Notice and Agenda of a Workshop of the Yucaipa Sustainable Groundwater Management Agency

Thursday, August 9, 2018 at 8:30 a.m.

City of Yucaipa, 34272 Yucaipa Boulevard
Yucaipa, California 92399
(909) 797-2489 | www.yucaipasgma.org

I. Call to Order

II. Roll Call

III. Public Comments At this time, members of the public may address the representatives of the Yucaipa Groundwater Sustainability Agency on matters within its jurisdiction.

IV. Discussion Items

A. Interviews for the Development of a Groundwater Sustainability Plan for the Yucaipa Valley Basin Ares

- Water Systems Consulting - 9:00 am [Proposal provided on page 3 of 208]
- Dudek - 10:00 am [Proposal provided on page 74 of 208]
- Todd Groundwater - 11:00 am [Proposal provided on page 146 of 208]

V. Comments by Board of Directors

VI. Announcements - Future Meetings

A. Wednesday, August 22, 2018 at 10:00 am

B. Wednesday, September 26, 2018 at 10:00 am

C. Wednesday, October 24, 2018 at 10:00 am

D. Wednesday, January 23, 2019 at 10:00 am

VII. Adjournment

Roll Call - Board of Directors

Purveyors	Present	Primary Representative	Present	Alternative Representative
South Mesa Water Company		David Armstrong		George Jorritsma
South Mountain Water Company		- -		- -
Western Heights Water Company		Mark Iverson		Tim Green
Yucaipa Valley Water District		Joseph Zoba		Jennifer Ares
Municipals				
City of Calimesa		Lori Askew		Bonnie Johnson
City of Redlands		Cecilia Griego		- -
City of Yucaipa		Ray Casey		Fermin Preciado
Regionals				
San Bernardino Valley MWD		Doug Headrick		Bob Tincher
San Gorgonio Pass Water Agency		Jeff Davis		- -
Stakeholders				
County of Riverside		Steve Horn		Jeff Johnson
County of San Bernardino		Bob Page		- -

* Quorum requires a minimum of five Purveyor, Municipal, Regional members.

SAN BERNARDINO VALLEY MUNICIPAL WATER DISTRICT

In Partnership With:

Yucaipa Valley Water District, Western Heights Water Company, South Mesa Water Company, South Mountain Water Company, City of Calimesa, City of Yucaipa, City of Redlands, and San Gorgonio Pass Water Agency

June 20, 2018

PROPOSAL TO DEVELOP A GROUNDWATER SUSTAINABILITY PLAN FOR THE YUCAIPA BASIN AREA

WSC
WATER SYSTEMS CONSULTING, INC.

MR. AARON JONES
Assistant Engineer
380 East Vanderbilt Way
San Bernardino, CA 92408

PROPOSAL TO DEVELOP A
Groundwater Sustainability Plan for the Yucaipa Basin Area

WATER SYSTEMS CONSULTING, INC.
9375 Archibald Avenue, Suite 200
Rancho Cucamonga, CA 91730
(909) 483-3200

Dear Mr. Aaron Jones,

The Yucaipa Basin Groundwater Sustainability Agency (GSA) is seeking assistance in developing a Groundwater Sustainability Plan (GSP) for the Yucaipa Groundwater Basin. The GSP must be compliant with the Final GSP Emergency Regulations approved by the California Water Commission and outline a clear, supported, and sustainable path forward to address declining groundwater conditions.

Water Systems Consulting, Inc. (WSC) and Geoscience have partnered together to bring the right combination of technical and stakeholder facilitation expertise to help develop a compliant and defensible plan that will provide the greatest value to the Yucaipa Basin GSA members. Our team will:

- **Develop a pathway to sustainability.** Our team has an extensive understanding of the groundwater management challenges and opportunities in the Yucaipa Basin area from our experience working with and listening to GSA members. We will leverage this understanding to develop clear sustainability goals and management actions that support a shared vision while also being cognizant of the Basin's many management areas.
- **Guide an efficient GSP development process.** Our team brings working knowledge of the Yucaipa Basin and has a significant amount of the data required for the GSP, allowing us to perform the early planning tasks efficiently. Geoscience supplements WSC's team to provide insight, experience, and data for the Yucaipa Basin, with experience completing dozens of projects for the GSA members, 11 of which were in the Yucaipa Basin. Through past work, our firms have developed a seamless working relationship while helping our clients achieve their goals.
- **Build support and foster engagement.** WSC's proven facilitation and stakeholder engagement team has experience effectively facilitating the development of regional, multi-agency water management plans throughout California. We will navigate the GSA members through the GSP development process, engage key stakeholders, and gain alignment and support among stakeholders.

