sanitation District to complete a preliminary engineering report to interconnect seven water systems within the District's boundaries.

Ms. Cartron participated in several decision analysis projects to develop alternatives, identify objectives and performance criteria for the sensitivity analysis, and evaluated of risks and uncertainties of alternatives for ensuring sufficient long-term water availability. Participated in all stakeholder meetings and drafted significant portion of project reports. Based on success of the first project, the client retained DBS&A to conduct the decision analysis process to related to other strategic water management planning challenges.



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	P	P	P		P		P	S	P	
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	P	P	P				P	S	P	
Joseph LeClaire	Database and Monitoring Program/Data Management Task Leader	Costa Mesa	Ph.D., Soil Science/Chemistry, University of California (Riverside), 1996 B.A., Soil Science/Chemistry, University of California (San Diego), 1980	N/A	33	S	S	S		S		P	S	P	
Timothy Moore	Hydrogeology Task Leader	Santa Barbara	B.A., Environmental Studies (Minor: Geology and Geography), California State University (San Bernardino), 2010	PG, CA #9268 CHG, CA #1027	8	P	P	P				P	P		
Kenneth Calhoun	GIS and Database Task Leader	Albuquerque	M.A., Geography, University of New Mexico, 1997 B.A., Geography, University of New Mexico, 1993	GISP #46134	21							P	P		
Hannah Erbele	GIS and Database	Costa Mesa	B.A., Earth and Environmental Science, University of California (Irvine), 2010	N/A	8	S	S	S				P	P	S	
Shannon Williams	Sampling and Analysis Plan	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	P	P	P				P	P		S
Neil Blandford	Groundwater Model Interpretation	Albuquerque	M.S., Hydrology, New Mexico Institute of Mining and Technology, 1987 B.A., Environmental Science, University of Virginia, 1984	PG, TX #1034	31	P	P	P		S		P	P	P	S
Stephanie Moore	Decision Analysis	Austin	M.S., Earth and Planetary Sciences, University of New Mexico, 1998 B.S., Environmental Sciences, Texas Christian University, 1998	PG, TX #11727	20	P	S	P		S		P		S	
Jean-Luc Cartron	Groundwater Dependent Ecosystems/Biological Peer Reviewer	Albuquerque	Ph.D., Biology, University of New Mexico, 1995 M.D., University of Paris Val de Marne (France), 1991	N/A	27				P	P	S				S
Amy Ewing	GSP Development/Stakeholder Involvement/Grant Assistance	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	P		S		S		P	S	P	
Tammy Hampton	Grant Assistance	Wisconsin	M.S., Criminal Justice, University of Wisconsin, 2014 B.S., Criminal Justice, University of Wisconsin, 1993	N/A	8	S						P		S	
Robyn Fay	Technical Editor/QA	Albuquerque	B.S., Civil and Environmental Engineering, Cornell University, 1997	N/A								P		S	
Ellen Torgrimson	Technical Editor/QA	Louisiana	M.M., Piano Pedagogy, Southern Methodist University, 1977	N/A								P		S	



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
Bruce Orr <sup>2</sup>	Ecosystems Task Leader	Berkeley	Ph.D., Aquatic Entomolgy, University of California (Berkeley), 1991 B.A., Biological Sciences and environmental Studies, University of California (Santa Barbara), 1979	N/A	39			P	P	S			S	S	
Christian Braudrick <sup>2</sup>	GDE/Fluvial Geomorphologist	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	N/A	20	S	P	P	P	P			S	S	
Amy Merrill <sup>2</sup>	GDE/Senior Ecologist	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	N/A	25			P	P				S	S	
Ethan Bell <sup>2</sup>	Fisheries	Davis	M.S., Fisheries Biology, Humboldt State University, 2001 B.S., Ecology and Evolution, University of California (Santa Barbara), 1990	N/A/	20			P	P		P		S	S	
Dave Ceppos <sup>3</sup>	Stakeholder Involvement Task Leader/Facilitator	Sacramento	B.L.A., Landscape Architecture, University of Florida (Minor in Geology), 1985	N/A	33	P	S	P		S		P	S	P	
Lisa Ballin <sup>3</sup>	Public Involvement/Lead Mediator	Taranza	M.S., Engineering-Economic Systems, Stanford University, 1988 B.A., Mathematics, University of Pennsylvania, 1986	N/A	24					P			P	P	S
Mindy Meyer <sup>3</sup>	Public Involvement/Associate Mediator	Santa Monica	M.A., Organizational Management, Antioch University B.A., Liberal Studies, Antioch University	N/A	16					P			P	P	S
Dominique Cartron <sup>4</sup>	Decision Analysis	Albuquerque	J.D., University of New Mexico School of Law, 1996 B.A., French Literature and Latin American Studies, University of New Mexico, 1991	Member of the State Bar, NM #9406	22	P						P		P	

P = Primary area of expertise

S = Secondary area of expertise

Subconsultants

2 SWS

3 CCP

4 Independent Contractor



## 4. Negative History



## NEGATIVE HISTORY

On February 2, 2015, all claims against DBS&A were dismissed with prejudice in the case "2011, Ronald James Baker, Plaintiff v County of Canyon, a political subdivision of the State of Idaho, DBS&A, and Adamson Pump & Drilling Co." The plaintiff was injured when he crashed his recreational motorbike at the user-assumed-risk site when he encountered an excavated mud pit from drill site 5 of Pickles Butte Landfill.

In the 2011 case, "Slippery Rock Ranch LLC, etc. v Hansen-Welldo-Service, Dfts etc. et al.: Cross Complainant v Slippery Rock Ranch LLC, including DBS&A, etc. Cross-Dfts - Santa Barbara County Superior Court, Santa Barbara, CA." Slippery Rock Ranch, LLC sued its subcontractor Hansen-Welldo-Services for damages related to a failed production well caused by Hansen-Welldo-Services' efforts to mitigate artesian inflow to the well. Hansen-Welldo-Services countersued alleging contributory negligence by Slippery Rock Ranch, LLC, and DBS&A. Based on a jury trial, DBS&A was ultimately ordered to pay \$35,797 in costs for lost pipe and damage to the drill bit. On June 3, 2014, satisfaction of judgement was issued to DBS&A.

We strive to avoid claims by providing for smooth and cooperative construction projects through steps such as:

- ♦ Utilization of standard operating procedures and staff experienced in construction oversight that are empowered to stop work if there are unacceptable on-site safety or practice issues.
- ♦ Comprehensive, robust company-wide quality assurance/quality control procedures.
- ♦ Ensuring that all scopes of work are reviewed by a principal of the company.
- ♦ Making plans and specifications clear, accurate, and unambiguous.
- ♦ Holding on-site pre-bid meetings so contractors clearly understand the project requirements and offer their best bids.
- ♦ Strict subcontracting requirements, including adequate insurance listing DBS&A as additional insured.
- ♦ Company-wide safety standards and training, kept up-to-date with yearly refreshers.



## **5. Client References**

## CLIENT REFERENCES

### Owens Valley GSP and Groundwater Modeling

#### 1. Client Name, Client Project Manager, address, telephone number, and e-mail address.

County of Inyo  
Robert Harrington, Water Director  
P.O. Box 337  
135 S. Jackson Street  
Independence, California 93526  
(760) 878-0003  
bharrington@inyocounty.us  
Type of Business: Government Agency

#### 2. Type of service provided to client.

Groundwater modeling and selected to develop groundwater sustainability plan

#### 3. Project description.

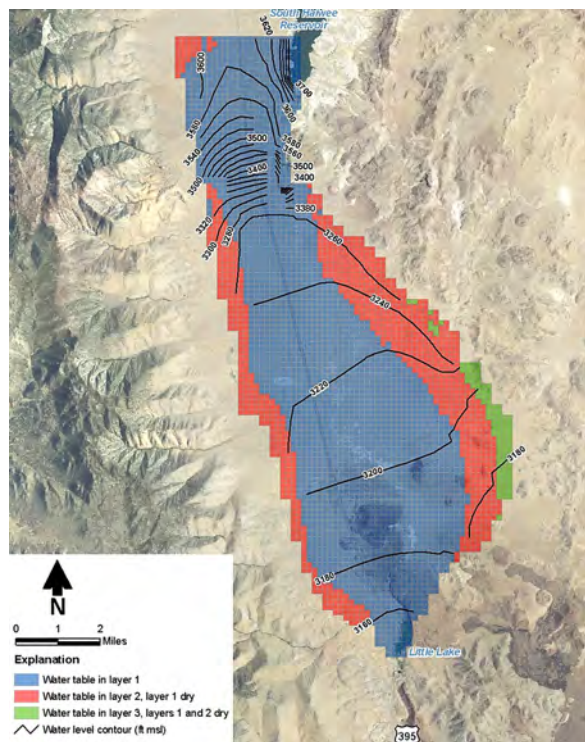


Figure 2. Water table illustration with color-coded layers

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. DBS&A 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 (LADWP), and project pumping that occurred through 2010.

DBS&A was also recently selected by the Owens Valley Groundwater Authority with Inyo County as the fiscal agent to produce a GSP for future groundwater management in the Owens Valley Groundwater Basin in compliance with the SGMA, while also meshing with the Inyo/Los Angeles Agreement. The scope of the project includes data compilation, review, and management; description of the Basin setting; development of a hydrogeologic conceptual model



for the Basin; description of current and historic groundwater conditions; development of a basin water budget; identification of management areas; development of sustainability criteria (undesirable results, sustainability goal, minimum thresholds, and measurable objectives); refinement and consolidation of existing groundwater monitoring programs; development of specific projects necessary to maintain or achieve sustainability; development of an annual GSP reporting system; submittal of the GSP to the Department of Water Resources (DWR); and revisions based on DWR's review.

#### 4. Project dates (starting and ending).

Modeling: April 2014 - December 2017; GSP development: Scheduled to begin November 2018

#### 5. Staff assigned to that project.

Stephen Cullen, Neil Blandford, Kenneth Calhoun, Robyn Fay, Ellen Torglimson

#### 6. Discuss final outcome.

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. GSP development will be initiated next month.

### Groundwater Budgets for Groundwater Sustainability Planning

#### 1. Client Name, client Project Manager, address, telephone number, and e-mail address.

Fox Canyon Groundwater Management Agency (FCGMA)  
Kim Loeb, Ventura County Groundwater Manager  
800 South Victoria Avenue  
Ventura, California 93009  
(805) 650-4083  
kim.loeb@ventura.org

Type of Business: Government Agency

#### 2. Type of service provided to client.

Development of Groundwater Budgets for Groundwater Sustainability Planning

### 3. Project description.

FCGMA selected DBS&A as part of a team to develop GSPs in compliance with California's SGMA. SGMA provided the FCGMA the authority to act as the GSA to manage the development of the GSPs. 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).



Figure 3. Groundwater budget used to understand how to achieve and maintain groundwater basin sustainability

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.

Available groundwater-level monitoring data were used to constrain estimates of change-in-storage for each year of the water balances. Available groundwater-level data were compiled to estimate change-in-storage. Shallow groundwater level data (i.e., well screens less than approximately 500 ft bgs) from all available 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.

#### 4. Project dates (starting and ending).

September 2015 - December 2017

#### 5. Staff assigned to that project.

Stephen Cullen, \*Tony Morgan

*\*Prior to DBS&A employment*

#### 6. Discuss final outcome.

In support of GSP development DPWM Model Results: Average Deep Percolation from Precipitation and Irrigation 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 NGOs. 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.

### Ventura River Watershed Modeling

#### 1. Client Name, client Project Manager, address, telephone number, and e-mail address.

California State Water Resources Control Board  
evin DeLano, Geologist  
1001 I Street  
Sacramento, California 95814  
(916) 319-0631  
Kevin.DeLano@waterboards.ca.gov

Type of Business: Government Agency

#### 2. Type of service provided to client.

Integrated groundwater/watershed model development

### 3. Project description.

The Ventura River was designated by the California State Water Resources Control Board (State Water Board) Instream Flow Unit as one of five priority stream systems under the California Water Action Plan for enhancement of instream flow to support critical habitat for anadromous fish. DBS&A is developing an integrated groundwater/surface-water model of the Ventura River watershed in collaboration with Geosyntec Consultants, in order to assist the State Water Board in establishing instream flows that support critical habitat. Objectives of the model include:

- ♦ Representation of water use and other human activities that impact instream flows
- ♦ Estimation of instream flows under scenarios with and without groundwater extraction and diversions

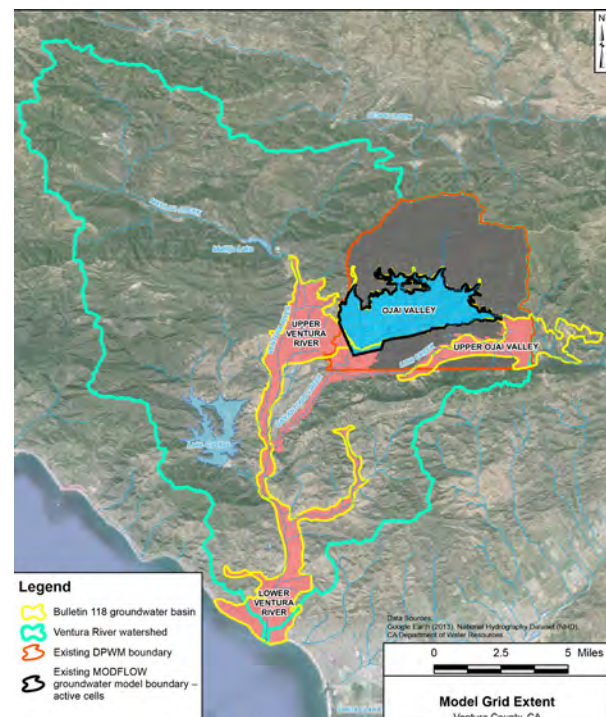


Figure 4. Ventura River watershed modeling project area

In addition, the model will support the Los Angeles Regional Water Quality Control Board by refining information related to nitrogen source assessment and load allocations for agriculture and other sources identified in an existing Total Maximum Daily Load (TMDL) regulation that contribute to algae and



eutrophic conditions in the Ventura River, and its estuary and tributaries. The model will also be publically available upon completion, and the Water Boards are coordinating with local groundwater sustainability agencies such that the final model can support groundwater sustainability planning. DBS&A will be providing model training to local stakeholders.

DBS&A is leading the development of the groundwater portion of the model. We are using the US Geological Survey (USGS) Newton-Raphson version of MODFLOW (MODFLOW-NWT), which will be integrated with surface-water flow using the USGS Groundwater and Surface-water FLOW model (GSFLOW). DBS&A previously developed a numerical groundwater model of the Ojai portion of the watershed. We are building on that effort by extending the model domain to the Ventura River and Upper Ojai groundwater basins and stream-bed alluvium that connects the basins.

Model development includes:

- ◆ Geologic evaluation of alluvium extent and thickness
- ◆ Representation of pumping from agriculture and municipal wells including estimating pumpage for wells without historical records
- ◆ Establishment of boundary conditions representative of recharge from deep percolation of precipitation, irrigation, and septic systems
- ◆ Riparian evapotranspiration
- ◆ Flow between groundwater and stream channels
- ◆ Groundwater exchange between alluvium and bedrock geologic units
- ◆ Groundwater inflow from and outflow to the Pacific Ocean

The integrated model will be calibrated to historical groundwater elevation data collected by Ventura County on a quarterly basis from a network of private wells, and to available surface-water gage data for water years 1995 through 2015. In addition, nutrient loading and groundwater transport will be simulated and the model will be calibrated to available groundwater nitrate data. The modeling study is anticipated to be completed by March 2020.

- ◆ Using MODFLOW-NWT to develop groundwater portion of integrated groundwater/surface-water model

- ◆ Model will allow the State Water Board to estimate instream flows under scenarios with and without groundwater extraction and diversions
- ◆ Model will support TMDL-required nitrogen analyses

#### 4. Project dates (starting and ending).

June 2017 - May 2022

#### 5. Staff assigned to that project.

Stephen Cullen, Hannah Erbele, Shannon Williams, Ellen Torgimson, Robyn Fay

#### 6. Discuss final outcome.

Model development and supporting hydrogeologic analyses are ongoing, with initial model development completion anticipated in 2020 and project completion in 2022. Currently DBS&A has prepared a geologic analysis memorandum and project Study Plan that are available on the SWRCB website and have received public and technical committee member comment. Model objectives and anticipated final outcomes are described above.

### Santa Paula Groundwater Subbasin Safe Yield Study

#### 1. Client Name, client Project Manager, address, telephone number, and e-mail address.

United Water Conservation District  
John Lindquist, Senior Hydrogeologist  
106 North 8th Street  
Santa Paula, California 93060  
(805) 317-8970  
johnl@unitedwater.org

Type of Business: Government Agency

#### 2. Type of service provided to client.

Identify groundwater management practices, determined and estimated safe yield, applied model to evaluate groundwater recharge.

#### 3. Project description.

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.



Figure 5. 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. The team discovered and continued to evaluate whether deep percolation of precipitation may be a significant contributor to Basin recharge.

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 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 estimated based on results of the calibrated hydrologic balance, and is being reported for representative precipitation conditions, including the average, median, 25th- and 75th-percentile conditions during the hydrologic base period.

#### 4. Project dates (starting and ending).

June 2014 - July 2017

#### 5. Staff assigned to that project.

Stephen Cullen, Ellen Torgrimson

#### 6. Discuss final outcome.

DBS&A's project team helped the UWCD to determine a technically sound, defensible estimate of the groundwater safe yield of the Basin.



## 6. Project Proposal



## PROJECT PROPOSAL

We use Section 6 to present our approach to performing the 11 tasks outlined in RFP Section 2, Description of Scope of Work, and we also provide some recommendations and optional tasks not specifically called out in the RFP.

### Technical Approach

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

- ◆ Are tailored to the critical issues of the Basins;
- ◆ Address the items prescribed by DWR in their GSP Preparation Checklist and GSP Annotated Outline guidance documents; and
- ◆ Are sensitive to the scope of work and funding available from FPBGSA's Proposition 1 (Prop 1) Grant Award.

SGMA specified many actions that a GSA must accomplish to achieve 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 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 they do provide insights 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 DBS&A team in the preparation of the GSPs. 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 FPBGSA and interested stakeholders can understand the general steps and recognize how the Basins' sustainability planning can be achieved.

The DBS&A team's approach to this project has the following major components:

#### **Leverage existing knowledge**

- ◆ Make extensive use of the information contained in 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 their concerns and issues early in the process;
- ◆ Establish multiple venues for stakeholders to participate in the process; and
- ◆ Create and implement a stakeholder engagement plan that shows 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 each of the Basins;
- ◆ Fill in data gaps later. Significant data unknowns can be addressed over time rather than depleting limited fiscal resources during the early stages of the GSA operations;
- ◆ Prepare GSPs substantially compliant with DWR requirements. Our team's approach will develop GSPs 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 12 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 must be convinces of the cost-benefit relationship for proposed projects.
- ◆ Stakeholders must be convinced of the cost-benefit relationship for proposed projects.

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## **TASK 1 - PROJECT MANAGEMENT**

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### ***A. Project Administration***

Project administration activities are expected to fall within the following general categories:

- ◆ Work Plan
- ◆ Kickoff Meeting
- ◆ Monthly Progress Meetings
- ◆ Staff Workshops
- ◆ Agency Coordination
- ◆ Various presentations

### ***B. Work Plan***

A key element of the project administration will be preparation of a work plan for review and approval by the FPBGSA. A draft work plan will be prepared within three weeks of receiving the Notice to Proceed from the FPBGSA. Upon receipt of review comments from UWCD and the FPBGSA Board of Directors, the draft work plan will be updated and a final work plan provided to the FPBGSA Board of Directors for their acceptance.

The work plan will include a Gantt chart in MS Project and show actions required, strategies employed,



responsibilities (persons, organizations, and agencies), dependencies, and milestones with dates in weeks and months beginning with Notice of Award.

### **C. Kickoff Meeting**

At the onset of the project, the project management team will review background information provided by UWCD and attend a kickoff meeting with FPBGSA and UWCD staff.

### **D. Monthly Progress Meetings**

Mr. Morgan and other key staff will organize and participate with FPBGSA staff in periodic (e.g., monthly) meetings or teleconferences to keep the project on track and provide staff with information to keep FPBGSA 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 UWCD, with both parties contributing their background knowledge and experience toward refining our path forward to ensure the FPBGSA's compliance with DWR requirements and timelines.

It is anticipated that monthly progress reports will be provided to FPBGSA staff for inclusion in the agenda for regularly scheduled Board of Director meetings. DBS&A personnel will be present at these meetings to address questions from the Board of Directors. DBS&A will work with the FPBGSA to coordinate technical meetings and board meetings in order to minimize travel costs.

### **E. Staff Workshops**

DBS&A team members will work with UWCD staff on workshops, as needed, to keep the FPBGSA Board of Directors and stakeholders informed of our progress in developing the GSPs, as well as to seek input at various times on specific topics (e.g., water budget, sustainability management criteria, projects and management actions). Stakeholder workshops are key elements of our proposed Stakeholder Engagement program.