The scope of work and fee estimate were prepared based on the information contained in the RFP and would appreciate the opportunity to refine the scope to align with the progress of other infinitives and meet the GSP requirements.

Thank you for this opportunity to submit our proposal. We look forward to partnering with the Yucaipa Basin GSA members on this important endeavor.

Sincerely,
Water Systems Consulting, Inc.

JEROEN OLTHOF,
PE, MS, MBA
Chief Operating Officer, (858) 227-2551

MICHAEL CRUIKSHANK,
PG, CHG, MS
Principal Hydrogeologist, (909) 483-3201

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THE WSC-GEOSCIENCE TEAM

IS YOUR PREMIER GROUNDWATER SUSTAINABILITY PLAN PARTNER

WATER SYSTEMS CONSULTING, INC.

WSC is a full-service engineering consulting firm that specializes in delivering innovative sustainable solutions, building relationships, and bringing value to our clients.

We value our role in supporting our clients as they provide reliable service to their community, and in creating a sustainable future through responsible business practices. Our core competencies include water resources and groundwater management, hydrogeology, infrastructure design, stakeholder outreach and coordination, and program facilitation.

WSC brings a comprehensive understanding of the required components of a Groundwater Sustainability Plan (GSP) and members of our team have completed numerous directly relevant hydrogeologic studies. WSC has partnered within many of the Yucaipa Groundwater Sustainability Agency (GSA) members and developed a comprehensive understanding of the local water portfolio, as well as developed relationships with many of the key project stakeholders.

WSC prides ourselves on our ability to effectively and efficiently collect, compile, and analyze data to determine implementable solutions that will mutually benefit all participating agencies. We facilitate working sessions that enhance collaboration, understanding, and to enable transparent knowledge-transfer.

GEOSCIENCE

Geoscience specializes in groundwater modeling, sustainability studies, full-service water well design and rehabilitation, and recycled water projects. Over the past 40 years they have completed more than 2,000 groundwater studies including basin-wide sustainable management, safe yield, well siting, and others.

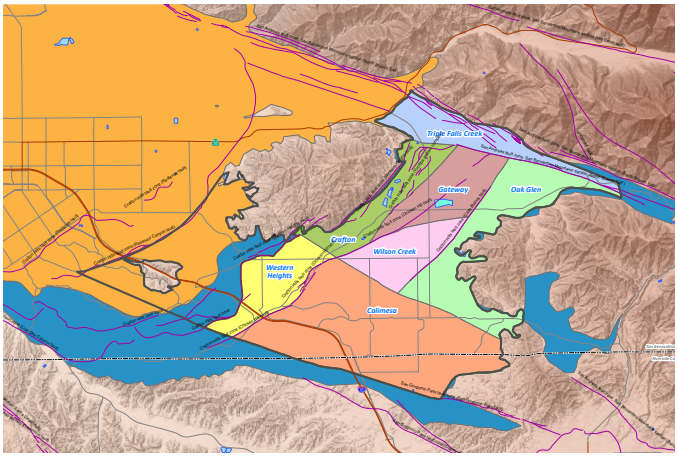
As a full-service hydrogeologic consulting firm, Geoscience has completed all of the technical components required in a Groundwater Sustainability Plan. They bring the expertise to complete a full range of hydrogeologic services, including groundwater and surface water modeling, GIS mapping, monitoring well and network design and construction, municipal and injection well design and construction, extensometer design and construction, and subsidence monitoring using InSar.

The Geoscience team has many years of experience evaluating sustainable yield in numerous groundwater basins, including the Yucaipa Basin. As required for this project, they routinely refine and modify USGS groundwater models, including MODFLOW. Additionally, the groundwater modeling lead, Johnson Yeh, collaborates with the USGS to develop models for the Yucaipa and San Bernardino area, and is helping USGS beta-test GSFLOW. Geoscience will leverage their lessons learned from more than 40 projects that they have completed for the GSA members, 11 of which were in the Yucaipa Basin.

PROJECT UNDERSTANDING

The Yucaipa Groundwater Basin has been identified by the Department of Water Resources (DWR) as a high priority basin, requiring the development of a GSP to be submitted to DWR by January 31, 2022. The GSP must be compliant with the Final GSP Emergency Regulations approved by the California Water Commission on May 18, 2016.

The Yucaipa Groundwater Basin has been studied extensively since the 1970's by the United States Geological Survey (USGS) and consultants working for the purveyors and regional agencies. Stakeholders in the Yucaipa Basin have observed declining groundwater conditions in many of the sub-basins and began working collaboratively on elements of a groundwater management plan in 2014.