### **F. Agency Coordination**

The GPSs to be developed for this project will be joint efforts of the DBS&A team and UWCD staff. The DBS&A project management team has extensive experience in working with UWCD staff on groundwater management programs. This experience, when coupled with our existing knowledge of the hydrogeology of the Basins and the breadth of the

available data, provides a solid framework for Agency-UWCD-DBS&A coordination. The monthly progress meetings, workshops, and informal consultations will provide ample opportunities for DBS&A project team interaction with the FPBGSA Board of Directors, as well as UWCD staff to ensure that all efforts are progressing in a coordinated, cost-effective manner.

### **G. Presentations**

It is anticipated that DBS&A, in support of the FPBGSA, may be requested to conduct presentations to various interested groups. These groups could include, for example, stakeholder organizations (e.g., Piru or Fillmore Basin Pumpers Associations), industry representatives (e.g., Farm Bureau, Association of Water Agencies of Ventura County), or other governmental organizations (e.g., County Supervisors, Fillmore City Council). DBS&A team members are well prepared to represent the GSP development process, as well as the SGMA compliance requirements. Our proposed Project Manager, Tony Morgan, is a recognized authority on SGMA compliance requisites and has historically advised the FPBGSA on such issues.

### **Key Assumptions**

The following assumptions that are central to our proposal:

- ♦ Funding for this project is to come from the Prop 1 Grant Award and is limited to the Prop 1 Grant amount. This does not preclude other future sources of funding (e.g., grants, monies from FPBGSA General Fund) from being developed and used to augment the Prop 1 Grant funds for supplemental studies or analyses. The scope and budget for any supplemental studies or analyses will be negotiated at a future date.
- ♦ The vast majority of the existing data in the Basins (e.g., groundwater elevation, water quality, groundwater extractions, well construction, stream flows, vegetation mapping) is available in digital format. This assumption is valid as most of these data are expected to be provided by UWCD and County of Ventura.
- ♦ Ecosystem evaluations will largely be restricted to desktop analyses using existing databases (e.g., Natural Communities Commonly Associated with Groundwater) available from DWR, CDFW, The



Nature Conservancy (TNC), and other entities, as well as previous, readily available evaluations and analyses performed on behalf of third parties. This would include the extensive data set developed by our team member, Stillwater Sciences. TNC's guidance document on assessing GDEs will be a centerpiece in the evaluation of surface water - groundwater interactions and potential surface water depletion due to groundwater extractions. The inclusion of extensive field ecosystem mapping is beyond the scope of the budget for these initial GSPs.

- ♦ Legal counsel in support of the GSPs development process will be provided by FPBGSA.
- ♦ The existing and/or in-development groundwater models will be available and 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 are not included in this proposal.

## DELIVERABLES

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

## TASK 2 - COMPILATION OF EXISTING DATA

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 a FPBGSA data repository and management system. DBS&A has previously and successfully performed all aspects of the scope of services requested with regard to data management. For example, DBS&A completed an on-line well registration database for the Northern Trinity Groundwater Conservation District in Texas, which was led by proposed team member, Kenny Calhoun. This system is similar in both scope and size to the system

under consideration by FPBGSA. This .NET, Microsoft Structured Query Language (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.

DBS&A understands that UWCD manages, collects and archives the majority of the groundwater data available for Fillmore and Piru Basins housed primarily but not limited to the following three databases: groundwater level, water quality (groundwater and surface water) and groundwater extraction (well production records). UWCD also maintains approximately 20 pressure transducer and data loggers distributed throughout Fillmore and Piru Basins set to record on 4-hour reads that will provide high resolution data that will be important in complex areas such as near GDEs that may exist at the boundaries between basins. Ventura County Watershed Protection District (VCWPD) collects groundwater data and maintains databases containing water level and water quality data. VCWPD and UWCD routinely share data resulting in considerable overlap between the two entities' databases. VCWPD houses much of the available Ventura County-wide precipitation and streamflow data on their publically accessible Hydrologic Data Server (Hydrodata). Additional in-stream flow measurements from transient gaging locations may be available from UWCD to supplement VCWPD's fixed gaging site streamflow data. Both UWCD and VCWPD maintain well inventory shape files that contain well construction information.

Communication is critical to successful database design and construction. The DBS&A team will work collaboratively with FPBGSA, UWCD, VCWPD and the other 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 UWCD 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 FPBGSA and DBS&A's 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 as 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 historical 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 FPBGSA member agency representatives and appropriate stakeholders.

Our team will inventory documents and gather data from multiple parties which could include: UWCD, VCWPD, City of Fillmore, CDFW (Fillmore Fish Hatchery), USGS, and public and private water systems (e.g., Warring Water Service, Inc.). 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 the state and federal databases. We anticipate that FPBGSA, stakeholder agencies, the USGS, the California Statewide Groundwater Elevation Monitoring (CASGEM), and other appropriate federal and state agencies will identify data sets and provide data upon request.

Stillwater Sciences, part of the DBS&A team, will compile and review available information relevant for identifying and characterizing known or potential groundwater dependent ecosystems (GDEs) and ecohydrological linkages between aquifers and GDEs. Available information includes the California Natural Diversity Database (CNDDDB) and DWR's Natural Communities Commonly Associated with Groundwater Database (<https://gis.water.ca.gov/app/NCDatasetViewer/>). Stillwater Sciences also is currently updating detailed maps of the riparian corridor of the Santa Clara River through the Fillmore and Piru Basins. In addition, recent habitat suitability model results for riparian-dependent endangered bird species (i.e., yellow-billed cuckoo and southwestern willow flycatcher) will be included in this data compilation.

Stillwater will also compile available data on steelhead passage and steelhead usage in streams in the Basins. This information will be used in the identification and characterization of GDEs and other ecological issues.

DBS&A has incorporated many types of hydrogeologic 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. (need some CA projects here) 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:

1. Digital library of collected data, which may include:
  - a. Basins wide well inventory
  - b. Well production records
  - c. Groundwater elevation data
  - d. Groundwater and surface water quality data
  - e. Precipitation data
  - f. Stream gaging data
  - g. Groundwater dependent ecosystems

### TASK 3 - ASSESSMENT OF EXISTING DATA AND DATA GAP ANALYSIS

The DBS&A team will perform an assessment of the existing data gathered and inventoried under Task 2. In consultation with UWCD, DBS&A will propose the level of effort required to minimize the data gaps and provide recommendations for securing missing information and data through a streamlined process using standardized data collection templates, as applicable. In coordination with UWCD, Stillwater will evaluate the data to identify



areas, gaps and uncertainties in either GDE data or where additional groundwater monitoring may be required to assess the degree to which surface or near-surface water is tied to groundwater. DBS&A will perform a data gap analysis adequate to satisfy the data needs for each sustainable management criteria in accordance with DWR's "Monitoring Networks and Identification of Data Gaps BMP" (Figure 6. Data Gap Analysis Flow Chart from BMP reproduced below).

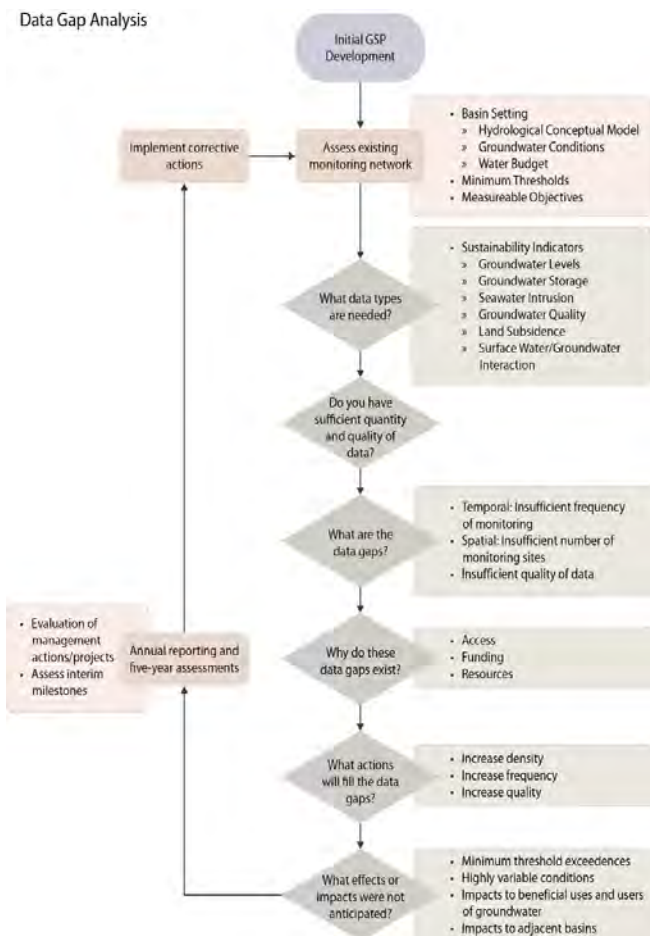


Figure 6. Data Gap Analysis Flow Chart

From a review of the 2014 and 2015 Piru and Fillmore Basins Biennial Groundwater Conditions Report (UWCD, 2016), it is anticipated that the existing data for water level, water quality, groundwater extractions, precipitation, and streamflow is likely nearly adequate for meeting the minimum requirements of 23 California Code of Regulations (23 CCR) § 352.4 and § 352.6. Fortunately, groundwater extractions have been

reported to UWCD biannually since 1980 which is an advantage these Basins have over many other basins in the state. Based on the data needs and existing available data, the DBS&A team will identify temporal and spatial data gaps. Recommendations on how to reduce temporal or spatial data gaps might include, but not necessarily limited to, the following examples:

- ♦ More frequent water level measurements and/or the installation of additional pressure transducers and data loggers;
- ♦ Increased frequency of water quality sampling or water level measurements to capture the transient groundwater and surface water conditions near potential GDEs at the basin boundaries;
- ♦ Additional shallow water level monitoring sites to more adequately define GDEs;
- ♦ Installation of discrete-depth monitoring wells, such as the nested monitoring wells included in FPBGSA's Prop 1 Grant Award, to assess vertical groundwater gradients;
- ♦ Additional subsurface data to refine the hydrostratigraphy in areas lacking well drillers reports or other geologic information; and
- ♦ Additional field mapping or verification of potential GDEs.

UWCD recently published a report that documents their development of the Ventura Regional Groundwater Flow Model (VRGWFM) (UWCD, 2018). DBS&A understands that UWCD's current work is focused upon defining the hydrostratigraphy of Santa Paula, Fillmore and Piru Basins, and will be followed by expanding the numerical model to include these Basins by early 2020.

SGMA requires aquifer-specific assessment of the six sustainability indicators. Historically, the Fillmore and Piru Basins have been considered unconfined groundwater basins (UWCD, 2016). If the results of UWCD's updated hydrostratigraphic mapping indicates that the Fillmore and/or Piru Basins' aquifers are more confined than historically conceptualized, there may be data gaps associated with one or more of the hydrostratigraphic units. Many wells in these Basins have long perforated intervals, and as a result, few wells (particularly in the deeper aquifers) are screened in only one aquifer. As necessary, the DBS&A team will



work closely with UWCD to identify potential data gaps identified from UWCD's in-progress hydrostratigraphic mapping for Fillmore and Piru Basins.

#### **DELIVERABLE:**

##### **1. Technical Memo: Data Gap Analysis Report**

#### **TASK 4 - MONITORING PROGRAM AND DATA MANAGEMENT SYSTEM**

The preparation of the GSPs will be a data-intensive effort. Fortunately, the Fillmore and Piru Basins have two long-term groundwater level and water quality monitoring networks operated by UWCD and VCWPD. Additional studies have been performed for various purposes such as water supply evaluation, ecosystem monitoring, and water quality evaluations (Regional Board) that have yielded additional data and analysis. 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.

A focus of this task will be to determine how refinement of the existing monitoring programs might minimize or eliminate data gaps, especially in critical areas. As project Task 2 (Compilation of Existing Data) and Task 3 (Assessment of Existing Data and Data Gap Analysis) proceed, our team will provide guidance on ways to leverage the existing data sets and/or ideas on monitoring program refinements that could benefit the GSP development process and the stakeholders. The process may benefit VCWPD as the CASGEM reporting entity for Ventura County 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 to track GSP sustainability goals. In most basins, groundwater monitoring and modeling are focused on the deeper aquifers, while shallow water-table aquifers are treated with reduced precision and have greater uncertainty. DBS&A intends to leverage existing wells and data as much as is practicable. 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. These shallow monitoring wells could

be used to track deviations from baseline conditions and monitor trends over time as part of an adaptive management program.

Stillwater will develop monitoring protocols and data collection methods for GDEs in the Basins based on standard ecosystem monitoring techniques for ecosystems and species identified in Tasks 2 and 3. Any data analysis and reporting protocols for GDEs will be developed by Stillwater Sciences. Stillwater will develop a plan to ensure that the GDE monitoring program is effective and able to track deviations from baseline conditions and identify trends over time as part of an adaptive management program for both management actions (Task 8) and the monitoring network.

DBS&A will draw on our team's specific experience working in the Basins and the outcomes of Task 2 and Task 3 to familiarize ourselves with the active monitoring networks, including overall coverage, objectives, monitoring practices and protocols, and degree of public access to data. The DBS&A team has specific experience working with UWCD's databases and monitoring program. One of DBS&A's hydrogeologists, Tim Moore, worked for UWCD for nearly eight years before recently joining DBS&A's team. His responsibilities included developing and maintaining UWCD's groundwater databases, and developing and overseeing UWCD's monitoring program.

We will describe the physical, jurisdictional, and administrative aspects of current programs, address monitoring gaps identified in Task 3, 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 a focus on leveraging the existing datasets and monitoring programs to minimize or eliminate data gaps. DBS&A routinely performs groundwater monitoring and we 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. These data are most useful when collected at spatially distributed sites at a consistent frequency.





DBS&A will consult with the FPBGSA and UWCD to determine if UWCD's existing database of groundwater levels and water quality meets the user requirements for storing, viewing, analyzing, and reporting data in the context of the intent of 23 CCR § 352.4, § 352.4 for public accessibility. Based on the FPBGSA's 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 programming and provide significant cost benefit to the FPBGSA. The team will also recommend an approach for populating the selected DBMS with existing data.

#### **DELIVERABLES:**

1. Technical Memorandum: Monitoring Program
2. Data Management System Summary and Location Information

### **TASK 5 - WATER LEVEL AND WATER QUALITY DATA COLLECTION AND ANALYSIS**

The DBS&A team will perform a trend analysis of groundwater level and groundwater quality constituents, as necessary, which expands on the general groundwater level and water quality analysis available in the 2014 and 2015 Piru and Fillmore Basins Biennial Groundwater Conditions Report (UWCD, 2016). The report includes groundwater hydrographs for a number of representative wells within the Fillmore and Piru Basins and time series graphs of water quality constituents including: total dissolved solids (TDS), sulfate, chloride, nitrate, and boron. DBS&A understands that an update that includes 2016 and 2017 data is currently in progress by UWCD and is anticipated to be completed this fall.

A trend analysis performed on a broader suite of analytes than those identified above may be necessary to satisfy the requirements of SGMA, and may lead to identification of additional constituents of concern in the Basins. Identification of constituents of concern will be important in establishing the frequency and suite of analytes for sample analysis, which may not be the same for all locations and/or management areas in the Basins.

DBS&A envisions the development of a SGMA focused Sampling and Analysis Plan (SAP) as a companion document to the Technical Memorandum: Monitoring Program included in Task 4. The Task 4 memo will likely include, but not necessarily limited to, descriptions of the following:

- ◆ Available groundwater level and water quality data
- ◆ The two long-term groundwater level and water quality monitoring networks operated by UWCD and VCWPD
- ◆ Recommendations on how refinement and expansion of the existing monitoring programs might minimize or eliminate data gaps, especially in critical areas

In cooperation with UWCD, DBS&A will develop a SAP in accordance with DWR's "Monitoring Networks and Identification of Data Gaps BMP" and "Monitoring Protocols, Standards, and Sites BMP." DBS&A does not intend to impose specific schedules or monitoring wells and/or sampling locations on UWCD or VCWPD beyond the recommendations that will be included in the Task 4 Memo. The SAP will formalize field techniques and procedures that UWCD may already have in place for the existing monitoring program. Our efforts will be focused on meeting the minimum criteria of 23 CCR § 352.4 and § 352.6. A SAP might include, but will not necessarily limited to, the following sections:

- ◆ Introduction, background and analyses of concern
- ◆ Equipment
- ◆ Sample containers and preservation
- ◆ Water level measurement protocol
- ◆ Sampling protocol
- ◆ Decontamination procedures
- ◆ Analytical methods
- ◆ Quality assurance/quality control (QA/QC)

#### **DELIVERABLE:**

1. Sampling and Analysis Plan (SAP)





## TASK 6 - DEVELOP WATER BUDGET, HYDROGEOLOGIC CONCEPTUAL MODEL, AND NUMERICAL FLOW MODEL

UWCD has recently published a report that documents development of the Ventura Regional Groundwater Flow Model (VRGWFM) (UWCD, 2018). DBS&A understands that UWCD's current work is focused upon defining the hydrostratigraphy of Santa Paula, Fillmore and Piru Basins, and will be followed by expanding the numerical model to include these Basins by early 2020. Our prior knowledge of the Fillmore and Piru Basins and initial review of the model report indicates that the VRGWFM, if expanded to include the Santa Clara River basins in time to coincide with the GSPs development milestones, is expected to meet the needs of the GSPs development. DBS&A anticipates that once UWCD's model is calibrated and in a form consistent with DWR's modeling BMP (DWR, 2016), UWCD will set aside a version (2.0) of the model for preparation of the Fillmore and Piru Basins GSPs, which will be used to prepare historic, current and projected water budgets.

We are less optimistic concerning the utility of the groundwater model developed by the USGS.

In 2003, the USGS released documentation of their groundwater flow model for the lower portions of the Calleguas Creek and Santa Clara River watersheds, including the Piru and Fillmore Basins. The USGS model includes two layers, representing the Upper Aquifer System and Lower Aquifer System. UWCD later contracted to update the USGS model by extending the calibration period and including an additional upper model layer. Although the USGS model was an effective starting point for developing an understanding of hydrogeologic conditions in the area, its relatively coarse discretization limited the level of detail at which it could be calibrated, and prevented its use for evaluating complex surface water-groundwater interactions and impacts of future pumping/recharge scenarios on specific aquifers.

DBS&A also understands that a 2018 basin boundary modification for Fillmore and Piru Basins has been submitted and is currently under review by DWR. If DWR approves the basin boundary modification for the Basins, the area included in each of the two GSPs, potential management areas, and water budget calculations may be impacted. A map of the proposed basin boundary modification from Agency's website is reproduced below.

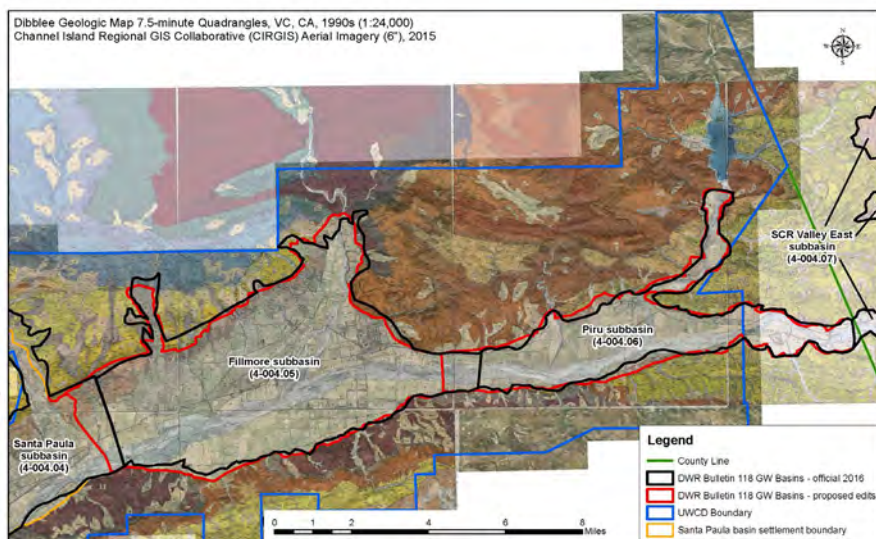


Figure 7. Proposed basin boundary modification

### Hydrogeologic Conceptual Model

DBS&A understands that development of a credible hydrogeologic conceptual model (HCM) is the first step to understanding and conveying the GSP basin setting in the GSP process. The HCM also provides the foundation upon which other GSP tasks will be based, such as the development of GSP monitoring networks and development of water budgets for Piru and Fillmore Basins. DBS&A understands that UWCD is responsible for the development of the HCM and it will form the underpinning for the expansion of UWCD's numerical model. DBS&A will coordinate with UWCD to assure that the HCM is complete and consistent with DWR's BMP for development of a HCM (DWR, 2016). The three-dimensional representation of the updated hydrostratigraphic conceptual model from UWCD's model documentation report is reproduced below.