Yucaipa GSA

Stakeholders in the Yucaipa Basin have already developed a shared vision for sustainable groundwater management and were already performing studies and collaborating on groundwater management activities. This forward thinking led to the successful formation of a single Yucaipa Groundwater Sustainability Agency (Yucaipa GSA) to complete the GSP. Since the Yucaipa GSA was formed, they have held monthly meetings where administrative items, most notably the Bylaws of the Yucaipa GSA, were established. The Yucaipa GSA conducts regular meetings on the fourth Wednesday of each month.

Yucaipa Basin Boundary Modification

In 2016, as part of the Sustainable Groundwater Management Act (SGMA) basin boundary modification, Valley District modified the groundwater basin boundary for the Yucaipa Basin to be more consistent with the Yucaipa Basin watershed boundary and to close the gaps between adjacent basins. The seven subbasins (Triple Falls Creek, Gateway, Oak Glen, Crafton, Wilson Creek, Western Heights, and Calimesa) were used to determine the safe yield estimates in 2014 and the subsequent annual change in groundwater storage capacities. The subbasins will be updated to match Yucaipa Basin boundary as currently defined.

USGS Groundwater Model

The USGS is in the third year of a four-year project with Valley District to develop an integrated flow model in the Yucaipa Basin. The Yucaipa Basin Groundwater Model is a four-layer model using the computer code GSFLOW. GSFLOW was developed by the USGS to simulate coupled groundwater and surface water resources. The USGS is scheduled to have a fully calibrated groundwater flow model by the end of June 2018 for use in developing the GSP. The USGS has also provided technical outreach in support of studies and projects being performed by Valley District and the retail agencies.

YUCAIPA GSA BOARD OF DIRECTORS

PURVEYORS

South Mesa Water Company

South Mountain Water Company

Western Heights Water Company

Yucaipa Valley Water District

MUNICIPALS

City of Calimesa

City of Redlands

City of Yucaipa

REGIONALS

San Bernardino Valley Municipal Water District

San Gorgonio Pass Water Agency

STAKEHOLDERS

County of Riverside

County of San Bernardino

PROJECT APPROACH

Our approach is designed to efficiently produce a GSP that is defensible and widely accepted. Tasks 1 through 5 are largely informational, and the WSC-Geoscience Team will perform these tasks efficiently as we will draw on the experience of key team members in the Yucaipa Basin. WSC's proven facilitation and stakeholder engagement team will navigate the GSA through critical Tasks 6 ,7, and 9 of the GSP and gain alignment amongst the GSA members. Following each task where a technical memorandum is prepared, the draft technical memorandum will be reviewed by the GSA, and a workshop will be conducted and coordinated with the regularly scheduled GSA meetings. In addition to the workshops with the GSA, 13 workshops with the Technical Advisory Committee (TAC) will be conducted at strategic junctures during the development of the GSP, as described in Task 17 in the RFP. During preparation of this proposal, our team identified two additional recommended TAC meetings to address the sustainable yield estimations and definition of management areas that will be critical for the success of the GSP.

EVALUATE SUPPLIES AND DEMANDS

TASK 1.0 USGS GROUNDWATER MODEL

Our team has successfully used models developed by the USGS to conduct geohydrologic studies in several groundwater basins, including groundwater models for the San Bernardino Basin Area, Rialto-Colton Basin, and Antelope Valley. Geoscience is currently in the process of developing an integrated Upper Santa Ana River groundwater model that incorporates the model layers developed by the USGS in the Yucaipa Basin.

The Yucaipa Basin Groundwater Model developed by the USGS is a four-layer groundwater model using the computer code GSFLOW. GSFLOW was developed by the USGS to simulate coupled groundwater and surface water resources. We have used the GSFLOW computer code to develop the Murrieta-Temecula Groundwater Basin Model in coordination with the USGS and can conduct the model scenarios efficiently and accurately for the Yucaipa Basin.

We will obtain the calibrated Yucaipa Groundwater Model developed by the USGS and will rerun the model to validate the results. Our team will analyze the modeled water budgets to develop the information required in the following tasks, historic and current groundwater conditions (Task 2), water budget and sustainable yield (Task 4), and data management system (Task 12). We will also run various predictive model scenarios to provide necessary information to define undesirable results, minimum thresholds and measurable objectives (Task 6) and to identify projects and management actions to achieve sustainability.