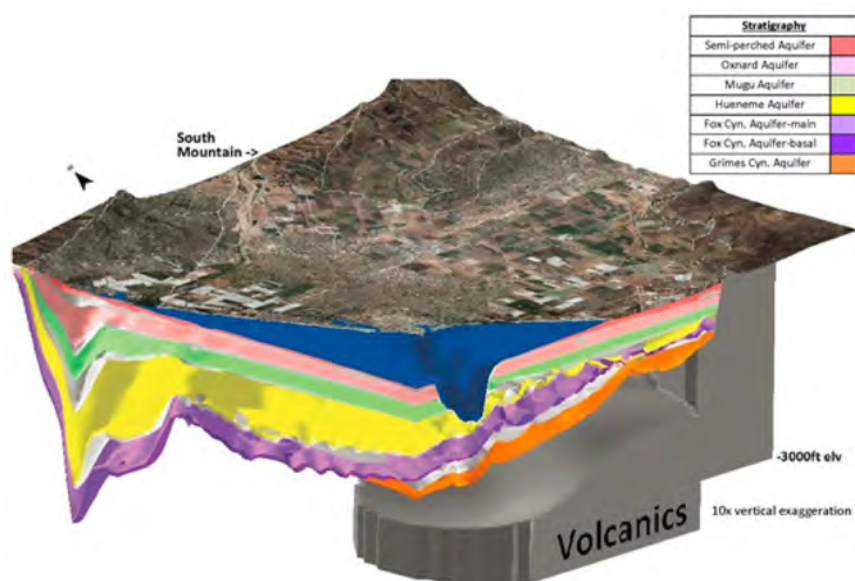


Figure 8. 3-D Representation of Updated Hydrostratigraphic Conceptual Model

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
- ◆ Provides a tool for stakeholder outreach and communication

### Groundwater Dependent Ecosystems

Stillwater Sciences will combine the results of the GDE data collected in Tasks 2 and 3 with the results of the water budget, hydrogeologic conceptual model, and numerical flow model to help forecast the effects of future groundwater and climatic conditions on groundwater dependent ecosystems. This includes likely impacts to changes in the spatial pattern or timing of groundwater flows on riparian and wetland ecosystems.

The project team will review and summarize the general distribution and condition of GDEs in the Fillmore and Piru Basins. The first step in our team's approach to GDEs involves the background data collected and reviewed under Task 2 and the mapping

of known and potential GDEs based on the DWR spatial database (i.e., natural communities commonly associated with groundwater) and readily available sources. A literature/data review and GIS-based assessment of the current ecological conditions in the GSP area 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., Steelhead Trout and Unarmored Threespine Stickleback). 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 GSPs area.

Given the project budget constraints, we propose that this assessment of GDEs be office-based and no field work 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 12 for Other Recommended Actions).

### Establishment of Management Areas

While not explicitly identified in the RFP, this task, if necessary, will define management areas for use in the

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

For this potential task, management areas can be grouped according to the hydrogeologic conditions and water balance determined, and then re-examined for various management criteria. 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.

There are several likely groundwater interrelated management areas, which may include, but are not limited to the following:

- ◆ Santa Clara River near the Santa Paula/Fillmore Basin boundary
- ◆ Bardsdale
- ◆ Sespe Uplands
- ◆ Pole Creek Fan
- ◆ Santa Clara River near the Fillmore/Piru Basin boundary
- ◆ Piru Creek
- ◆ Piru/SCR East Basin boundary

The GSPs could 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.

### Water Budget

Water budgets for the Basins constitute an important basis for overdraft susceptibility and sustainable groundwater management assessment. DBS&A understands that UWCD is responsible for preparing preliminary spreadsheet water budgets (based on existing data) due March 29, 2019 that will not rely

on numerical model outputs. Once UWCD's model is expanded to include Fillmore and Piru Basins, UWCD will produce modeled draft water budgets and modeling text for inclusion in GSPs due September 30, 2020. It is anticipated that the draft water budgets will be delivered to the FPBGSA for comment. Based on receipt of one set of consolidated written comments from the FPBGSA member agencies and stakeholders, UWCD in coordination with DBS&A, will address the comments and produce final water budget text for inclusion in the GSPs.

The Required Water Budget Components from DWR's BMP is reproduced below.

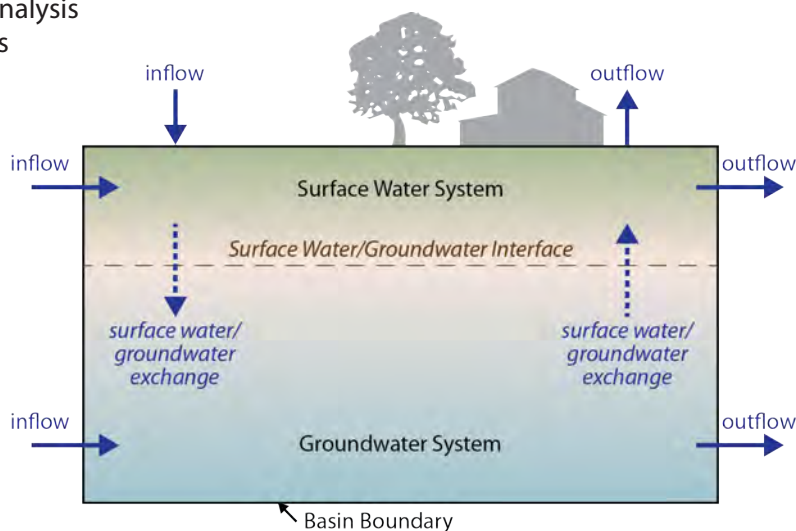


Figure 9. Water Budget Components

Within each Management Area established by FPBGSA, if necessary, DBS&A anticipates that water budgets will be estimated based on the equation (or an equivalent equation) shown below. Groundwater inputs may include deep percolation of precipitation ( $P_p$ ), deep percolation of irrigation ( $P_i$ ), lateral groundwater inflow ( $GW_i$ ), deep percolation from wastewater treatment plants ( $WWTP$ ), deep percolation beneath stream and river channels ( $R_i$ ), 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:

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

where  $\Delta S$  = the change in groundwater storage

When  $\Delta S$  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, 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 FPBGSA.

A water budget schematic showing the Interrelationships among potential water budget components and the water systems that comprise the hydrologic cycle from DWR's BMP is reproduced below.

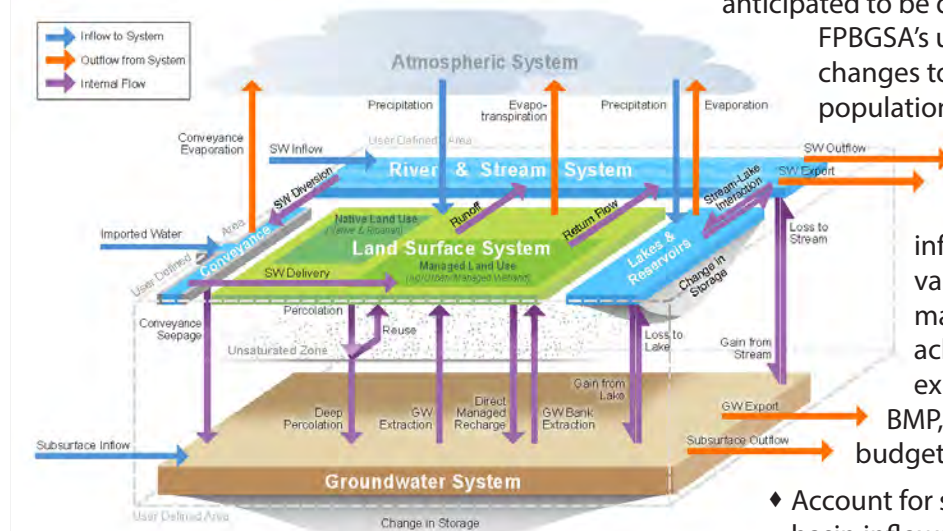


Figure 10. Hydrologic Cycle

DBS&A anticipates that UWCD will estimate groundwater balance component magnitudes based on available data using standard methods for each management area, if necessary. Water budget information from the management areas will be combined to develop basin-specific water budgets. DBS&A will coordinate with UWCD to assure that the water budgets are complete and consistent with DWR's BMP for preparation of water budgets (DWR, 2016).

The DBS&A team is highly qualified to prepare interpretations of UWCD's model outputs having 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 experience we are familiar with available data sources and studies.

Consistent with DWR's SGMA BMP for a water budget, DBS&A will develop projected future scenarios for UWCD to simulate for the Fillmore and Piru Basins. Also consistent with the BMP, the GSP water budgets are anticipated to be quantified in sufficient detail to build FPBGSA'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 Basins. The ultimate aim is to use this information to predict how these same variables may affect or guide future management actions intended to achieve and maintain sustainability. As explained in DWR's SGMA Water Budget BMP, examples of uses for the water budgets include:

- ◆ Account for spatial and temporal distribution of basin inflows and outflows by water source type and water use sector.
- ◆ Assess how the water budget components 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 FPBGSA member agencies and stakeholders.
- ◆ Identify data gaps and uncertainty critical to future basin water management actions.



- ◆ Identify water budget conditions that often 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 FPBGSA and UWCD to identify an appropriate base period. If the historical data set is sufficiently robust, a base period will be selected in consultation with the FPBGSA, 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.

It is anticipated that using a similar methodology to that described above and available data, UWCD will prepare historical and current water budgets for the identified groundwater management areas and for the overall Basins. In collaboration with UWCD, DBS&A will report and interpret the results of the water budgets, along with the methodologies utilized, data incorporated into the evaluation, and assumptions that underlie water budget component estimates.

#### DELIVERABLES (DBS&A):

1. Provide expertise to evaluate GDEs in the Basins
2. Prepare scenarios for UWCD to model
3. Prepare draft text interpretations of the UWCD model outputs for inclusion in GSPs

#### DELIVERABLES: (UWCD):

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

## TASK 7 - DEVELOPMENT OF 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 Basins, selection of appropriate metrics for each of the criteria, setting measurable objectives and interim milestones for each criterion 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 the following graphic.

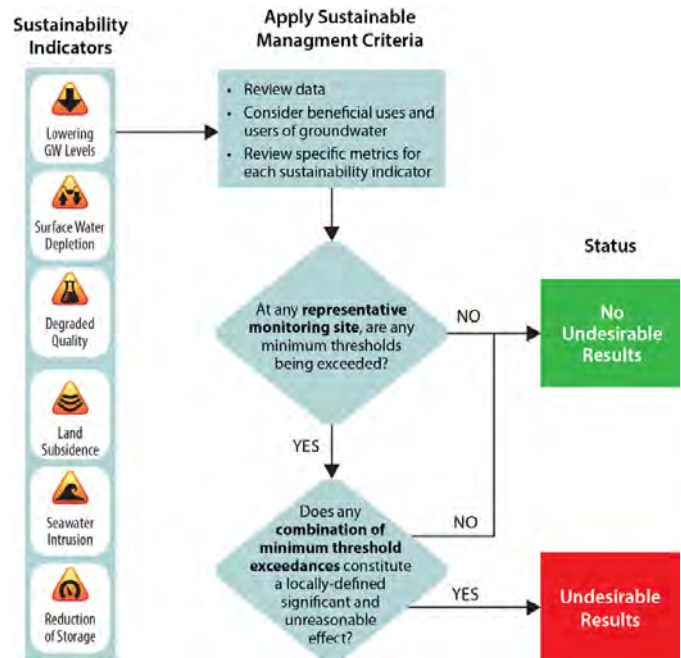


Figure 11. Relationship between sustainability indicators, minimum thresholds, and undesirable results

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.”

Stillwater Sciences will identify potential sustainable management criteria related to GDEs, and work with the team to determine which GDE-related criteria should be included in the GSPs. Criteria will be linked to spatial and temporal changes in groundwater elevation, surface water discharge, and water quality (including salinity). Based on these criteria, we will assess the likely response of GDEs to the simulated outcomes of proposed management actions. Our approach will involve a review of UWCD’s model results to determine future trends in groundwater elevations and surface water flow to identify areas where future groundwater management is most likely to affect GDEs.

The effects of potential changes in future groundwater-surface water interactions on GDEs and ecological assets (e.g., animal and plant species of concern and their key habitat) will be evaluated to determine the range of potential threats and impacts to GDEs and ecological assets within the GSPs area, and the most appropriate indicators of sustainable management to use as criteria. We will also evaluate the potential impacts of climate change and water quality on GDEs.

### **Sustainability Goals**

Our team will assist the FPBGSA in identifying the sustainability goals for the Basins by providing technical rationale to aid the FPBGSA in their discussions. Functionally, these goals are 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 six 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 is significant and unreasonable. For example, the lowering of the water table to achieve sustainability may be considered undesirable by stakeholders, but it is not considered an undesirable result per SGMA unless it is significant and unreasonable.

### **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 FPBGSA 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 these Basins is sea-water intrusion; the geographic remoteness of the Basins from the Pacific Ocean make this indicator a non-factor, and sustainability criteria will 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 Basins and provide narratives as appropriate for inclusion in the GSPs.

### **Minimum Thresholds**

The team will establish the minimum thresholds (MT) for each of the applicable sustainability indicators. An MT is quantitative (i.e., a numeric value) and represent a groundwater condition that, if exceeded, would



result in significant and unreasonable impacts to the beneficial users/uses of groundwater in the Basins. The MT must also be set at a value that does not impede other adjacent basins or management areas, such as the down-gradient adjudicated Santa Paula Basin to the west or the Upper Santa Clara River Basin to the east. Monitoring the success of a groundwater sustainability plan is accomplished, in part, by comparing groundwater conditions to the MT. Representative 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 a measurable objective (MO) for each sustainability indicator with descriptions of a reasonable margin of error or margin of operational flexibility (i.e., the range between the MO and MT). Implementation of the GSPs will position the Basins to achieve the MO for each applicable indicator within a 20-year sustainability timeline. Interim Milestones (IMs) will be identified along the sustainability timeline to aid the FPBGSA and DWR in evaluating the Basins' progress towards achieving the MOs.

### **Management Areas and Monitoring Sites**

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

This task will require significant interaction and meetings between our team and the FPBGSA, UWCD, stakeholders, and the general public. We are prepared to work with all interested parties to work through issues and concerns around this crucial part of the sustainability plan. To facilitate the stakeholder and FPBGSA discussions, we suggest the following general approach:

- ♦ Our team will prepare draft or "strawman" sustainability criteria (sustainability goals, sustainability indicator assessment of undesirable results, minimum thresholds, interim milestones, and measurable objectives) as early as reasonably feasible in the GSP development effort;
- ♦ We will coordinate with the FPBGSA to present

the draft sustainability criteria to the public and FPBGSA at two or more workshop-style meetings; and

- ♦ The team will revise the sustainability criteria based on stakeholder comments, as well as FPBGSA input, prior to completing the draft GSPs.

The sustainability criteria will be a part of the draft GSPs. This will provide stakeholders and the FPBGSA another opportunity to comment while reviewing them within the context of a full GSP.

### **DELIVERABLES:**

1. Technical Memo: Draft Basin Sustainable Management Criteria
2. Summary of Comments from Public Meetings
3. Technical Memo: Final Basins Sustainability Management Criteria, including Summary of Responses to Comments Received During Public Meetings

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## **TASK 8 - PROJECTS AND MANAGEMENT ACTIONS**

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The GSPs should identify the best approach for achieving groundwater sustainability in the Fillmore and Piru Basins in light of the main issues driving sustainability concerns in the area. The DBS&A team will work with the FPBGSA Board through the stakeholder engagement process outlined in Task 9 to identify the recommended approach for the plans, which will include a suite of projects (e.g., UWCD's proposed Alternative Solution Alliance Pipeline [ASAP]) and management approaches that will meet the sustainability goals for the Basins. The difficulty for any water management agency is to lay out the critical path for achieving the long-term goals, which in this case is sustainability of the aquifer. While it is necessary to identify feasible projects and management approaches that will contribute to achieving sustainability, the greater challenge is to identify which combination of projects and management actions will have the most benefit in the short- and long-term. The DBS&A team proposes to use a quantitative and robust Decision Analysis approach to recommend the alternatives that best meet the goals of the Agency.

The DBS&A team will begin the process by developing a list of strategies, whether specific projects or



management actions or policies, that, if implemented, could beneficially impact the sustainable yield in each Basin. Input from stakeholder groups, FPBGSA, and beneficial users of groundwater is critical to ensure identification of a range of strategies from each stakeholder group. These alternative 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, voluntary shortage sharing agreements, aquifer recharge during the non-irrigation season 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 FPBGSA to settle on a workable, sustainable yield for the Basins.

Based on sustainability criteria developed in Task 7 and the modeling results of Task 6, Stillwater Sciences can develop a series of management actions to maintain GDEs under different management and climate change scenarios. Where GDEs are likely to be impacted, the team can develop management scenarios such as aquifer recharge, vegetation restoration, and fish passage improvements.

Stakeholder and FPBGSA identification and evaluation of the management actions or projects must be based on different types of data to allow for informed decision making. 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, the status of a species in a GDE, and implementation priority within the GSPs 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 expected benefit of each project or management action will be based on available data and described along with how each benefit will be evaluated and accomplished.

One limitation the Board may encounter is lack of sufficient technical or cost data to fully evaluate the impacts and benefits of proposed alternatives. The scope of this project does not include conducting feasibility studies or preliminary engineering reports. Therefore, the project team must rely on existing

studies and published data to determine whether sufficient information is available, what additional studies may be needed, and develop an approach to rank the projects when data is limited. The GSPs will likely include the Board's recommendations for other studies and plans to address data gaps and the need for additional project feasibility analyses.

The proposed evaluation process for selecting the strategies that best meet sustainability goals is a formalized Decision Analysis using multi-attribute utility analysis (MUA). DBS&A proposes to employ Decision Analysis as a tool that can be used to systematically evaluate, compare, and rank water management options. Perhaps no task is more difficult than capturing in a few measurable criterion that will determine which combination of projects and management actions is "best." The MUA process facilitates decision-making by allowing consideration of the issues and values that are most important to implementing projects. DBS&A has developed a practice using the decision analysis modeling software Criterium DecisionPlus for water management decision support. DBS&A proposes to use Criterium DecisionPlus for this project as an effective way to identify sustainability alternatives that incorporate participation by Agency officials and stakeholders and also provides a means for identifying potential consensus on portfolios of preferred alternatives. The goal of the process is to systematically evaluate, compare, and rank alternative sustainability scenarios for a final long-range plan. Decision Analysis also helps to define possible scenarios based on combinations of objectives and sustainability options. The decision analysis process, using principles of MUA, is based on the assumptions that:

- ◆ Due to a lack of complete "hard data" at the point when water supply choices must be made, particularly regarding intangibles such as public, institutional and regulatory acceptability, the evaluation and ranking of alternatives must incorporate judgments from those knowledgeable about-or affected by-the alternatives.
- ◆ At least three types of judgments are needed: (1) value judgments (such as what objectives should be used in evaluating alternatives and what is really practical and socially desirable), (2) technical judgments (such as well yields, rates of





depletion, costs of development and transmission facilities, environmental impacts), and (3) reliability judgments (such as future sustainability of the aquifer).

- ◆ Technical specialists knowledgeable about geohydrology, water supply planning, engineering feasibility, and cost estimating are an important source of technical and reliability judgments, and the key stakeholders impacted by the long-range water supply choices will ultimately be the source of value judgments.

The evaluation process is designed to separate, to the degree possible, technical judgments from value judgments. This aspect allows the collection of two types of information from different sources and more accurate sensitivity analyses to explore whether the evaluation of alternatives changes much depending on (1) technical uncertainties that can be resolved or (2) value judgments about what environmental needs must be protected and how much conservatism is needed in ensuring the reliability of future supplies.

DBS&A has used the decision analysis process to help the City of Albuquerque, City of El Paso and other municipal and state clients with water resources strategy development and planning. Once the stakeholder groups have identified various projects and management actions for consideration, DBS&A uses the decision analysis framework to guide stakeholders through the following steps:

- ◆ Identifying the desired outcomes and key performance indicators for potential projects (or combinations of projects)
- ◆ Ranking the level of uncertainty and unknowns for potential projects
- ◆ Incorporating sensitivity analyses to explore whether the preferred alternatives change with respect to reduced uncertainty
- ◆ Screening out the least favorable options

This process provides a “decision audit trail” documenting the inclusion of stakeholder values and

resolution of concerns in the decision process, and ultimately, allows the group to reach the most effective and defensible decision with broad acceptance.