TAC Meeting: USGS Model Inputs

Deliverables: TM summarizing USGS model use for GSP preparation

TASK 2.0 CURRENT AND HISTORICAL GROUNDWATER CONDITIONS

2.1 Summarize Studies

The Yucaipa Groundwater Basin has been studied extensively since the 1970s by the USGS and consultants working for the Yucaipa Valley Water District or Valley District. Geoscience has reviewed the geologic and hydrogeologic technical documents available for the basin over the course of a number of studies completed in the basin.

2.2 Sustainability Indicators

This task will document historical and current sustainability indicators as established by SGMA. This documentation will become the foundation for the development of the sustainability criteria (Task 6). The team understands that the identification of sustainability criteria is a critical aspect to the development of the GSP and will be referenced throughout the development process. This process will be stakeholder driven and two TAC meetings will be dedicated to evaluating and achieving consensus of the historical water level and water quality conditions of the Yucaipa Basin.

The GSA members have maintained an extensive record of groundwater data from numerous wells in the Valley. Having prepared a preliminary groundwater model of the basin, Geoscience is very familiar with the database for the Valley. The results of the 2014 "Safe Yield" study indicated that the basin was in overdraft for the period of study. The USGS model will be used to further assess the basin conditions with regards to groundwater overdraft and the other sustainability indicators.

- **Groundwater Levels and Storage.** Considerable work has been completed to understand the change in storage in the groundwater basin by Valley District. Current and historical groundwater level and storage estimates data will be reviewed.
- **Water Quality.** The existing data will be used to evaluate the ambient groundwater quality as a basis for evaluation of future projects including recycled water recharge.
- **Seawater Intrusion.** Although the Yucaipa groundwater basin has no direct hydraulic connection to the sea, an evaluation of potential brackish water sources potentially from irrigation return flows will be considered in the analysis.
- **Subsidence.** The subsurface geologic conditions in the southern portion of the basin indicate the presence of a well-defined aquitard as well as lenses of materials that may be potentially susceptible to liquefaction. The USGS model will be equipped with the subsidence package to evaluate potential subsidence under various planning scenarios.
- **Identification of Interconnected Surface Water Streams.** Several surface streams are present in Yucaipa Valley including Yucaipa Creek, Live Oak Canyon Creek, and Wildwood Canyon Creek. These streams have seasonal flowing water which recharge the groundwater aquifer. However, most of the year there is a vadose zone between the surface of the stream and the groundwater surface, so basin pumping does not directly influence the seasonal flow in streams.
- **Identification of Groundwater-Dependent Ecosystems.** Groundwater-dependent ecosystems will be identified using available shapefiles generated by projects in the Santa Ana Watershed in combination with the hydrologic model developed by the USGS.

TAC Meetings

- ***Evaluation of Historical Groundwater Levels***
- ***Evaluation of Historical Groundwater Quality Conditions***

Deliverables: TM that will become the "Current and Historic Groundwater Conditions" chapter of the Yucaipa GSP.

TASK 3.0 PLAN AREA INCLUDING LAND USE

This task provides a description of the plan area for the Yucaipa Basin. Many of the requirements of the plan area chapter are included in many of the documents already prepared for the Yucaipa Basin and have been written by the project team. The team will leverage the existing work prepared for the USGS Model, Regional Urban Water Management Plan, Regional Recycled Water Concept Study, Ambient Water Quality, Safe Yield, and other studies to efficiently describe the Yucaipa Groundwater Sustainability Plan area.

Deliverables: TM that will become the "Plan Area" chapter of the Yucaipa GSP.

TASK 4.0 WATER BUDGET AND SUSTAINABILE YIELD

Seven subbasin boundaries within the Yucaipa Basin were defined by the USGS in 1970 based on groundwater levels differences from data obtained from a limited set of wells. Previous workers have calculated the safe yield of the sub-basins for water resource planning. The "safe yield" refers to the natural recharge available to a groundwater basin. The term "sustainable yield" includes both natural and supplemental water sources added to the groundwater system such as recharge of imported water and return flow from imported water. In 2014, Geoscience was commissioned by Valley District and the GSA members to review the location of subbasin boundaries and to provide an update of the sustainable yield for each subbasin and the basin as a whole, and to determine the usable storage capacity for potential groundwater recharge. Since then, the basin boundary has been modified by DWR at the request of basin stakeholders as a part of the SGMA process resulting in an expanded basin boundary and adding an eighth subbasin. The newly constructed USGS model will be used to update sustainable yield estimates for the Yucaipa Groundwater Basin and subbasins. Our team will build on the 2014 safe yield report and use the USGS model to describe the water budget and sustainable yield determinations.