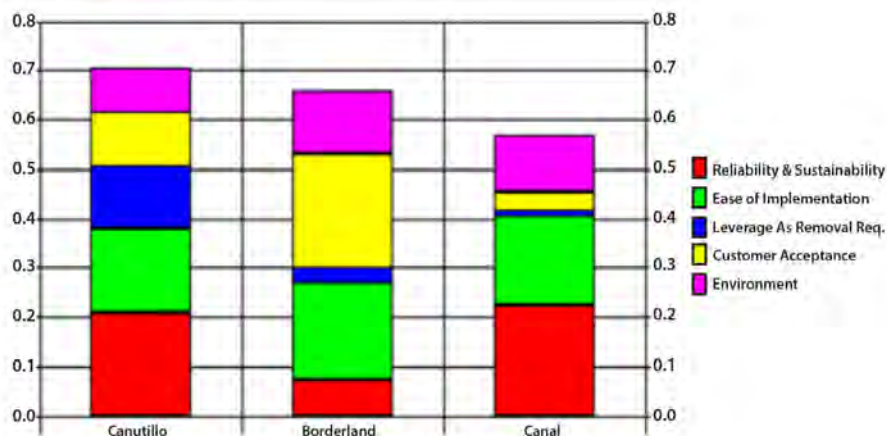


Figure 12. Final results show how much each goal contributes to overall performance of the alternatives

DBS&A completed a project to help the Edwards Aquifer Authority (EAA) determine whether the past studies of the Edwards aquifer modeling and potential recharge enhancement mechanisms provide any insight on the “safe yield” of the aquifer while meeting the many other interests and objectives of EAA stakeholders. This process was used by EAA to reach a decision on the necessity of continued programmed reductions in groundwater withdrawals.

### Technical Approach

To provide a cost effective delivery of the Decision Analysis approach, we suggest holding two to three workshops with the FPBGSA to complete the following Steps:

- ◆ Step 1--Project Initiation- (after general stakeholder meeting on projects and management actions)
- ◆ Step 2--Develop Decision Model
- ◆ Step 3--Apply Decision Model
- ◆ Step 4--Review, Revise, and Apply Decision Model
- ◆ Step 5--Final Recommendations and Report
- ◆ Step 6--Project Delivery

The GSP will identify those tasks, activities, or projects that will aid the FPBGSA in guiding the Basins toward 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 in groundwater quality. 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.

#### DELIVERABLE:

1. The deliverable for this task will consist of a Technical Memo summarizing the output from the multi-attribute utility analysis process and identifying the suite of projects and management actions identified to meet the Agency's sustainability goals. The results will be incorporated into the GSPs.

### TASK 9 - STAKEHOLDER ENGAGEMENT

As part of our team, Consensus and Collaboration Program (CCP) will support all requested and related stakeholder engagement services for the FPBGSA. CCP will support the following: A. Develop Presentation Materials, B. Present Information in Public Meetings, C. Receive Feedback/Comments, and D. Respond to Comments. More specifically and as requested, CCP will support seven (7) planned stakeholder meetings to be held at distinct milestones during the GSP process and said services will include: develop draft agendas, prepare presentation materials (as necessary), and prepare written summaries from each meeting. These summaries will be limited in scale and will principally record key discussion topics, majority and minority opinions, action items and meeting attendees. Lastly, CCP will provide written materials in newsletter format to facilitate public understanding of meeting content.

The FPBGSA, with significant support from UWCD, has proven to be very adept at the effective design and management of GSA meetings. As stated in the RFP, the FPBGSA expected the seven public meetings (as well as potential additional meetings that might take place to address Disadvantaged Community [DAC]-

related topics and beneficial users) will be facilitated by internal staff. Should the FPBGSA determine a need for third-party neutral facilitation of any meeting, CCP can also provide that support given its extensive, statewide role providing similar services to literally thousands of stakeholders on hundreds of complex, policy topics including SGMA GSA formation and GSP development.

In addition to the necessary services described above, our team (similarly through the services of CCP) is prepared to support the FPBGSA to develop a Public Engagement Plan. The Engagement Plan offers a valuable early benefit to the FPBGSA as a functional tool that will inform early stage GSP outreach activities. It is also a product that should be included in the GSP submission (Task 10) as proof of compliance with required GSP regulations.

CCP has been an advisor to DWR to prepare the standard, statewide DWR recommendations for these plans. 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 GSA
- ♦ Colusa Groundwater Authority
- ♦ Glenn Groundwater Authority
- ♦ Vina Subbasin
- ♦ Wyandotte Creek Subbasin
- ♦ Madera Subbasin
- ♦ Owens Valley Basin
- ♦ Chowchilla Subbasin
- ♦ Turlock Subbasin
- ♦ Santa Margarita Groundwater Agency
- ♦ Shasta Valley Basin
- ♦ Butte Valley Basin
- ♦ Scott Valley Basin

Similarly (and in the context of FPBGSA's expectation that DAC-related discussions may be forthcoming), CCP has done focused DAC work on several of the above cases, particularly in Chowchilla, Madera, Turlock, and the Shasta, Butte, and Scott Valleys efforts (all in Siskiyou County). Additionally, CCP is currently managing a comprehensive DAC program in the Tulare Basin, involving several integrated regional water management planning (IRWMP) groups and associated impacted communities. Such work is part of CCP's specialization as



a third-party neutral organization. Capitalizing on their work preparing engagement plans with the 13 basins and GSAs above, CCP can perform the following:

- ♦ Work with the FPBGSA to review and potentially update the list of stakeholders, groups, and organizations to engage through the GSP development process. CCP will work with the FPBGSA 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 Basins, including the land uses and property interests potentially affected by the use of groundwater in the Basins, 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 FPBGSA.
  - » A description of how the FPBGSA encourages the active involvement of diverse social, cultural, and economic elements of the population within the Basins.

In addition to these essential elements, a section in the Engagement Plan that sets the stage to describe methods the FPBGSA 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 essential elements, we find that there is significant "value-added" for the FPBGSA to include the following in the Engagement Plan.

- ♦ FPBGSA 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 FPBGSA is least likely to be subject to legal challenges of the GSP based on procedural deficiencies.

“**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

- ♦ 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 FPBGSA 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 FPBGSA's work. This task will benefit from meetings with the full FPBGSA and/or an ad hoc or standing committee of the GSA (as has been set up for other key FPBGSA topics such as legal services, bylaws, etc.) to define and agree on items proposed above, identify venues and engagement resources, and confirm the messaging approach and



associated milestones. This task includes time for our team to conduct such meetings and to present the draft and final Engagement Plan to the FPBGSA Board and/or subcommittee.

“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

Regarding “outreach approach” of the FPBGSA and as an overarching recommendation related to many of the GSP 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 statute, 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. FPBGSA has identified an approach very similar to that which CCP regularly advises wherein 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 FPBGSA 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 FPBGSA Board should be focused on.

#### DELIVERABLES:

1. Develop Presentation Materials
2. Present Information in Public Meetings
3. Receive Feedback/Comments
4. Respond to Comments

#### TASK 10 - PREPARE GROUNDWATER SUSTAINABILITY PLAN

The DBS&A team will work with FPBGSA and its staff to prepare a GSP outline for the Fillmore Basin GSP and the Piru Basin GSP, preliminary review draft, public review draft, and final GSPs that the FPBGSA will consider for adoption.

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

The preliminary review draft GSPs will provide the FPBGSA an opportunity to comment on early versions of the GSP sections and associated appendices. The comments received from the FPBGSA on the preliminary draft GSPs will be used to revise the plans and create the public review drafts.

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.

Our team will prepare public review draft GSPs and all supporting documentation. The public review draft document is to respond to comments made on the preliminary review draft document and revise sections of the plan based on the latest information (e.g., new or updated information from UWCD modeling efforts). The public review draft GSPs will be circulated for agency and public review and comment. The public and agency comments will be taken into account in the creation of the final version of the GSPs. The final GSPs will be provided to the FPBGSA for consideration for adoption and submittal to the DWR.





The GSPs will identify those tasks, activities, or projects that will aid the FPBGSA in guiding the Basins towards sustainability by achieving the MOs. 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 GSPs 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 sustainable yield of the Basins. 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.

“Tony is very, very knowledgeable of the SGMA timelines, issues and requirements.”

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

#### DELIVERABLES (DBS&A):

1. Preliminary Draft Groundwater Sustainability Plans for FPBGSA review
2. Draft Public Review Groundwater Sustainability Plans
3. Responses to Comments on Draft GSPs
4. Final Groundwater Sustainability Plans

#### DELIVERABLES (UWCD):

1. Maps detailing area of the Basins and boundaries
2. Maps identifying existing and potential recharge areas that substantially contribute to the recharge of the Basins

### TASK 11 - GRANT ASSISTANCE

The DBS&A team is committed to assisting the FPBGSA in their compliance with the reporting and invoicing terms of their Sustainable Groundwater Planning Grant (Prop 1 Grant) and has experience with these processes in California and other western States.

Our team will prepare quarterly progress reports that will detail the work completed (including backup information [as appropriate]) during the reporting period and will be structured to provide the DWR

program manager with sufficient information to understand the status of the project. Our progress reports will be submitted to FPBGSA. If needed, our team will respond to items needing clarification once DWR has reviewed the progress reports.

DWR will require a Project Completion Report to document the activities and outcomes associated with work supported by the grant funding. Our team is prepared to provide FPBGSA with a Draft Project Completion Report within 90 days of work completion. Should DWR request revisions or further clarification of information in the Draft Project Completion Report, our team will update the report accordingly.

#### DELIVERABLES:

1. Quarterly Project Progress Reports
2. Project Completion Report

In addition to the reporting assistance described above, draft invoices will be prepared for submission to DWR. The invoices will be prepared using the DWR the invoice template and provided to FPBGSA for ultimate submittal to DWR. Invoices will be supported with back-up documentation (by task) with a summary Excel document detailing the contents of the backup documentation organized to match the tasks in the grant agreement budget. The back-up documentation will track budget expenditures (i.e., project-to-date), as well. If DWR's project manager has comments or requires clarification on a draft invoice, our team is prepared to respond in a timely manner and will work with FPBGSA and DWR to create a final invoice.

#### DELIVERABLES:

1. Draft and final invoices
2. Backup documentation and summary document

#### Standards

Documents and data will be generated by various DBS&A team members, as well as others (e.g., UWCD) during the GSP development process. To help ensure data compatibility amongst the different entities, our team will use the following format conventions:

- ♦ Electronic text deliverables will be in the Microsoft Office platform (e.g., Word, Excel, PowerPoint, Project) and/or Adobe PDF format;
- ♦ Geographical Information System (GIS) deliverable formats will be:



- » Vector spatial data formats are file geodatabase (.gdb), personal geodatabases (.mdb), shapefiles (.dbf, .prj, .shp, .shx, .xml, .shx)
- » Raster data formats include file geodatabases, georeferenced TIFFs, ERDAS Image files (.img), Mr. Sid and ECW. Imagery will be orthorectified whenever possible.

All of the format conventions listed above are standards applied to DBS&A's normal operations and do not require special actions for this project. Our quality assurance program includes elements, such as but not limited to, dealing with data compilation and review, data archiving, technical report editing and review.

#### DELIVERABLES:

1. Electronic Text Document Deliverables
2. Geographical Information System Deliverables
3. Comprehensive Quality Assurance Program

#### Technical Writing Guidelines

DBS&A has prepared thousands of reports for various clients under established, in-house QA/QC guidelines and requirements. We have an excellent record of meeting client deadlines for deliverables, and maintain a reputation for preparing high quality technical reports. Our team is well versed in the design and preparation of complex and highly technical reports and plans. We know the importance of providing high quality reports that thoroughly address all applicable requirements and recognize the need to ensure the plan and its related documents (e.g., technical memoranda, stakeholder information sheets) are developed with the intended reader in mind.

**“Staff went above and beyond to help us meet our deadlines and presented great reports. Most definitely added value to our project and we look forward to working with you again.”**

**~Devin Romero  
AMEC Foster Wheeler Environment  
& Infrastructure, Inc.**

DBS&A employs a full-time technical editing and production group to ensure quality, accuracy, format, and completeness of reports prepared by DBS&A. The level of detail of our reports ranges from letter reports providing findings to multi-volume reports adhering to state and federal reporting guidelines. Regardless of the level of detail, DBS&A strictly adheres to a reporting review process described in our QA manual and formalized in our internal document review guidance, in all instances.

**“Thank you for the informative, concise report, I have no edits or comments. I think it will serve as a model for moving forward.”**

**~Trent Botkin  
New Mexico Department of Transportation**

DBS&A follows an established protocol as written in our corporate Quality Assurance Program Manual (QA Manual) on all our projects. This mature corporate QA program, developed from our history of more than 30 years in consulting, includes thorough preparation and planning, establishment of sound procedures, strict adherence to protocol, checks for precision and accuracy, and internal review of documents. The process includes reviews for technical accuracy by a technical manager familiar with the project goals and objectives; a complete editorial review that ensures logical sequence of ideas, and clear, concise writing; checking for consistency and accuracy in data tables and figures; and a final QA check prior to submission to the GSA. In some instances, outside review of documents is used to ensure quality. All DBS&A deliverables are reviewed in accordance with DBS&A's QA Manual to ensure a high-quality end product and one that meets the GSA's needs and SGMA requirements. DBS&A typically allocates 15 to 20 percent of time charged to projects for quality control functions, including data review, internal peer-review, and editorial review. A copy of DBS&A's document review form is shown to the right.

Our ability to produce high quality documents in-house saves time and money, and consistently ensures high quality deliverables. We also typically provide reports



as portable document format (PDF) files with figures and attachments included in a single PDF, incorporating bookmarks to enable readers to easily navigate large documents on screen.

DBS&A's technical editing and production team is responsible for supporting Water Resources plans, including the recent compilation, editing, and production of updates to all 16 regional water plans in New Mexico available here: [http://www.ose.state.nm.us/Planning/regional\\_planning.php](http://www.ose.state.nm.us/Planning/regional_planning.php)

As public documents, these reports present the information in lay terms with clearly understood supporting graphics. Through DBS&A's expert services work, the production team has been responsible for producing documents that withstand the same level of scrutiny in court as our technical experts do during deposition, where the use of scientific vocabulary and detailed supporting data is appropriate. Many clients have commented on our staff's ability to adjust their presentation of technical information to meet their audience's level of understanding. DBS&A staff also includes GIS, information solutions, graphic design, and modeling specialists that help our technical staff to communicate concepts to wide audiences visually.

“Just wanted to say that as a writing person it was a very well written report that I don't see that often. Great and correct citation to sources, easy to understand, and to my limits correct grammar use and formatting.”

~Kevin J. Powers  
Associate County Attorney  
Incorporated County of Los Alamos



Daniel B. Stephens & Associates, Inc.

## Quality Control Document Review Checklist Technical Reports

Project Name \_\_\_\_\_ Project No./Phase/Task \_\_\_\_\_  
Document Title \_\_\_\_\_  
Document Author(s) \_\_\_\_\_  
Checklist Initiated By \_\_\_\_\_ Deliverable Date [Click here to enter a date.](#) \_\_\_\_\_

**AUTHOR<sup>1</sup>** Initials \_\_\_\_\_

Has the following occurred: ☐ Calculations checked ☐ Tables/figures correct and consistent with raw data

**TECHNICAL REVIEW** Reviewer(s) \_\_\_\_\_ Budget \_\_\_\_\_ hour(s) Date Reviewed \_\_\_\_\_ Initials \_\_\_\_\_

☐ Addresses project objectives Comments \_\_\_\_\_

☐ Conclusions supported by data Comments \_\_\_\_\_

**EDITORIAL REVIEW** Reviewer(s) \_\_\_\_\_ Budget \_\_\_\_\_ hour(s) Date Reviewed \_\_\_\_\_ Initials \_\_\_\_\_

☐ Text clear and readable Comments \_\_\_\_\_

☐ Document internally consistent Comments \_\_\_\_\_

☐ Acronyms defined Comments \_\_\_\_\_

☐ Tables and figures cited and attached Comments \_\_\_\_\_

☐ Reference list complete Comments \_\_\_\_\_

☐ Appendices cited and attached Comments \_\_\_\_\_

**FINAL REVIEW<sup>2</sup>** Reviewer \_\_\_\_\_ Budget \_\_\_\_\_ hour(s) Date Reviewed \_\_\_\_\_ Initials \_\_\_\_\_

☐ All required changes made Comments \_\_\_\_\_

☐ Document complete Comments \_\_\_\_\_

☐ Approved for release Comments \_\_\_\_\_

Principal Review<sup>3</sup> (if applicable) Signature \_\_\_\_\_ Date \_\_\_\_\_

Additional Notes  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

<sup>1</sup> The author is responsible for ensuring that all calculations have been reviewed and tables/figures reconciled prior to providing the document for technical review.

<sup>2</sup> This review should occur after all technical and editorial changes have been completed and should be done by the author who has the most familiarity with the document.

<sup>3</sup> Anything other than the review described here must be approved by the Principal in Charge or designee. Note deviations to the review procedure on this form.

Figure 13. Document Review Form

## California Environmental Quality Act (CEQA)

The RFP states that the GSPs are considered to be categorically exempt under California Code of Regulation (CCR), Title 14. However, our project team has personnel that are CEQA knowledgeable if the need should arise.

## TASK 12 - RECOMMENDED ACTIONS

### Other Recommended Actions

The DBS&A team has carefully reviewed the RFQ/P and prepared a cross tabulation of the tasks identified in the RFQ/P 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 GSPs, but that were not a part of the scope of work specified in the RFQ/P 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:

**Enhanced Stakeholder Engagement:** Consistent with Task 9 Stakeholder Engagement, 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 understanding and expertise by beneficial users about the accurate conditions of their groundwater resources. This lack of a common knowledge base influences subsequent behavior and beliefs by these beneficial users when working with a GSA. The work to prepare the Basin Setting portion of the GSPs provides an exceptional opportunity to present information, educate the public, dispel “myths” and misunderstandings about the Basins, 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 9, the Engagement Plan include specific text about outreach activities that will coincide with this Task as a means to capitalize on the efforts done under this Task.

Similar to Task 9, CCP has found that development of sustainable management criteria (Task 7) 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 9 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.

**Enhanced efforts for GDEs:** The Basins have a large extent of known or potential GDEs. The existing DWR GDE mapping and recent projects by our team member, Stillwater Sciences, has improved our knowledge. Our core proposal includes a basic level of effort under a

number of tasks that is sufficient to ensure the GSPs show due diligence in addressing GDEs. However, given the number of potential and known GDEs and listed species dependent upon them, our team recommends that the FPBGSA seek additional funding to conduct an enhanced GDE effort (mapping, classification, characterization, potential effect, sustainability criteria, monitoring, and potential projects/actions) that builds on the core approach to reduce uncertainties. Such efforts would provide an efficient path towards ensuring the sustainability of GDEs that is consistent with the groundwater sustainability plan being developed for these Basins.

Stillwater is willing to help the GSA develop proposals for additional funding for GDE investigations in the Fillmore and Piru Basins.

*\*All references cited are shown in Appendix B.*

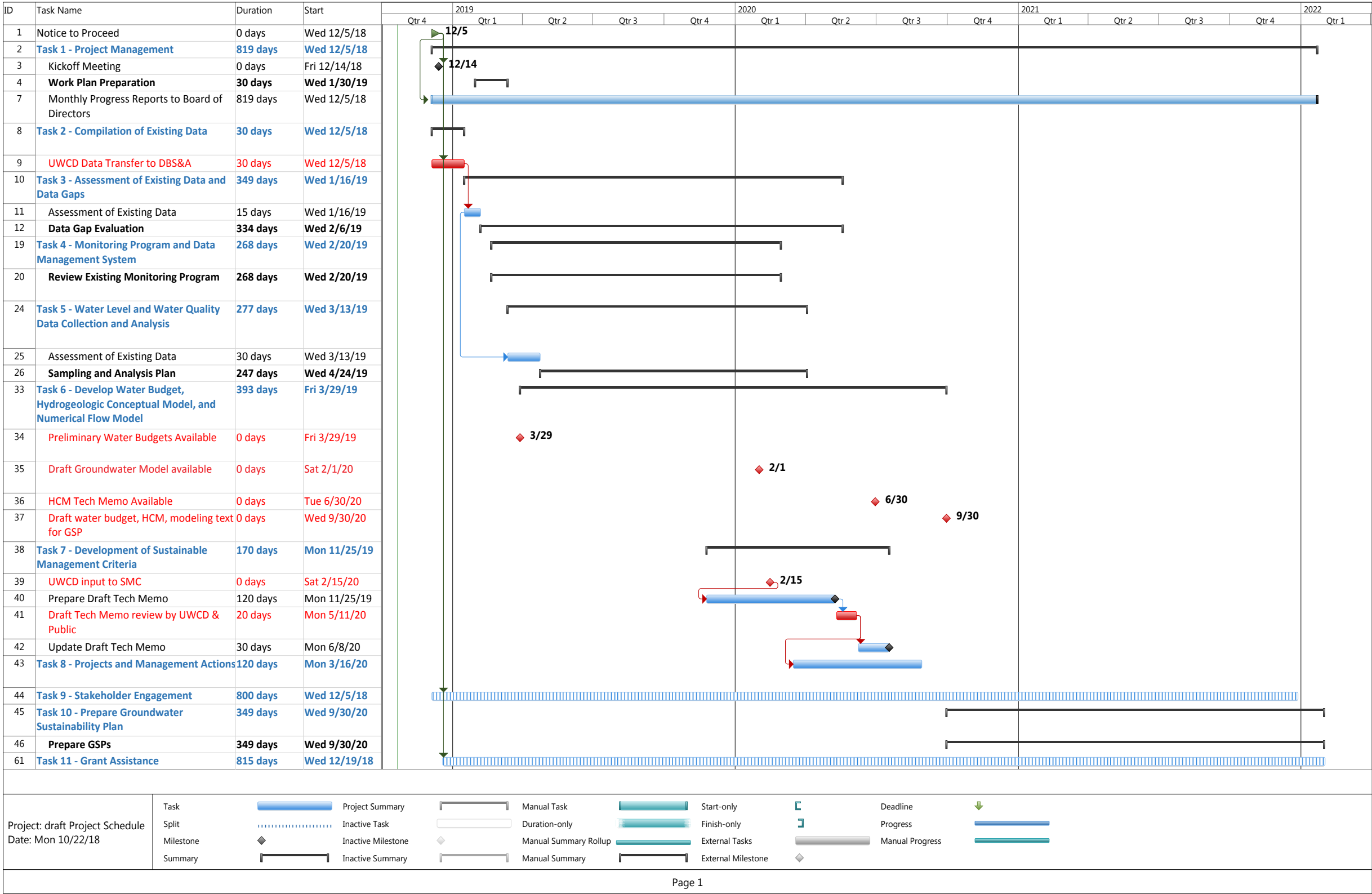




## **7. Estimated Project Schedule**

ESTIMATED PROJECT  
SCHEDULE

DBS&A’s proposed schedule to complete all activities and meet DWR’s deadline for GSP submittal is shown to the right. Because many critical elements of the GSPs will be prepared by UWCD, we have built UWCD’s assumed milestones into our schedule in red text. It will be important that DBS&A and UWCD work cooperatively and in tandem and that all parties achieve identified milestones in order to meet the DWR deadline. A more detailed project schedule is shown in Appendix C for ease of viewer’s reading.



## **8. Fee Proposal**

**(separate submittal)**

## **9. Other Information to Assist FPBGSA**



## OTHER INFORMATION TO ASSIST FPBGSA

DBS&A accepts the professional services agreement as written.

In addition, we have provided a table providing additional detail of our relevant project experience with emphasis on California projects.

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		✓	✓	✓		✓	✓				✓	✓			✓		✓
Development of Groundwater Budgets for Groundwater Sustainability Planning, Ventura County	✓	✓	✓		✓	✓	✓		✓		✓	✓				✓	✓
Safe Yield Study - Santa Paula Groundwater Subbasin, United Water Conservation District	✓	✓	✓	✓	✓	✓	✓		✓		✓	✓			✓	✓	✓
Coastal Groundwater Management Planning, Upper and Lower Ventura River Basin, Ventura Co.	✓	✓	✓	✓		✓	✓					✓		✓	✓	✓	✓
Hydrogeologic Evaluation, Watershed-Scale Recharge Evaluation, and groundwater Model development, Ojai Basin, Ventura Co.	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓				✓
Safe Yield Study and Water Master plan, Big Bear City	✓	✓	✓	✓	✓	✓	✓	✓				✓				✓	✓
Quantification of Aquifer Recharge Enhancement from River Flow and Municipal Water Program Operations, City of Bakersfield	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓				✓	✓
Analysis of TEmporal Vaiability of Recharge and Water Quality for a Deep Spreading basin, Orange Co. Water District			✓	✓		✓	✓	✓	✓			✓	✓		✓		



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
Hydrogeologic Feasibility of Spreading River Water, United Water Conservation District, Ventura Co.		✓		✓		✓	✓	✓	✓			✓	✓				
Evaluation of Aquifer Recharge Estimates and Aquifer Storage and Recovery Program, Indio Water Authority		✓	✓	✓	✓	✓	✓		✓			✓				✓	✓
Groundwater Recharge and Replenishment, Padre Dam Municipal Water District	✓	✓	✓		✓	✓	✓	✓	✓			✓	✓		✓	✓	
Ambient Water Quality Recomputation for Santa Ana Watershed Groundwater Management Zones, Santa Ana Watershed Project Authority	✓	✓		✓	✓	✓		✓							✓		
Recharge Water Quality Analysis, Eastern Municipal Water District, Riverside Co.		✓	✓	✓		✓	✓	✓	✓			✓	✓				
Comparative Analysis of the AB3030 Groundwater Management Plan, Atascadero	✓				✓	✓									✓		
ASR Project Planning and Coachella Valley Groundwater Model Review, Indio Water Authority	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓				
Quantification of Groundwater Recharge, Stanbery Development, Scotts Valley	✓	✓	✓	✓	✓	✓	✓		✓			✓	✓		✓		
Hydrogeologic Characterization and Recharge Feasibility Study, Sonoma Valley	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓		
Evaluation of Natural and Artificial Recharge, City of Glendora		✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓

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
San Antonio Creek Spreading Grounds, Design and Redevelopment, Ventura County	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓		✓
Hydrogeologic Characterization & Water Balance Development, Newport Bay Watershed, Swamp of the Frogs, Orange County		✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	
Hydrologic Monitoring Program, Pepperdine University, Malibu	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
AB 3030 Groundwater Management Plan, Fillmore and Piru Basins	✓	✓		✓	✓		✓								✓	✓	
Preliminary Evaluation of Impact of Potential Groundwater Sustainability Indicators on Future Groundwater Extraction Rates	✓	✓	✓	✓	✓		✓				✓				✓	✓	✓
Saline Intrusion Update, Oxnard Plain	✓	✓		✓			✓							✓	✓		
Ventura Regional Groundwater Flow model, VEntura	✓	✓	✓	✓	✓		✓				✓	✓			✓	✓	✓

## **Appendix A. Team Resumes**



# 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 (MODFLOW) 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



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.

## 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

**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.



# 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.

# Timothy Moore, P.G., C.H.G.

Hydrogeologist



Mr. Moore is a hydrogeologist with eight years of professional experience. His project experience includes complex multi-basin hydrogeologic characterization, including the use of surface geophysics, groundwater monitoring and analysis, well installation oversight and aquifer testing design, database design and management, and technical report writing. While in college, he worked for environmental testing laboratories for almost four years, giving him the foundation for the data-driven approaches he applies in his projects.

Since the enactment of the California Groundwater Sustainability Act (SGMA) of 2014, Mr. Moore has actively been involved in several SGMA-related projects, including serving as technical staff to a Groundwater Sustainability Agency (GSA) in Ventura County, California.

## EDUCATION

B.A., Environmental Studies  
(Minor: Geology and  
Geography), California State  
University, San Bernardino,  
2010

## PROFESSIONAL REGISTRATIONS

Certified Hydrogeologist,  
California, No. 1027

Professional Geologist,  
California, No. 9268

Professional Geologist,  
Idaho, No. 1631

## PROFESSIONAL AFFILIATIONS

Groundwater Resources  
Association of California

National Ground Water  
Association

Coast Geological Society

Inland Geological Society

Channel Islands Regional GIS  
Collaborative

## **Development of Multi-Basin Hydrostratigraphic Conceptual Model, Ventura County, California**

Project hydrogeologist for the compilation and digitization of 950 borehole geophysical logs covering eight groundwater basins. Created a database to archive geophysical logs and well driller reports. Correlated major hydrostratigraphic units across basins based on borehole geophysical and lithologic logs. Used Rockworks, ArcGIS, and Surfer software to prepare 3D visual representations of hydrostratigraphy.

## **Groundwater Sustainability Agency Technical Support Staff, California**

Functioned as technical support personnel to assist the Fillmore and Piru Basin Groundwater Sustainability Agency (GSA) with meeting agendas and technical presentations, Department of Water Resources (DWR) SGMA portal submittals, agency comment letters on issues of concern, Proposition 1 Grant administration, DWR Bulletin 118 basin boundary modifications for three groundwater basins in Ventura County.

## **Fillmore and Piru Basins Biennial Groundwater Conditions Reports, California**

Lead hydrogeologist for preparation of comprehensive reports on groundwater elevations, groundwater extractions, cropping patterns, surface water flows, and both groundwater and surface water quality for these two basins.

## **Time-Domain Electromagnetic Survey, Forebay Subbasin, Ventura County, California**

Project manager for a time-domain, electromagnetic (TDEM) geophysical survey to map confining beds and lenses, faults and folds, and paleochannels. Led a team of technicians to collect TDEM data from 140 soundings that refined the subbasin boundaries based on changes in geometry of geoelectric units, and located unmapped faults and major hydrostratigraphic units. Processed the geophysical data to create multiple cross-sections that were



collected into basin-scale fence diagrams. Prepared a technical report describing the findings that were used to update the hydrostratigraphic conceptual model.

## **Time-Domain Electromagnetic Survey, Basin Boundary Delineation, Mound-Santa Paula-Forebay Basins, Ventura County, California**

Project manager for a TDEM geophysical survey to refine the location of basin bounding geologic features. Led a team of technicians to collect TDEM data from 115 soundings that refined the subbasin boundaries, identified blind faults within the basins, and depicted basin-scale changes in the hydrostratigraphic units based on geophysical properties. Processed the geophysical data to create multiple cross-sections that were collected into basin-scale fence diagrams. Prepared a technical report describing the findings that were used to update the hydrostratigraphic conceptual model.

## **Santa Clara River Percolation in Santa Paula Basin, Ventura County, California**

Lead investigator in assessing in-situ Santa Clara River low-flow percolation rates within the Santa Paula basin. In-stream flow measurements were used to build rating curves to establish the relationship between flow and river stage recorded with pressure transducers and data loggers.

## **Piezometer Installation Program along Santa Clara River, Ventura County, California**

Project manager for the installation of 11 shallow (100 foot) piezometers to monitor water table conditions along the Santa Clara River in the Forebay subbasin. Oversaw the site selection, permitting, drilling, development, water quality sampling, and pressure transducer and data logger installation. Authored the project report, *Santa Clara Recharge Evaluation: Forebay Groundwater Basin*, as part of the grant funding requirement deliverables.

## **Water Supply Well Installation, El Rio Area, Ventura County, California**

Assisted with the installation of two new production wells. Collected and described lithologic samples, provided field supervision of zone testing, well construction, and aquifer testing. Analyzed the aquifer test data to establish hydraulic properties of the production zones. Authored the as-built construction reports.

## **Multi-Basin Groundwater Monitoring Program, California**

Supervised two water resources technicians and designed a multi-basin groundwater monitoring program that included more than 350 wells that are manually measured for water level and/or sampled for water quality, 120 pressure transducers and data loggers, and 4 EC data loggers. Developed work flows to efficiently process the pressure transducer data and import new water quality and groundwater elevation information into the master databases.

## **Database Design, Management and Quality Assurance/Quality Control (QA/QC)**

Database design, management and QA/QC of the following systems: Geographic Information System (GIS) shape file, water level elevation, surface and groundwater quality, groundwater extraction, water well drillers reports, and borehole geophysical logs. The databases held more than 80 years of historical groundwater information.

## **Analytical Laboratory Technical Team, California**

Shift lead chemist for inorganic and microbiology analyses on potable and wastewater samples.

## **Publications and Presentations**

United Water Conservation District (UWCD) OFR 2018-04: Santa Paula-Mound-Forebay Basin Boundary TDEM Geophysical Survey (primary author).





- UWCD OFR 2018-02: Ventura Regional Groundwater Flow Model and Updated Hydrogeologic Conceptual Model: Oxnard Plain, Oxnard Forebay, Pleasant Valley, West Las Posas, and Mound Groundwater Basins (contributing author).
- Moore, T., D. Detmer, T. Morgan, and J. Lindquist. 2017. Santa Paula-Mound-Forebay Basin Boundary TDEM Geophysical Survey in Ventura County, California. Groundwater Resource Association of California (poster). October 2017.
- UWCD OFR 2017-01: Groundwater and Surface Water Conditions Report – 2015 (primary author of Piru and Fillmore Basins chapters).
- UWCD (2016) GIS Regional Planning Map.
- UWCD OFR 2016-01: 2014/2015 Piru and Fillmore Basins Biennial Groundwater Conditions Report (primary author).
- UWCD (2015, 2016, 2017 and 2018 reports): Annual Investigation and Report of Groundwater Conditions within United Water Conservation District – for California water code compliance and annual groundwater hearing (primary author).
- Sun, J., D. Detmer, T. Moore, K. Lindquist, and T. Morgan. 2016. Development of a Numerical Model for Sustainable Groundwater Management in Ventura County, California, Groundwater Models and Data. Groundwater Resource Association of California (poster presentation). February 2016.
- UWCD 2015: 2012/2013 Piru and Fillmore Basins AB 3030 Biennial Groundwater Conditions Report (primary author).
- GRA Annual Conference (2013): Oxnard Forebay TDEM Geophysical Survey in Ventura County, California (poster).
- UWCD OFR 2013-06: Aquifer Delineation within the Oxnard Forebay Groundwater Basin using Surface Geophysics (primary author).
- CSUSB Hydrology Class (2013, 2014 and 2015): Ventura County Water Resources Development History and UWCD Current Operations (primary presenter).
- UWCD OFR 2013-01: Percolation of Santa Clara River Flow within the Santa Paula Basin (primary author).
- Moore, T., D. Detmer, T. Morgan, and P. Dal Pozzo. 2012. Pressure Transducer and Data Logger Use and Applications as Part of Water Level Elevation Monitoring Network. Groundwater Resources Association of California, 21th Annual Conference and Meeting (poster). October 2012.
- CSUSB Engineering Geology class (2012): Electrical Logging (primary presenter).
- UWCD OFR 2012-05: Santa Clara River Recharge Evaluation: Forebay Groundwater Basin (primary author).
- Morgan, T. and T. Moore. 2011. Refining a Regional-Scale Groundwater-Flow Model to Address Basin-Specific Management Goals in Ventura County. Inland Geological Society, Riverside, California (presentation). December 2011.



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UWCD (monthly 2011 to 2015): UWCD Hydrologic Conditions Report (primary author/compiler).

UWCD Production Well As-Built Reports: El Rio #17 (2014) and El Rio # 18 (2016) Construction Reports (primary author).

# Kenneth Calhoun, G.I.S.P.

GIS Manager



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.

## **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

## **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.





### 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.

# Shannon Williams, C.P.G., GISP

Hydrogeologist



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.

## 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

### **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.



# Jean-Luc E. Cartron, M.D., Ph.D.

Senior Biologist



## EDUCATION

Ph.D., Biology, Department of Biology, University of New Mexico, 1995

M.D., University of Paris Val de Marne, France, with parts of medical curriculum completed at UCSF, 1991

## PROFESSIONAL REGISTRATIONS

Permitted for presence/absence surveys for the yellow-billed cuckoo (*Coccyzus americanus occidentalis*), U.S. Fish and Wildlife, No. TE82699-1

Permitted for presence/absence surveys for Mexican spotted owl (*Strix occidentalis lucida*), U.S. Fish and Wildlife, No. TE82699-1

Permitted for conducting biological surveys on the Navajo Nation, Special Permit 1057

Dr. Cartron has more than 20 years of experience in project management, ecological research, and biological surveys. He is the main author or editor of several prize-winning books and has written numerous peer-reviewed articles on birds, riparian ecosystems, indicator species, and anthropogenic impacts mainly on terrestrial wildlife. His project experience includes work on several habitat conservation plans related to water supply projects. Responsibilities include the preparation of sections for the conservation strategy and the effects analysis for both terrestrial species and fish; the analysis of modeling results for fish; the development of metrics and conservation targets for the effectiveness; and system monitoring and adaptive management. Modeling was conducted both with and without inclusion of predicted climate change effects.

### Bay Delta Conservation Plan, California

Part of the SAIC team in charge of developing a federal Habitat Conservation Plan (HCP) and a State Natural Community Conservation Plan (NCCP) for the San Francisco Bay Delta, formed by the confluence of the Sacramento and San Joaquin Rivers. The Bay Delta supplies water for 25 million Californians in the San Francisco Bay Area, the Central Valley, and southern California. It helps to produce nearly half the nation's domestically-grown fresh produce. Co-equal goals of the plan are to restore and protect the ecological health of the Bay Delta and restore and protect water supplies. Responsibilities included the preparation of sections for the conservation strategy and the effects analysis for both terrestrial species and fish; the analysis of modeling results for fish; the development of metrics and conservation targets for the effectiveness; and system monitoring and adaptive management. Modeling was conducted both with and without inclusion of predicted climate change effects. Bay Delta Conservation Plan (BDGP) is the largest habitat conservation plan ever developed to date nationwide.

### Butte Regional Conservation Plan, Butte County Association of Governments, Sacramento, California

Conservation Ecologist for the team in charge of developing a federal Habitat Conservation Plan (HCP) and a State Natural Community Conservation Plan (NCCP), a collaborative effort coordinated by the Butte County Association of Governments on behalf of the cities of Biggs, Chico, Gridley, and Oroville, the County of Butte, Caltrans District 3, and Western Canal Water District. Specific responsibilities included work on the conservation strategy and effects analysis for the plan.

### Yolo Natural Heritage Program, Yolo County Habitat/Natural Community Conservation Plan Joint Powers Agency, Sacramento, California

Conservation Ecologist for the team in charge of developing a federal Habitat Conservation Plan (HCP) and a State Natural Community Conservation Plan (NCCP). This was a collaborative effort coordinated by the Yolo County Habitat/Natural Community Conservation Plan Joint Powers Agency. Specific responsibilities included work on the conservation strategy and effects



analysis for the plan.

## **Environmental Monitoring, Fish Salvage Operations, Storm Water Pollution Prevention Plan Inspections, and Biological Surveys for the Santo Domingo Bridge Replacement Project, Sandoval County, New Mexico**

As project manager, conducted and supervised environmental monitoring during the replacement of a bridge over the Rio Grande in Sandoval County, New Mexico. Directed and conducted fish salvage operations during the construction of cofferdams and work platforms in the river channel. Also conducted Storm Water Pollution Prevention Plan (SWPPP) inspections and provided expert advice on mitigations during the bridge construction phase.

## **NEPA On-Call Services, New Mexico Department of Transportation, Statewide New Mexico**

Providing support for DBS&A's on-call contract with the New Mexico Department of Transportation Environmental Design Bureau for NEPA documentation, natural and cultural resource inventories, and other tasks as assigned by the Bureau. Representative tasks include biological evaluation for the right-of-way clearing and fencing project on New Mexico Highway 246 in Lincoln County.

## **Threatened and Endangered Species Survey, Sandia Pueblo, Sandoval County, New Mexico**

Conducted three years of yellow-billed cuckoo surveys and habitat evaluation for the Pueblo of Sandia in Sandoval County, New Mexico. All surveys were conducted according to the U.S. Fish and Wildlife survey protocol and led to the detection of several cuckoos and a possible breeding territory.

## **Environmental Impact Statement for the Southline Transmission Project, Western Power Area Administration and Bureau of Land Management (BLM), New Mexico and Arizona**

Lead biologist for the analysis of expected impacts to migratory birds. The proposed project involves the construction of a new 240-mile, 345-kilovolt double-circuit transmission line between the existing substations at Afton, New Mexico, and Apache, Arizona, and the upgrade of about 120 miles of Western's existing transmission lines between the Apache and Saguaro substations in Arizona from a 115-kV line to a 230-kV double-circuit line.

## **Biological Evaluation for the Proposed Red Hills Lateral Pipeline in Lea County, Enterprise Products Operating LLC, New Mexico**

Lead biologist for the preparation of a biological evaluation of potential impacts to conservation sensitive species along a proposed pipeline route.

## **Biological Assessment for the Regrading of the North Diversion Channel Embayment, Albuquerque Metropolitan Arroyo Flood Control Authority**

Project manager and principal investigator in the preparation of a biological assessment evaluating effects of regrading an embayment on threatened and endangered species and critical habitat for the silvery minnow.

## **Biological Assessment for the San Juan Chama Drinking Water Project Environmental Mitigation, Albuquerque Bernalillo County Water Utility Authority**

Principal Investigator for biological assessment prepared to address all likely effects on threatened and endangered species resulting from the implementation of habitat restoration along the Rio Grande in Albuquerque. In 2004, the U.S. Fish and Wildlife Service (Service) issued a Biological Opinion (BO), and the BOR issued a Record of Decision (ROD) under NEPA stipulating environmental mitigation requirements for implementation of the San Juan-Chama Drinking Water Project, also referred to as the City of Albuquerque Drinking Water Project).



## Middle Rio Grande Bosque Field Guide Development and Wetland Census

Director of a project to develop a field guide to the flora and fauna of the Middle Rio Grande Bosque (with funding from Middle Rio Grande Bosque Initiative, Public Service Company of New Mexico, and the University of New Mexico Biology Department). The field guide includes over 700 species accounts with color photos and information on distribution, conservation status, habitat associations, and natural history. A census of plants and animals in wetlands of the Middle Rio Grande Valley was also conducted as part of this project.

## Publications and Presentations

- Cartron, J.-L. E. (ed.). 2010. *Raptors of New Mexico*. University of New Mexico Press, Albuquerque.
- Cartron, J.-L. E., D. C. Lightfoot, J. E. Mygatt, S. L. Brantley, and T. K. Lowrey. 2008. *A Field Guide to the Plants and Animals of the Middle Rio Grande Bosque*. University of New Mexico Press, Albuquerque.
- Cartron, J.-L. E., D. M. Finch, D. L. Hawksworth, and S. H. Stoleson. 2013. Nesting ecology and nest success of the Blue Grosbeak along two rivers in New Mexico. *Western Birds* 44:33-44.
- Cartron, J.-L. E., D. W. Anderson, C. J. Henny, and R. Carmona. 2010. Ospreys of the Gulf of California: ecology and conservation status. Pp. 168-187 in R. C. Brusca (ed.), *The Gulf of California: Biodiversity and Conservation*. University of Arizona Press, Tucson.
- Cartron, J.-L. E., D. W. Anderson, C. J. Henny, and R. Carmona. In press. Ospreys (*Pandion haliaetus*) of the Gulf of California: ecology, and conservation status. In R. C. Brusca (ed.), *The Gulf of California: Biodiversity and Conservation*. University of Arizona Press, Tucson.
- Cartron, J.-L. E., and J. E. Mygatt. 2006. Nesting birds of a drained, post-fire, semi-permanent wetland at the Bosque del Apache National Wildlife Refuge. *New Mexico Ornithological Society Bulletin* 34: 12-14.
- Whitmore, R. C., R. C. Brusca, J. León de la Luz, P. González-Zamorano, R. Mendoza-Salgado, E. S. Amador-Silva, G. Holguin, F. Galván-Magaña, P. A. Hastings, J.-L. E. Cartron, R. S. Felger, J. A. Seminoff, and C. C. McIvor. 2005. The ecological importance of mangroves in Baja California Sur : Conservation implications for an endangered ecosystem. Pp. 298-333 in J.-L. E. Cartron, G. Ceballos, and R. S. Felger (eds.), *Biodiversity, Ecosystems, and Conservation in Northern Mexico*. Oxford: Oxford University Press.
- Velarde, E., J.-L. E. Cartron, H. Drummond, D. W. Anderson, F. Rebón Gallardo, E. Palacios, and C. Rodríguez. 2005. Nesting seabirds of the Gulf of California's offshore islands: diversity, ecology, and conservation. Pp. 452-470 in J.-L. E. Cartron, G. Ceballos, and R. S. Felger (eds.), *Biodiversity, Ecosystems, and Conservation in Northern Mexico*. Oxford: Oxford University Press.
- Brown, J. H., E. J. Bedrick, S. K. M. Ernest, J.-L. E. Cartron, and J. F. Kelly. 2004. Constraints on negative relationships: mathematical causes and ecological consequences. Pp. 298-315 in M. Taper and S. Lele (eds.), *The Nature of Scientific Evidence*. University of Chicago Press.
- Cartron, J.-L. E. 2000. Status and productivity of Ospreys along the eastern coast of the Gulf of California: 1992-1997. *Journal of Field Ornithology* 71:298-309.



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.

**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

**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.



Dr. Bruce Orr (*Ph.D., Entomology/Ecology*) has over 35 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 various Bay Area wetlands, streams, and watersheds). Dr. Orr provides senior strategic support on many of Stillwater's large-scale regulatory, watershed management, and restoration projects, including those involving groundwater dependent ecosystems.

### 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. and A.M. Merrill. 2018. **Down by the river: riparian forests of California.** *Fremontia* 46 (2): 30-35.

Braudrick, C.A., A.M. Merrill, and B.K. Orr. 2018. **Groundwater Dependent Ecosystems.** *Fremontia* 46 (2): 54-55.

### SELECTED PROJECT EXPERIENCE

**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 acres 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 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.

**Strategic Habitat Conservation Planning for Least Bell's Vireo on the Santa Clara River, CA** (*Client: USFWS*). Dr. Orr is currently working with USFWS, USGS, UCSB, and the Western Foundation of Vertebrate Zoology to link vegetation, habitat structure, and river-riparian habitat dynamics to habitat suitability and population response of least Bell's vireo as part of a larger USFWS effort to develop a strategic habitat conservation plan for this species. Team members were recently awarded an ESA Section 6 grant to expand the effort. Dr. Orr and Stillwater will be updating the vegetation classification and mapping along 65 miles of the Santa Clara River and developing detailed descriptions of riparian and floodplain habitat structure using LIDAR and field surveys to support development of habitat suitability models and decision support tools to guide restoration and management of southwestern willow flycatcher, and western yellow-billed cuckoo and their habitats in the river corridor.

**Orr, B.K.** 2018. **Emerging Approaches for Managing and Restoring Resilient River-Riparian Ecosystems.** Invited plenary talk for Riparian Restoration in the West, Grand Junction, CO.

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.

**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 Report 2017-1091.

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 river.** 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.

**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.

**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, as well as broader planning efforts in the Delta region.

Dr. Christian Braudrick (*Ph.D., Earth and Planetary Science*), has worked on rivers for 20 years. Dr. Braudrick uses mechanistic understanding of river processes to better understand how rivers respond to environmental changes to inform land use decisions and stream restoration planning. His work often uses the results of numerical models and sediment budgets to assess morphological impacts to streams. His work has been integral in developing Stillwater's technical approach to assessing groundwater dependent ecosystems and is the lead author on an article on groundwater dependent ecosystems that is currently in press in *Fremontia*.

#### 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., A.G. Merrill, and B.K.  
Orr. *In press*. **Groundwater Dependent  
Ecosystems**. Invited paper for special  
wetlands issue of *Fremontia*.

#### SELECTED PROJECT EXPERIENCE

**Groundwater Dependent Ecosystems Technical Support** (*Client: California Department of Water Resources*): Dr. Braudrick is the lead physical scientist developing Stillwater Sciences' approach to assessing groundwater dependent ecosystems under the Sustainable Groundwater Management Act.

**Madera and Chowchilla Groundwater Sustainability Plan Development** (*Clients: Madera and Chowchilla Groundwater Sustainability Agencies*): Dr. Braudrick is developing the approach to assessing groundwater dependent ecosystems for the Madera and Chowchilla Groundwater Sustainability Plan.

**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. 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.

**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 North Umpqua Hydroelectric Project Relicensing.

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

**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 Decommissioning, 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.

**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.

**Fish Passage Monitoring Post Dam Removal, Sandy River, Oregon** (*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.



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: 27 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

Merrill, A.G., N.L. Jurjavic. In Press.  
Mountain meadows: emerald oases of  
the Sierra Nevada. Invited paper for  
special wetlands issue of *Fremontia*.

Orr, B.K., A.G. Merrill. In press. Down  
by the river: riparian forests of  
California. Invited paper for special  
wetlands issue of *Fremontia*.

## SELECTED PROJECT EXPERIENCE

**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.

**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.

**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



Braudrick, C.A., A.G. Merrill, and B.K. Orr. In press. Groundwater Dependent Ecosystems. Invited paper for special wetlands issue of *Fremontia*.

A.G. Merrill, A.E. Thode, A.M. Weill, J. Fites-Kaufman, A.F. Bradley, and T.J. Moody. 2018. **Fire and Plant Interactions** Chapter 8 in van Wagtenonk, 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 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.

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).

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.

**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.

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

Ethan Bell (*M.S., Fisheries Biology*) is a fisheries biologist with particular expertise with Pacific salmonids and trout. He is an experienced project manager and has provided technical expertise on projects in groundwater dependent ecosystems. He has worked on a variety of interdisciplinary projects including large-scale watershed assessments, fish passage analysis, population dynamics modeling, limiting factors analysis, restoration design, endangered species consultation, and hydroelectric relicensing. Mr. Bell is also instrumental in coordinating and analyzing collected field data, as well as researching and writing reports.

## AREAS OF EXPERTISE

- Instream Flows
- Fish Stranding Evaluations
- Aquatic Ecology

## YEARS OF EXPERIENCE

At Stillwater: 17 years

In Total: 20 years

## EDUCATION

**M.S., Fisheries Biology**, Humboldt State University, 2001

**B.S., Ecology and Evolution**, University of California at Santa Barbara, 1990

## PERMITS

USFWS Section 10(A)(1)(A) (Permit #TE198917-1) For Native Endangered Species Recovery – Wildlife

## PROFESSIONAL AFFILIATIONS

- American Fisheries Society

## SELECTED PUBLICATIONS

R. Dagit and E. Bell. 2017. **The Effects of a Prolonged Drought on Southern Steelhead Trout (*Oncorhynchus mykiss*) in a Coastal Creek, Los Angeles, California**. Bulletin of the Southern California Academy of Sciences.

Krug, J., E. Bell, and R. Dagit. 2012. **Growing up fast: diet and growth of a**

## SELECTED PROJECT EXPERIENCE

**Stormwater Diversion Effects on Steelhead in Piru Creek, Ventura County, CA** (*Client: Ventura County Public Works*): Mr. Bell was the fisheries lead on a study of the effects of a stormwater diversion and infiltration from the city of Piru on potential steelhead passage in lower Piru Creek. He reviewed scientific literature on steelhead fish passage requirements, assessed the hydrologic effects of the proposed stormwater diversion, and evaluated the conditions that would influence fish passage opportunities.

**Habitat Conservation Plan for United Water, Santa Clara River, Ventura County, CA** (*Client: United Water Conservation District*): Mr. Bell was the fisheries lead of a hydrological analysis of the Santa Clara River estuary to determine the potential impacts of proposed diversion and bypass flow operations (e.g., increased high-flow diversion rates) on tidewater goby and steelhead that inhabit the estuary for part or all of their lifecycle. This work supported the client in their development of a multi-species Habitat Conservation Plan needed to modify operations at the Freeman Diversion Dam, located ten miles upstream of the estuary.

**Estuary Special Studies, Santa Clara River, Ventura County, CA** (*Client: City of Ventura*): Mr. Bell was the technical lead on an assessment of the ecological impact of wastewater discharge into the Santa Clara River Estuary. Between 2014 and 2016 he led field efforts to sample for aquatic species in the estuary and was instrumental to the analysis and reporting.

**Percolation Zone Study of Pilot-Study Groundwater Basins in San Luis Obispo County, CA** (*Client: Upper Salinas-Las Tablas RCD*): Mr. Bell was the Aquatic Resources Technical Lead for a pilot study to locate areas with relatively high intrinsic percolation (or groundwater-recharge) potential that, through management actions, could enhance local groundwater supplies for human and ecological benefits. He integrated data on ecological flow needs to identify areas where groundwater recharge would derive benefits for aquatic species.

**population of *Oncorhynchus mykiss* in Topanga Creek, California.** Calif. Fish Game 98(1):38–46.

Bell, E., S. Albers, and R. Dagit. 2011. **Juvenile growth in a population of southern California steelhead (*Oncorhynchus mykiss*).** California Department of Fish and Game Fish Bulletin.

Bell, E., R. Dagit, and F. Ligon. 2011. **Colonization and Persistence of a Southern California Steelhead (*Oncorhynchus mykiss*) Population.** Bulletin of the Southern California Academy of Sciences.

Bell, E., S. Kramer, D. Zajanc, and J. Aspittle. 2008. **Salmonid fry stranding mortality associated with daily reservoir fluctuations in Trail Bridge Reservoir, Oregon.** North American Journal of Fisheries Management 28: 1515–1528.

Bell, E. and W. Duffy. 2007. **Previously undocumented two-year freshwater residency of juvenile coho salmon in Prairie Creek, California.** Transactions of the American Fisheries Society 136: 996–970.

Bell, E., W. G. Duffy, and T. D. Roelofs. 2001. **Fidelity and survival of juvenile coho salmon in response to a flood.** Transactions of the American Fisheries Society 130: 450–458.

Bell, E. 2001. **Survival, growth and movement of juvenile coho salmon (*Oncorhynchus kisutch*) over-wintering in alcoves, backwaters, and main channel pools in Prairie Creek, California.** Master's thesis. Humboldt State University, Arcata, California.

**San Joaquin River Restoration Plan** (*Client: Natural Resources Defense Council & Friant Water Users Authority*): Mr. Bell led the development of innovative and feasible restoration and management actions to improve ecosystem functioning and habitat conditions to the lower San Joaquin River, CA. He designed and implemented field studies to assess habitat potential for spring Chinook salmon and steelhead in the lower river and tributaries. He also integrated existing literature on the life history and habitat requirements of spring Chinook salmon and steelhead, water temperature modeling, and the results of field studies to develop appropriate restoration and management strategies to benefit both species in the lower river and tributaries.

**San Luis Obispo Stormwater Resource Plan, CA** (*Client: City of San Luis Obispo*): Mr. Bell was the Aquatic Resources Technical Lead for the preparation of the San Luis Obispo Creek Watershed Stormwater Resource Plan, designed to meet the State Water Board's requirements for such plans within the logistical and financial constraints of a small city. We achieved the goals of the Plan by identifying existing water-quality and flooding problems arising from urban runoff, identifying key aquatic resources meriting high levels of protection or restoration, determining feasible areas for stormwater infiltration and groundwater recharge, and determining and prioritizing management actions (both capital projects and other non-capital actions) to address identified problems of existing and likely future degradation.

**Santa Rosa Creek and San Simeon Creek Watershed Management Plans, San Luis Obispo County, CA** (*Client: Greenspace – the Cambria Landtrust*): Mr. Bell provides fisheries input for the development of two watershed management plans for the Santa Rosa Creek and San Simeon Creek watersheds, which include steelhead limiting factors analyses. The plans synthesize overall watershed conditions and are leading to the development and prioritization of restoration and research recommendations that will enhance riparian ecosystem conditions and contribute to steelhead population recovery.

**Regional Assessment of Environmental Water Demand, San Luis Obispo County, CA** (*Client: Coastal San Luis Resource Conservation District*): Mr. Bell led this study to estimate environmental water demand (defined as flows required to support steelhead) throughout all fish-bearing watersheds in San Luis Obispo County. Analysis of all existing hydrologic and physical data, as well as a rapid field assessment in numerous steelhead-bearing watersheds throughout the County was used to estimate the minimum flows needed to support steelhead rearing during the sensitive spring and summer rearing periods. Results of this effort will be used to prioritize watersheds for more precise estimates of instream flows, and to improve the assessment of environmental water demand used by the County in their Master Water Plan.



## CALIFORNIA STATE UNIVERSITY, SACRAMENTO CONSENSUS AND COLLABORATION PROGRAM

**Dave Ceppos, SGMA Program Manager**

### Years of Experience

CCP: 16 years

Total: 33 years

### 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.L.A. 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 State Water Resources 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 and GSP
- 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.



## CALIFORNIA STATE UNIVERSITY, SACRAMENTO CONSENSUS AND COLLABORATION PROGRAM

**Lisa Ballin, Lead Mediator**

### **Years of Experience**

CCP: 3 Years  
Total: 24 Years

### **Education**

Master of Science, Engineering-  
Economic Systems, Stanford  
University, 1988

Bachelor of Arts, Mathematics,  
University of Pennsylvania,  
1986

### **Geographic Experience**

Southern California

### **Professional Affiliation(s)**

Southern California Mediation  
Association

### **Summary of Experience**

Lisa Ballin has supported facilitation, public policy, and mediation in a wide range of policy areas. Prior to joining CCP, her career focused on environmental planning and analysis. She conducted objective environmental review for myriad projects and plans that involved community concern, intense scrutiny, controversy, and/or conflict. She addressed public comments expressed by stakeholders. Her project experience includes public infrastructure (including transit and sewage treatment), urban development, and redevelopment plans. She has wide ranging knowledge of environmental issues spanning scientific, quantitative, and technical subjects; qualitative issues; and policy matters. She is an avid researcher and analytical thinker and is skilled at communicating technical information in a clear, concise, and effective manner.

Ms. Ballin received mediation training from the Ventura Center for Dispute Settlement and the US Institute for Environmental Conflict Resolution. She has mediated at Ventura and Los Angeles County Superior Courts, Days of Dialogue, and for the Inland Valleys Justice Center.

## **Project Experience**

### **Sustainable Groundwater Management Program, Local Assistance Facilitation Support Services, Santa Clara River Valley East Subbasin**

Client: Department of Water Resources. Location: Northern Los Angeles County. Years: 2016-2017. Role: Assistant Facilitator. Summary: CCP is assisting a group of local water purveyors, the County of Los Angeles, and the City of Santa Clarita in their efforts to form a Groundwater Sustainability Agency (GSA) as a first step in complying with the Sustainable Groundwater Management Act (SGMA). CCP is facilitating the process, supporting public outreach, and offering its expertise in SGMA compliance. Ms. Ballin collaborated with the project's lead facilitator in conducting a stakeholder assessment, including interviewing stakeholders and presenting findings to the project team. She assists with client support, meeting facilitation and documentation, and outreach.

### **Medical Cannabis Pre-Regulatory Meetings**

Client: Department of Consumer Affairs Bureau of Medical Cannabis Regulation and California Department of Public Health Office of Medical Cannabis Safety. Location: Los Angeles, San Diego. Years: 2016. Role: Assistant Facilitator. Summary: CCP designed and facilitated eight large public meetings throughout the State to gather public input on development of new regulations for licensing, manufacturing, testing, distribution, transportation, and sale of medical cannabis. Ms. Ballin facilitated breakout groups at two large public meetings.

### **Sustainable Groundwater Management Program, Local Assistance Facilitation Support Services, Upper Ventura River Basin**

Client: Department of Water Resources. Location: Upper Ventura River Basin. Years: 2016. Role: Assistant Facilitator. Summary: CCP assisted five agencies that came together to form a Groundwater GSA for the Upper Ventura River Basin (Ventura Water, Casitas Municipal Water District, Ventura River Water District, Meiners Oaks Water District, and Ventura County). The agencies collaborated and negotiated a Joint Powers Agreement that will serve as a governance document for the GSA. Ms. Ballin took notes during team and public meetings, prepared meeting summaries, and provided general support and coordination.

### **California Executive Order B-37-16 Implementation**

Client: California Department of Water Resources. Location: Statewide. Years: 2016. Role: Assistant Facilitator. Summary: CCP facilitated meetings with public stakeholders and an Urban Advisory Group on a framework for new statewide water use targets, water loss regulations, water shortage contingency plans, and drought planning. Ms. Ballin supported CCP's lead facilitator in planning meeting logistics, running a concurrent webinar, and preparing meeting summaries that capture extensive comments.

### **City of Ventura and Casitas Municipal Water District Mediation**

Client: City of Ventura and Casitas Municipal Water District. Location: Ventura County. Years: 2016. Role: Assistant Facilitator. Summary: CCP mediated the negotiation of a revised water services agreement between the parties. A series of mediation meetings were held with both parties' negotiation teams to identify common goals, promote an understanding of each party's interests and concerns, and identify and draft mutually agreeable contract terms. Ms. Ballin attended mediation meetings and documented points of agreements and required actions.

## **Other Experience**

### **Director of Environmental Services, Senior Project Manager, July 1997 - May 2011**

#### **Envicom Corporation, Agoura Hills, CA**

- Led multi-disciplinary teams of scientists, engineers, and planners in objective environmental research and reporting.
- Assessed a full range of environmental issues for urban and suburban development, land use and redevelopment plans, and projects often involving complexity, public concern, and/or controversy.
- Addressed concerns expressed by multiple stakeholders.
- Coordinated efforts among clients, multiple public agencies, in-house staff, and subconsultants.

### **Project Manager, October 1992 - July 1996**

#### **Myra L. Frank & Associates, Los Angeles, CA**

- Conducted environmental impact analysis and documentation, performing functions similar to those listed above.

### **Project Manager, July 1998 – September 1992**

#### **Allee, King, Rosen & Fleming, New York, NY**

- Conducted environmental impact analysis and documentation, performing functions similar to those listed above.

### **Policy Analyst, July 1986 – July 1987**

#### **ICF Incorporated, Washington D.C.**

- Assisted with analysis of energy and environmental legislative initiatives.



## CALIFORNIA STATE UNIVERSITY, SACRAMENTO CONSENSUS AND COLLABORATION PROGRAM

**Mindy Meyer, Lead Facilitator**

### **Years of Experience**

CCP: 8 years  
Total: 16 years

### **Education**

M.A., Organizational  
Management, Antioch  
University, Los Angeles, CA  
B.A. Liberal Studies, Antioch  
University, Los Angeles, CA

### **Discipline/Expertise**

Facilitation/Mediation  
Public Participation  
Water Resource Management  
Natural Resource Management  
Organizational Development  
Community Outreach

### **Geographic Experience**

Eastern Sierra  
Central Coast  
Central Valley  
Los Angeles County  
Orange County  
San Diego County  
Ventura County

### **Professional Affiliations**

Assoc. for Conflict Resolution

### **Publications**

M.E. DuPraw, S. Di Vittorio, D.  
Ceppos, M.D. Wylie, M. Kopell,  
S. Lucero, T. Carlone, M.  
Meyer, and S. Horii. 2017.  
Groundwater Sustainability  
Plans: California's Newly-  
Formed Groundwater  
Sustainability Agencies – The  
Rewards of Optimizing  
Effective Coordination and  
Collaboration. The Water  
Report: Issue 162, August.

### **Summary of Experience**

Mindy Meyer is an experienced mediator and facilitator whose practice in private, public, and non-profit sectors centers on using collaborative strategies to build sustainable outcomes. She uses innovative methods and designs to support diverse groups in reaching agreement. She has worked with local, state, and federal government entities in groups as large as 250. Ms. Meyer has extensive experience in the areas of: consensus building and dispute resolution, strategic planning and implementation, public outreach design, organization development, leadership and team development, and training. Ms. Meyer is an effective project manager who achieves desired results and submits agreed-upon deliverables on time and within budget. She quickly learns the needs, complexities, and challenges for a given project and its stakeholders and is adept in building trusting relationships.

### **Project Experience**

#### **Sustainable Groundwater Management Act Local Assistance: Upper Ventura River Basin**

Client: Department of Water Resources. Location: Ventura Valley, San Luis Obispo, and Santa Clarita Valley. Basin. Years: 2015 to 2017.  
Role: Lead Facilitator. Summary: California's Sustainable Groundwater Management Act (SGMA) of 2014 requires broad stakeholder involvement in the development and implementation of Groundwater Sustainability Agencies (GSAs) and Groundwater Sustainability Plans (GSPs) for 127 groundwater basins around the state. Five agencies joined together to create a GSA for the Upper Ventura River: Ventura Water, Casitas Municipal Water District, Ventura River Water District, Meiners Oaks Water District, and Ventura County Watershed Protection District. Ms. Meyer coordinated basin stakeholder outreach and education and worked with the eligible agencies and stakeholders to develop governance models and agreements in compliance with SGMA.

#### **Sustainable Groundwater Management Act Local Assistance: Santa Clara River Valley East Subbasin**

Client: Department of Water Resources. Location: Northern Los Angeles County. Years: 2016-2017. Role: Assistant Facilitator.  
Summary: CCP is assisting a group of local water purveyors, the County of Los Angeles, and the City of Santa Clarita in their efforts to form a Groundwater

Sustainability Agency (GSA) as a first step in complying with the Sustainable Groundwater Management Act (SGMA). CCP is facilitating the process, supporting public outreach, and offering its expertise in SGMA compliance. Ms. Ballin collaborated with the project's lead facilitator in conducting a stakeholder assessment, including interviewing stakeholders and presenting findings to the project team. She assists with client support, meeting facilitation and documentation, and outreach.

### **Owens Lakebed Master Plan & Project**

Client: Los Angeles Department of Water and Power (LADWP). Location: Eastern Sierras. Years: 2010-2011 & 2013-2015. Roles: Work Group Facilitator, Project Management, Public Outreach Design and Execution. Summary: LADWP, responsible for dust mitigation on the dry lakebed, convened a diverse collaborative to develop a master plan to achieve dust control while enhancing habitat and conserving water. Ms. Meyer co-facilitated the Ground Water Work Group and facilitated the Public Access and Recreation Work Group (PAR WG) for the Master Plan. The recommendations from these work groups will guide LADWP's implementation strategies for ground water use for dust control and public access and recreation use of Owens Lake.

### **Hinkley Groundwater Community Advisory Committee**

Client: Pacific Gas & Electric (PG&E). Location: Hinkley, CA. Years: April 2013-April 2014. Role: Lead Mediator/Facilitator. Summary: Historical discharges of chromium in the 1950s led to groundwater contamination in Hinkley, CA. To support a large-scale remediation effort, PG&E hired CCP to: ensure stakeholder issues and concerns were addressed and resolved, manage conflict, find common ground, and identify and work towards achievable goals. Ms. Meyer facilitated Community Meetings and provided meeting facilitation and support for the Hinkley Community Advisory Committee.

### **Spiny Lobster Fishery Management Plan (FMP)**

Client: California Department of Fish and Wildlife (DFW). Location: Southern California. Years: 2012-2014. Role: Facilitator. Summary: CCP supported DFW's efforts to develop a Spiny Lobster Fishery Management Plan to ensure effective management, sustainability, and long-term economic viability of the resource. As a member of the facilitation team, Ms. Meyer designed the public participation and advisory committee processes to create broad based support for the plan.

### **Access Code Update Stakeholder Workshops**

Client: Division of the State Architect (DSA). Location: Sacramento, Oakland, Los Angeles, and San Diego, CA. Year: 2012 & 2014. Role: Facilitator. Summary: The Division of State Architect conducted interactive stakeholder workshops to receive public input as it updated the California Building Code to comply with recent updates to the federal Americans with Disability Act. Ms. Meyer consulted on the meeting design and stakeholder engagement plan. She facilitated meetings and supported project management, while ensuring stakeholder engagement was designed to support the full participation of people with access and functional needs.

### **San Elijo Lagoon Conservancy (SELCO) Restoration Project Assessment and Communication Plan**

Client: State Coastal Conservancy. Location: Cardiff-by-the-Sea, CA Years: 2011-2012. Role: Public Engagement Consultant. Summary: CCP supported community engagement and public participation for the planning phase of a large scale restoration plan for the San Elijo Lagoon. Ms. Meyer conducted an issues assessment and designed a public outreach and engagement plan to respond to the concerns, interests, and questions of the San Elijo Lagoon Conservancy's constituents. The plan outlined key communication goals, principles, and strategies; key audiences, partners, and messages; and specific communication tools and methods.



# Dominique Cartron, J.D.

Water Resources Specialist



Ms. Cartron specializes in water resources management including long-term water supply planning, regional water plans, water rights permitting, water price studies, and 40-year water development plans for municipalities (including water use inventories and audits). Her experience includes regional water planning on major New Mexico rivers, legal constraints on water supply and water project development, water rights research (including price studies), and confidential water resources work with Tribes in New Mexico. Ms. Cartron has evaluated major issues in New Mexico water resources management covering interstate compacts, intergovernmental cooperation, federal, state, and local control of water resources, drought management, watershed management, conservation, tribal water claims, endangered species issues, and funding for water resource development.

## EDUCATION

J.D., University of New Mexico  
School of Law, 1996

B.A., French Literature and  
Latin American Studies,  
University of New Mexico,  
1991

## PROFESSIONAL REGISTRATIONS

Member of the State Bar of  
New Mexico, No. 9406

**New Mexico Regional Water Plan Updates, New Mexico Interstate Stream Commission, Santa Fe, New Mexico:** Project manager for technical update of New Mexico's 16 regional water plans. Responsible for project budget and oversight, staffing, drafting portions of the technical update, presenting the technical approach and results to the 16 regional steering committees, as well as participating in strategic planning meetings with the Interstate Stream Commission Planning Committee and senior staff. A significant component of her work with the regions was in identifying the projects, programs, and policies to address water supply challenges, particularly in groundwater-dependant basins with projected future water supply deficits.

### **Rural Water Systems Appraisal Level Investigation, Bureau of Reclamation, McKinley County, New Mexico**

Project Manager for the evaluation of water supply alternatives for 17 rural water systems at the appraisal level. Work includes identifying multiple water supply alternatives, developing preliminary engineering costs, and developing evaluation criteria for ranking the different alternatives. A key component of this study is identifying, evaluating and working with project stakeholders to rank different alternatives for future water supply, in particular, the Navajo Gallup Water Supply Project. Project involved working with the water systems and representatives from the Navajo Department of Water Resources, the Navajo Tribal Utility Authority, the Indian Health Service, and other state and local governmental entities.

### **Decision Analysis Projects, Confidential Client**

Participated in development of alternatives, identification of objectives and performance criteria, performance of sensitivity analysis, and evaluation of risks and uncertainties of alternatives for ensuring sufficient long-term water availability. Participated in all stakeholder meetings and drafted significant portion of project reports. Based on success of the first project, the client retained DBS&A to conduct the decision analysis process to related to other strategic water management planning challenges.

### **Pajarito Mesa Water Supply Improvements, Albuquerque Bernalillo County Water Utility Authority and Pajarito Mesa Mutual Domestic Water Users**



## **Association, Bernalillo County, New Mexico**

Project Manager working with the Project Engineer to evaluate the feasibility of different options for providing water to residents of the Pajarito Mesa located south of Albuquerque. Presented water supply options to Water Users Association members and answered residents' questions in Spanish. Managed the process for developing project design and specifications and prepared project budget and bid package.

## **State Water Plan Development, New Mexico Interstate Stream Commission**

Summarized legal issues and legal constraints on water supply for the 2010 New Mexico State Water Plan. Researched and presented information on various aspects of water planning in western states, including legal requirements, technical methodologies, level of funding, level of public participation, tribal involvement, and planning process structure and organization.

## **Hydrological Services for Water Rights and Water Supply, Town of Taos, New Mexico**

Assisting the Town of Taos, New Mexico, with hydrological services, including assistance with water supply, water rights, Abeyta Settlement technical support, and preparation of a 40-year plan. Tasks have included performing in-depth review of the Town's water rights on file with the New Mexico Office of the State Engineer (OSE) to determine the status of transfers, developing a water rights inventory system, and assisting the Town with submittal of information in support of pending transfers. Assisting the Town with Abeyta Settlement negotiations and technical support, and currently developing a 40-year water plan, including an analysis of the current water demand and calculation of existing future water demand projections based on pumping and customer water use records.

## **40-Year Water Development Plans Including Conservation Plans for New Mexico Municipalities**

Project Manager for three municipal 40-year water plans. Studies included hydrologic evaluation of the water supply, calculation of current and future water demand based on a demographics study and assessment of potential for conservation, review of water quality, evaluation of water rights, development and evaluation of alternatives for meeting future demand, and preparation of a water conservation plan including a draft water-conservation ordinance.

## **Small Water Systems Regionalization Plan, McKinley County, New Mexico**

Project Manager for efforts to develop cooperative working arrangements and leverage resources among numerous small water systems in northwest New Mexico. Tasks included summarizing all previous water system studies and planning efforts and working with each participating system to gather baseline data, including water rate structures, operations and maintenance staff and practices, operator certifications, governance structure, asset management, water accounting, water rights, and water quality monitoring results. Responsible for identifying all relevant stakeholders; coordinating, facilitating, and documenting all public participation efforts; and drafting the final regionalization plan, which evaluated and recommended multiple regionalization integration strategies. Prepared a successful \$276,000 funding application to the Water Trust Board for several regionalization projects in McKinley County.

## **40-Year Water Plan, Eddy County, New Mexico**

Project Manager for preparation of a 40-year water plan that addresses region-wide, long-term water management issues, the need for regionalization of small systems, and infrastructure requirements. The scope of work also included evaluating water supply and demand, projecting future demand, and identifying strategies for meeting demand for 19 water systems. The project involved many public meetings and presentations to the water systems and the Eddy County Commission.



## **San Juan-Chama Title Transfer, Albuquerque Bernalillo County Water Utility Authority, Albuquerque, New Mexico**

Evaluated the feasibility and implications of transferring title of the San Juan-Chama Project from the Bureau of Reclamation to an entity representing the various contractors for San Juan-Chama water. Reviewed Bureau of Reclamation operations rules and regulations and researched precedents for transferring title of federal projects in the western United States.

## **Water Rights Study, Confidential Client, New Mexico**

Identified water rights prices, evaluated administrative criteria governing the relevant New Mexico Office of the State Engineer (OSE) groundwater basin, and identified major water rights holders, along with the priority dates, locations, and current uses of the rights. Summarized contents of OSE files detailing current ownership, history of transfers, and issues related to determining whether the water rights had been consistently put to beneficial use without significant lapses in time. Completed abstracts for multiple water rights. Advised client on water rights management and acquisition strategies.

## **Water Rights Price Studies, Confidential Clients, New Mexico**

Prepared several water rights valuation studies of the water market on the Rio Grande in New Mexico from 2003 through 2008. Identified water rights prices from recent transactions and developed a range of water rights prices based on historical and current transfers to discern pricing trends.

## **Water Rights Review, Office of the State Engineer-Declared Bluewater Groundwater Basin, Northwest New Mexico**

Reviewed administrative criteria governing the OSE-declared Bluewater groundwater basin and identified the major water rights holders in the basin along with associated priority dates, locations, and current uses. Summarized contents of OSE files detailing current ownership, history of transfers, and any issues related to determining whether the water right had been consistently put to beneficial use without significant lapses in time or without extensions.

## **Analysis of Legal Issues for Regional Water Plans, New Mexico**

Researched and drafted (in conjunction with the Sheehan, Sheehan and Stelzner law firm) legal issues sections for the Southwest New Mexico and Mora-San Miguel-Guadalupe regional water plans. Also prepared the overview of New Mexico water law included in each plan.

## **Middle Rio Grande Regional Water Plan Alternatives Feasibility Analysis, New Mexico**

Project Manager for an interdisciplinary team of 14 experts (economics, hydrology, engineering, law, and sociology) who analyzed 25 alternatives for meeting future water demand in the Middle Rio Grande (MRG) water planning region. Alternatives evaluated included the technical and legal feasibility of water storage in federal project reservoirs, water conservation and reuse, watershed management, desalination, irrigation system efficiency, conjunctive management, and water banking. Analyses included the hydrologic, environmental, legal, social, cultural, and economic implications of these alternatives. As Project Manager, reviewed and provided comments to experts on all written documents and presented results of research to different client groups (the Mid-Region Council of Governments Water Resources Board and the Middle Rio Grande Water Assembly) and the general public.

## **Supplemental Well Permit, City of Hobbs**

Prepared documentation to support the City's successful application for a municipal supplemental well within a critical management area. As project manager, oversaw the preparation of modeling analysis, reporting, and



pumping schedule submitted to and approved by the OSE. The permit was approved within 9 months of an initial denial by the OSE.

## **Brownfields Promotional Services, New Mexico Environment Department Ground Water Quality Bureau, New Mexico**

Project Manager for contract to assist the New Mexico Environment Department's Ground Water Quality Bureau in promoting its Brownfields and Voluntary Remediation Programs to rural communities in New Mexico. Project involved conducting initial community research, developing relationships with key individuals, meeting with leaders in five New Mexico communities, identifying candidate sites, and following up with each community. Prepared final report detailing activities, contacts, recommendations, and conclusions.

## **Regulatory Analysis of Applicable or Relevant and Appropriate Requirements for State Superfund Program, Texas Commission on Environmental Quality, Texas**

Project Manager for development of an index of potential applicable or relevant and appropriate requirements (ARARs) for TCEQ Superfund Section project managers and contractors to use as a guideline for identifying ARARs. Project involved comprehensive review and analysis of Texas environmental statutes and administrative code to determine which state laws and regulations should be applied to Superfund sites as ARARs. Researched all relevant regulations, developed document format, and produced deliverable in a short timeframe.

## **Comprehensive Environmental Response, Compensation, and Liability Act and Resource Conservation and Recovery Act Regulatory Research, Confidential Tribal Client, New Mexico**

Extensive research into all aspects of Superfund and RCRA laws and regulations. The research memorandum focused on the applicability and use of state and tribal laws to determine remedies and cleanup levels at Superfund sites. Reviewed the National Contingency Plan and all U.S. Environmental Protection Agency guidance on the use of state and tribal laws at specific Superfund sites, including sites that do not make the National Priorities List but are targeted for removal action.

## **Groundwater Remediation Cost Allocation under Superfund, Confidential Client**

Researched whether the location of a potentially responsible party (PRP) within an operable unit might affect allocation of remediation costs. Contributed to published paper discussing techniques for distributing costs for groundwater remediation among PRPs.

## **Water Rights Inventory and Legal Issues for Regional Water Planning, Interstate Stream Commission, New Mexico**

Evaluated water rights and local basin management issues for two water planning regions. Identified major legal and environmental issues affecting water use and development for those regions, including water-quality issues that arise under various federal and state environmental laws. Led and facilitated several public meetings that included identification, prioritization, and selection of alternatives for meeting future water demand. This prioritization process required facilitation and consensus-building skills with participants who had diverging viewpoints and were easily distracted from the meeting's objectives. Additionally, this process required identifying the technical information needed to assist individuals in understanding the viewpoints expressed by other meeting participants.

## **Indian and Water Law Course, Southwestern Indian Polytechnic Institute, Albuquerque, New Mexico**

Prepared materials and lectures to teach eight hours of water and environmental law, including New Mexico water law, federal environmental law (Clean Water Act, Safe Drinking Water Act, Endangered Species Act), and four hours of Indian law.



## **Study Recommending a Comprehensive Reorganization of New Mexico Water Agencies, New Mexico Environment Department, New Mexico**

Directed by the Secretary and Deputy Secretary of the New Mexico Environment Department of the State of New Mexico to evaluate state agencies and political subdivisions of the state that manage water and propose an organizational structure that would improve statewide water resource management. Researched laws pertaining to water in five western states as part of background research for the study.

## **Hydrologic Assessment, Confidential Tribal Client**

Researched water rights and hydrologic management history and legal issues on a major interstate stream system.

## **Grant Development and Proposal Writing, Various Clients, New Mexico**

Developed funding strategy and drafted grants for two water planning regions. Out of the seven planning regions awarded funding by the New Mexico Interstate Stream Commission, 35 percent of the funds were awarded to these two clients. Also drafted successful proposal to initiate Lead-Based Paint Assessment Program for the Pueblo of Acoma, and participated in various successful proposals (including a proposal for a Total Maximum Daily Load [TMDL] on the Red River) and various EPA grants for Indian Tribes.

## **Green Zia Program Evaluator, New Mexico Environment Department, New Mexico**

Received training to evaluate environmental management programs for companies applying to the State of New Mexico for a Green Zia Certificate. Reviewed applications and scored environmental programs presented by the applicants.

## **Clean Water Act Permitting Course, Government Institutes, Albuquerque, New Mexico**

Developed and taught Clean Water Act permitting course that covered application requirements for all Clean Water Act permits, including National Pollutant Discharge Elimination System (NDPES) discharge and stormwater permits.

## **Legal Issue Identification, Quay County Working Group, New Mexico**

Participated in feasibility study for a pipeline to deliver water from Ute Lake to eight municipalities in three counties. Identified and evaluated issues related to aquifer storage and recovery as a means of storing water for the project.

## **Funding Identification Plan, Pueblo of Acoma, New Mexico**

Researched and evaluated more than 20 funding sources to address nonpoint source pollution in the Rio San Jose watershed. Based on this work, the client obtained funding and is currently implementing projects to address nonpoint source pollution.

## **40-Year Water Plan, Village of Angel Fire, New Mexico**

Completed summary and evaluation of existing water rights. Recommended strategies to obtain additional water rights.

## **Water Code Development, Pueblo of Acoma, New Mexico**

Drafted water code provisions that outline the permitting process for use of Pueblo of Acoma water resources. The water code incorporates water quality standards and provides the Pueblo with various tools for protecting its water resources.





## **Water Resources Research, University of New Mexico, Albuquerque, New Mexico**

Evaluated implications of H.R. 961 (Clean Water Act reauthorization). Drafted portions of published paper on water quality standards. Other research areas included watershed management, TMDLs, water quality, and Indian water rights.

## **Litigation Preparation, Robert Maguire and Associates, Albuquerque, New Mexico**

Drafted pleadings and prepared materials for arbitrations, mediations, and a jury trial.

## **Indian Water Law Research, Office of the State Engineer, Santa Fe, New Mexico**

Researched and drafted legal memoranda related to Native American claims in river basin adjudications in New Mexico. Summarized opinions, orders, and special master recommendations related to Pueblo water rights claims.

## **Legal Research, Office of the State Engineer, Santa Fe, New Mexico**

Reviewed Bureau of Reclamation law and regulations pertaining to the operation and management of the Middle Rio Grande Project. Reviewed and summarized history and status of Aamodt litigation, including outstanding unresolved legal issues that had been litigated and heard but for which no decisions had yet been issued by the court. Examined legal implications of certain uses of statutorily created state funds. Reviewed case law and statutory authority related to creation and use of funds. Summarized the Office of the State Engineer's use of funds over the past 40 years.

## **Trade and Investment in India, Dr. Linda Spedding, London, England**

Drafted environmental management sections of a book by Dr. Linda Spedding entitled Trade and Investment in India, published in 1997. Wrote sections on environmental issues associated with project finance in developing countries, ISO 14000, and environmental risk. Analyzed environmental lending criteria of major international development institutions and banks, and environmental accounting methodologies and trade issues.

## **Environmental Technology Development Roadmap Program, Microelectronics and Computer Technology Corporation, Austin, Texas**

Wrote \$1 million proposal for Electronics Industry Environmental Technology Roadmap awarded to Microelectronics and Computer Technology Corporation (MCC) by Advanced Research Projects Agency (ARPA) of the U.S. Department of Defense. Responsible for costing aspects of proposal and program design, planning, and scheduling.

## **Environmentally Conscious Electronics Manufacturing Initiative, Microelectronics and Computer Technology Corporation, Austin, Texas**

Analyzed environmental management issues for Electronics Industry Environmental Technology Roadmap. Hired and supervised graduate students, and worked with electronics companies to identify and evaluate specific environmental management issues. Analyzed impact of environmental issues on electronics technology development, as well as international competitiveness of electronics industry. Studied development of environmental management initiatives at Hewlett Packard, IBM, AT&T, and Northern Telecom.

## **Technology Commercialization Project, Microelectronics and Computer Technology Corporation, Austin, Texas**

Analyzed U.S. Department of Energy (DOE) regulations, policies, contracts, agreements, and intellectual property practices affecting technology transfer and commercialization at Los Alamos National Laboratory (LANL). Evaluated compatibility of regional economic development infrastructure with new company development. Worked with consultant from venture capital organization. Developed model for commercializing LANL-



developed technology and made numerous presentations to LANL and DOE officials. Drafted portions of final report

## **Additional Professional Training**

Water Law and Law of the River, Continuing Legal Education Seminars, 1998 to 2008

Environmental Project Management Course, University of New Mexico, Civil Engineering Department, 1996

## **Publications and Presentations**

Cartron, D. 2017. Regional Water Plan Updates in New Mexico. Presented at the American Ground Water Trust New Mexico Aquifer Conference. July 12, 2017, Albuquerque, New Mexico.

Hilton, J.H. and D. Cartron. 2009. Water supply strategies identified in New Mexico water plans. pp. 111-116 in Price, L.G., D. Bland, P.S. Johnson, and S.D. Connell (eds.) Water, Natural Resources, and the Urban Landscape: The Albuquerque Region. Decision-Makers Field Conference 2009, New Mexico Bureau of Geology and Mineral Resources, Socorro, New Mexico.

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Cartron, D. 2007. Western states water plans. Presentation given in three different venues, to the Interstate Stream Commission, the Governor's Blue Ribbon Task Force on Water, and the ad-hoc committee of New Mexico regional water planners.

Szekely, A., L.O. Martinez Morales, M.J. Spalding, and D. Cartron. 2005. Mexico's legal and institutional framework for the conservation of biodiversity and ecosystems. pp. 87-104 in J.-L. E. Cartron, G. Ceballos, and R. S. Felger (eds.), Biodiversity, Ecosystems, and Conservation in Northern Mexico. Oxford University Press, New York.

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Cartron, D., R. Ferrone, B. Kushner, and G. Pitts. 1993. Environmental consciousness: A strategic competitiveness issue for the electronics and computer industry, summary report.

## **Appendix B. References Cited**

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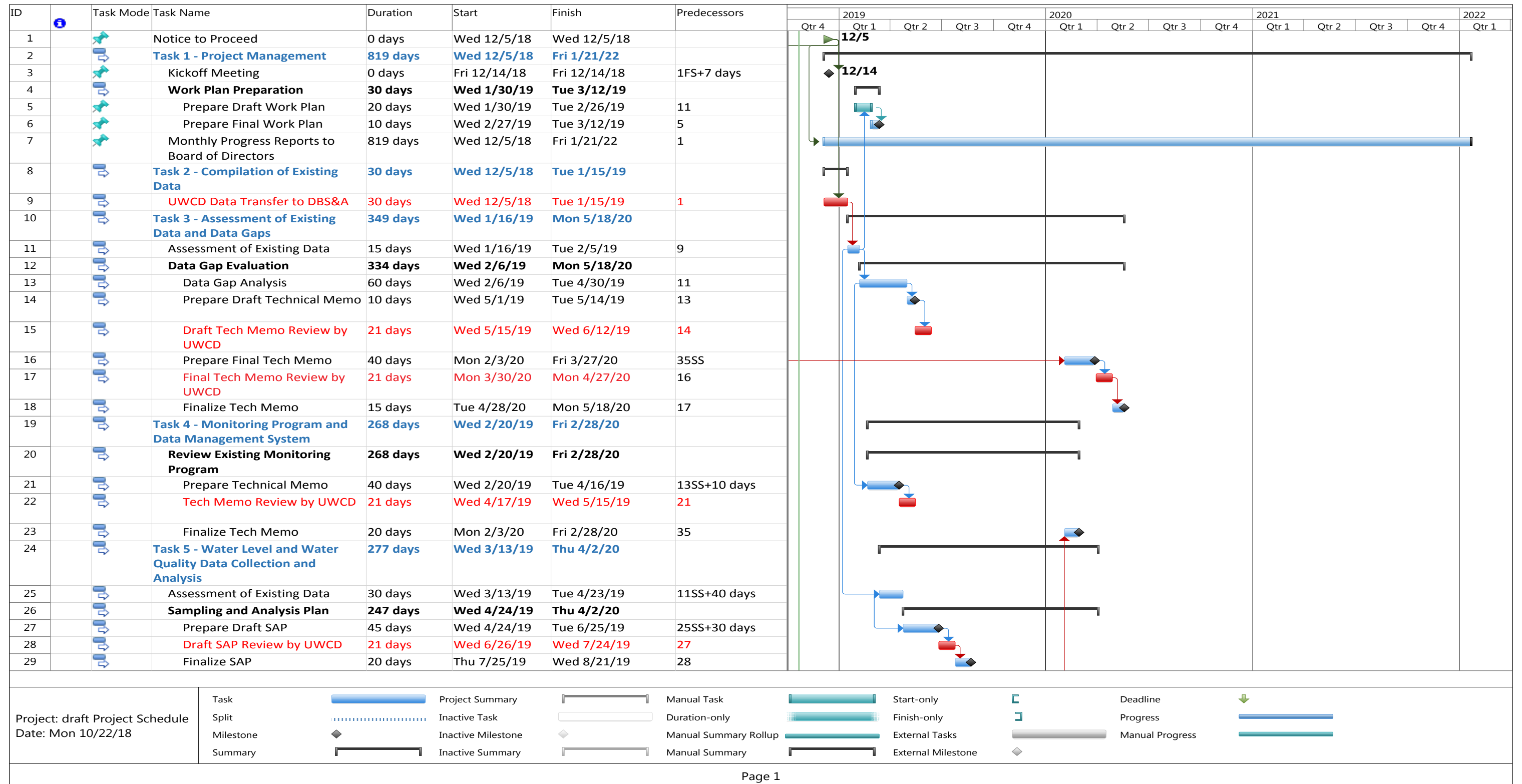
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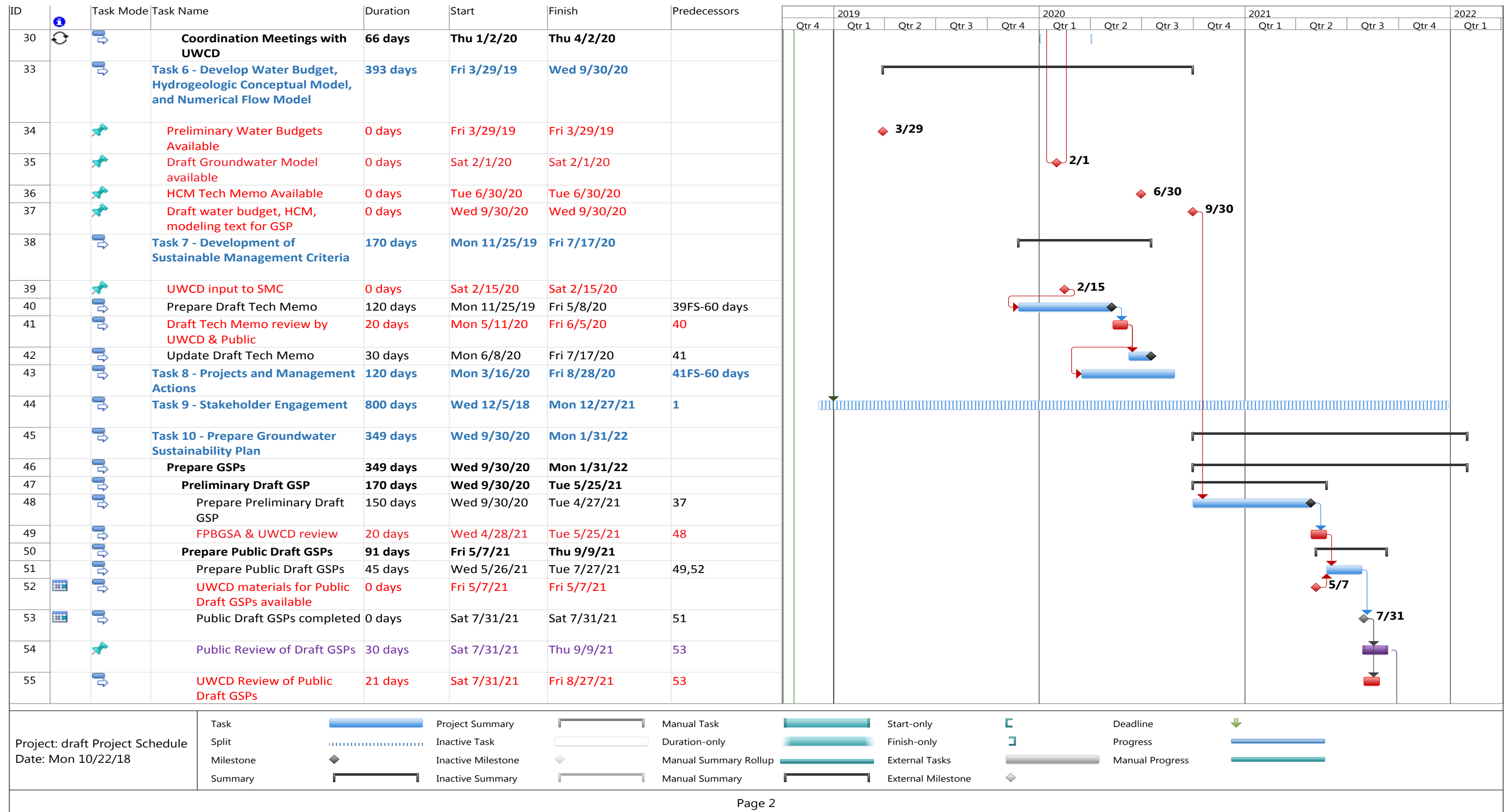
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Ventura County Watershed Protection District, Hydrologic Data Server (Hydrodata). <http://www.vcwatershed.net/hydrodata/>



## **Appendix C. Estimated Project Schedule**







ID		Task Mode	Task Name	Duration	Start	Finish	Predecessors																
								Qtr 4	2019				2020				2021				2022		
								Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1			
56			Prepare Final Draft GSPs	101 days	Fri 9/10/21	Mon 1/31/22																	
57			Update Draft GSPs	30 days	Fri 9/10/21	Thu 10/21/21	54																
58			Final GSPs adopted by GSA	0 days	Thu 10/21/21	Thu 10/21/21	57																
59			Final GSPs submitted to DWR	0 days	Wed 11/10/21	Wed 11/10/21	58FS+14 days																
60			DWR Deadline for GSP Submittal	0 days	Mon 1/31/22	Mon 1/31/22																	
61			Task 11 - Grant Assistance	815 days	Wed 12/19/18	Mon 1/31/22	1																

Project: draft Project Schedule Date: Mon 10/22/18	Task		Project Summary		Manual Task		Start-only		Deadline	
	Split		Inactive Task		Duration-only		Finish-only		Progress	
	Milestone		Inactive Milestone		Manual Summary Rollup		External Tasks		Manual Progress	
	Summary		Inactive Summary		Manual Summary		External Milestone			

## FEE PROPOSAL



# Groundwater Sustainability Plans Preparation for Fillmore Basin and Piru Basin

October 24, 2018

Prepared for



PO Box 1110  
Fillmore, CA 93016

Prepared by



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

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

## FEE PROPOSAL

The Daniel B. Stephens & Associates, Inc. team is pleased to provide the Fillmore and Piru Basins Groundwater Sustainability Agency (FPBGSA) with our cost proposal to prepare Groundwater Sustainability Plans (GSPs) for Fillmore Basin and Piru Basin. We have used our understanding of the stated desires of the FPBGSA Board of Directors to aid in developing this cost estimate. Those assumptions include, but are not necessarily limited to, the following:

- ◆ The Board of Directors preference is to maximize the Prop 1 GSP Development grant award. Per the terms of the grant agreement the DWR will reimburse the FPBGSA \$0.74 of each \$1.00 spent to prepare its GSPs up to a maximum reimbursable amount of \$1,500,000;
- ◆ The primary source of funding for the GSPs' development will be the Prop 1 grant funds. Consequently, a desired goal is to keep the costs within the limits of the Prop 1 grant award;
- ◆ Separate GSPs will be prepared for each of the Fillmore and Piru groundwater basins;
- ◆ United Water Conservation District will assist with the GSPs' development by providing

hydrogeologic data, technical memoranda, and groundwater flow model scenario runs. These services are being provided on a cost-reimbursable basis in accordance with a separate time-and-materials agreement between UWCD and FPBGSA. A budget for UWCDs efforts has not been formally established; and

- ◆ FPBGSA will self-perform a portion of the stakeholder engagement efforts including outreach to disadvantaged communities; however, the RFP does not detail the scope of these efforts or reconcile the scope with DWR requirements. For the purposes of this proposal, it is assumed that the GSP consultant will assist with the Communication and Engagement Plan preparation and provide overall guidance to the Agency on how to comply with DWR's requirements.

Information provided at the September 27, 2018 Board of Directors meeting contained a revised budget for the GSP development effort. It is presumed that the changes in the budget resulted from consultation with the DWR grant administrator during the grant contract negotiations. As a result, the following alternations to the grant amounts are:

**Table 1. Proposition 1 Grant Summary**

	Category	Grant Amount	Required Cost Share	Other Cost Share	Total Cost
(a)	Grant Administration	\$0	\$30,228	\$0	\$30,228
(b)	Stakeholder Coordination and Engagement	\$52,912	\$0	\$0	\$51,912
(c)	Construction/Implementation	\$302,970	\$497,030	\$0	\$800,000
(d)	Model and GSP Development	\$1,145,118	\$0	\$0	\$1,145,118
	<b>Total Costs</b>	<b>\$1,500,000</b>	<b>\$527,258</b>	<b>\$0</b>	<b>\$2,027,258</b>





To exercise maximum advantage of the Prop 1 grant award, the DBS&A team analyzed how the grant expenditures were allocated to major activities needed to complete the GSPs. Our analyses are summarized in the below table and following narrative.

Items (1) through (5) and their associated budgets are presented in the Prop 1 Grant Award that totals \$2,027,258 (\$1,500,000 in reimbursements and \$527,258 in matching FPBGSA expenditures or in-kind services). Overall, this means the agency must incur \$2,027,258 in expenditures or in-kind services to receive the maximum reimbursement of \$1,500,000 via the grant.

To prepare our cost proposal, we reviewed the grant application summaries and available information from the FPBGSA Board of Director meeting minutes and board packets. Some of our key observations include:

- A. At the time the grant application was submitted, it was assumed that UWCD would prepare the entire GSPs for both basins on a cost-reimbursable basis. This assumption is no

longer valid, and UWCD's role will be to provide FPBGSA with data, technical memoranda, and groundwater flow modeling runs (as summarized in the RFP and various Board of Director meeting minutes) to support the GSP consultant. Consequently, the \$799,576 grant amount (#3 in the table above) can be reduced to an amount more reflective of UWCD's lesser anticipated effort. A budget for UWCD's efforts was not a part of the RFP, so we have assumed \$200,000 as the approximate amount needed to reimburse UWCD for its groundwater flow modeling efforts. The FPBGSA Board of Directors approved a consulting agreement with UWCD itemizing unit rates for various labor categories (August 23, 2018 Board of Director meeting, Item 8C). If it is assumed that the bulk of the time spent by UWCD staff on the modeling effort will be by Senior-level persons, then approximately 1,809 man-hours are represented by the \$200,000 budget allocation ( $\$200,000 / \$110.57 \text{ per hr} = 1,808.88$  or ~1,809 man-hrs). This level of effort is thought to be sufficient for the scope of work;

**Table 2. Proposition 1 Grant Award Assumed Allocations**

	Grant	DBS&A Proposal		
		UWCD	GSP Consultant	Others
GSP Project Administration (1)	\$30,228	\$30,228	\$0	\$0
Monitoring Wells (2)	\$800,000	\$0	\$0	\$800,000
GW Model (3)	\$799,576	\$200,000	\$0	\$0
GSP Preparation (4)	\$345,542	\$0	\$745,118	\$0
Outreach (5)	\$51,912	\$0	\$51,912	\$0
In Kind Services (estimated)		\$200,000	\$0	\$0
Total Grant Award	\$2,027,258			
Subtotals by Entity		\$430,228	\$797,030	\$800,000
Total of all Entities			\$2,027,258	



- B. Two nested monitoring wells would be constructed as part of the GSP preparation process. The location and construction details will be determined at a later date. The RFP did not contain a scope of work to construct the monitoring wells as a task to be performed by UWCD and it was not included in the scope of work to be performed by the GSP consultant. Consequently, the amount for this effort (\$800,000) has not been modified and it is designated to be performed by "others"; and
- C. UWCD (and possibly others) has (have) performed services in support of the GSA and the GSP development process that can likely be claimed as in-kind services and therefore used to assist the FPBGSA in meeting the required cost share

associated with the grant. The value of the in-kind services is not presented in the RFP, so it is assumed that those services will total \$200,000.

The analyses suggest that as much as \$797,030 is potentially available for the preparation of the GSPs, including stakeholder outreach efforts. Using this analysis as our guidance, the DBS&A team has created a scope of work with a proposed budget that is reflective of that level of funding.

Several assumptions were made by the DBS&A team to create our proposed budget. If the FPBGSA prefers different assumptions, then we are certainly willing to revisit our budget in light of those new assumptions. Our summary budget is contained in Table 3 below with more detail provided in the supplemental spreadsheets contained herein.

Table 3. Cost Estimate Summary

Task	Task Description	DBS&A Labor	Other Direct Costs	Task Sub Total
1	Project Management	\$94,320	\$15,780	\$110,100
2	<b>Compilation of Existing Data</b>	\$8,200	\$16,267	\$24,467
3	*Assessment of Existing Data and Data Gap Analysis	\$20,600	\$10,844	\$31,444
4	Monitoring Program and Data Management Systems	\$25,560	\$6,778	\$32,338
5	Water Level and Water Quality Data Collection and Analysis	\$4,720		\$4,720
6	Develop Water Budget, Hydrogeologic Conceptual Model, and Numerical Flow Model	\$30,200	\$18,978	\$49,178
7	Development of Sustainable Management Criteria	\$42,208	\$21,689	\$63,897
8	Projects and Management Actions	\$46,160	\$22,822	\$68,982
9	Stakeholder Engagement	\$12,480	\$45,133	\$57,613
10	Prepare Groundwater Sustainability Plan	\$314,320	\$33,889	\$348,209
11	Grant Assistance	\$4,000		\$4,000
<b>Subtotals</b>		<b>\$602,768</b>	<b>\$192,180</b>	<b>\$794,948</b>
<b>Estimated Project Total</b>				<b>\$794,948</b>





Table 4. Cost Estimate Breakdown

Task	Task Description	Man-days							
		Prin II	Prin I	Senior II	Senior I	Project II	Project I	Staff II	Sr Tech Editor
		Cullen Morgan	Blandford	LeClaire	Calhoun	Ewing Cartron, J Moore, S	Moore, T Williams	Erbele Hampton	Fay Torgimson
		\$250.00	\$250.00	\$230.00	\$204.00	\$173.00	\$155.00	\$130.00	\$122.00
1	Project Management	36					18		
	1* man-day/month for 36 months by PM	\$72,000					\$22,320		
2	Compilation of Existing Data	1					5		
	*Majority of data has been compiled by UWCD; minimal new research needed	\$2,000					\$6,200		
3	*Assessment of Existing Data and Data Gap Analysis	1					15		
		\$2,000					\$18,600		
4	Monitoring Program and Data Management Systems	1		5	5		5		
		\$2,000		\$9,200	\$8,160		\$6,200		
5	Water Level and Water Quality Data Collection and Analysis	.5					3		
		\$1,000					\$3,720		
6	Develop Water Budget, Hydrogeologic Conceptual Model, and Numerical Flow Model	2	10				5		
		\$4,000	\$20,000				\$6,200		
7	Development of Sustainable Management Criteria	10		1		2	1	5	
		\$20,000		\$1,840		\$2,768	\$12,400	\$5,200	
8	Projects and Management Actions	8				20	2		
		\$16,000				\$27,680	\$2,480		
9	Stakeholder Engagement	5					2		
		\$10,000					\$2,480		
10	Prepare Groundwater Sustainability Plan	50					90	80	20
		\$100,000					\$111,600	\$83,200	\$19,520
11	Grant Assistance	2							
		\$4,000							
*Assumptions									
Subtotals		\$233,000	\$20,000	\$11,040	\$8,160	\$30,448	\$192,200	\$88,400	\$19,520
Total		\$602,768							



Table 5. Cost Estimate ODC's Breakdown

Task	Task Description	ODC's (Includes 10% Subconsultant Markup)			
		Personal or Company Vehicle Mileage \$0.545/mi	SWS	CCP	Dominique Carton
1	Project Management	3,600**			
	1* man-day/month for 36 months by PM		\$9,489	\$4,111	
2	Compilation of Existing Data				
	*Majority of data has been compiled by UWCD; minimal new research needed		\$16,267		
3	*Assessment of Existing Data and Data Gap Analysis				
			\$10,844		
4	Monitoring Program and Data Management Systems				
			\$6,778		
5	Water Level and Water Quality Data Collection and Analysis				
			\$18,978		
6	Develop Water Budget, Hydrogeologic Conceptual Model, and Numerical Flow Model				
			\$21,689		
7	Development of Sustainable Management Criteria				
			\$9,489		
8	Projects and Management Actions				
			\$8,133		\$13,333
9	Stakeholder Engagement				
			\$33,889	\$37,000	
10	Prepare Groundwater Sustainability Plan				
11	Grant Assistance				
**Mileage					
Subtotals		\$2,180	\$135,556	\$41,111	\$13,333
Total		\$192,180			