TAC Meetings

- ***Water Budget – Groundwater Inputs***
- ***Water Budget – Groundwater Outputs***
- ***Additional Recommended Meeting: Sustainable Yield***

Deliverables: TM that will become the "Water Budget and Sustainable Yield" chapter of the Yucaipa GSP.

TASK 5.0 DEFINE MANGAGEMENT AREAS

The Yucaipa Basin boundary modification resulted in a different boundary than the boundary previous studies have relied upon. The new Yucaipa Basin boundary extends into areas not previously associated with the Yucaipa Basin including Live Oak Canyon to the southwest, and the Singleton area to the southeast. The seven existing subbasins will be reevaluated and additional subbasins may be added if they are determined to behave hydrologically different and may need to be managed separately. We will build on our team's understanding of the hydrogeology as well as specific management plans and needs by the basin stakeholders to provide recommendations for the establishment of unique management areas. For the purposes of this proposal, work up to this task will take place prior to Task 4 Water Budget and Sustainable Yield. The proposed water budgets and sustainable yield will be computed for each management area and will be assessed and provided as recommendations for discussions with the stakeholders.

TAC Meeting

- ***Additional Recommended Meeting: Define Management Area***

Deliverables: TM that will become the the "Management Areas" chapter of the Yucaipa GSP.

ESTABLISH SUSTAINABILITY GOALS

TASK 6.0 DEFINE UNDESIREABLE RESULTS, MINIMUM THRESHOLDS, MEASUREABLE OBJECTIVES

The WSC-Geoscience team will work with the Yucaipa GSA and TAC to define the sustainability goal in accordance with GSP regulations. The sustainability goal is critical and will define how groundwater will be managed over the 20-year implementation phase and eliminate the undesirable results.

The definition of the undesirable results, minimum thresholds, and measurable objectives require scientific-based methods and will be driven by technical information from the USGS model and information documented in the Evaluate Supplies and Demands Phase (Tasks 1 through 5). The primary mechanism for achieving consensus amongst the GSA members is driven through the stakeholder process in three TAC meetings. During the stakeholder process of considering thresholds, the team will be cognizant of the different management areas and representative monitoring required to measure the objectives. For the

purposes of this proposal, it is assumed that sustainability indicators will be developed for up to four management areas. The management areas may make up multiple subareas and will be defined in the TAC and GSA meetings.

Undesirable Results

Undesirable results are defined as significant and unreasonable effects for one or more sustainability indications (as defined in Task 2) caused by groundwater conditions in the basin. Our team will work with the Yucaipa GSA and TAC to define the undesirable results. We will provide a description of the basin groundwater conditions that would lead to undesirable results, criteria used to determine when they occur, and potential effects of undesirable results. We will utilize the USGS groundwater flow model to help evaluate the key sustainability indicators.

Minimum Thresholds

We will develop minimum thresholds for the applicable sustainability indicators identified for the Yucaipa Basin. Minimum thresholds are a numeric value used to define the undesirable results in the previous subtask. The minimum thresholds are a critical component of the GSP as they set levels that determine whether the Yucaipa Basin is experiencing undesirable results and not achieving the sustainability goal. Our team will provide justification for each minimum threshold and will describe the relationship between different levels of the minimum thresholds and the effects on the other sustainability indicators. Our team will prepare maps and graphics to illustrate the sustainability indicators.

Measurable Objectives

The key to developing measurable objectives is that they provide sufficient operational flexibility under adverse conditions and consider levels of uncertainty. For example, a margin of operational flexibility (a buffer between the minimum threshold and objective) can be used during extended drought periods without causing undesirable results. Interim milestones will be developed for each applicable sustainability indicator in five year intervals (five, ten, 15, and 20 years).

TAC Meetings

- ***Define the undesirable results and minimum thresholds related to groundwater levels and storage***
- ***Define the undesirable results and minimum thresholds related to groundwater quality***
- ***Define the undesirable results and minimum thresholds related to other groundwater parameters***

Deliverables: TM that will become the "Undesirable Results, Minimum Thresholds, and Measurable Objectives" chapter of the Yucaipa GSP.

IDENTIFY AND EVALUATE MANAGEMENT ACTIONS

TASK 7.0 IDENTIFY PROJECTS AND MANAGEMENT ACTIONS TO ACHIEVE SUSTAINABILITY GOAL

The Yucaipa Basin GSP will identify and describe projects and management actions that will help achieve the sustainability goal identified in Task 6. The project identification and prioritization process will be a stakeholder driven process focused on the benefits of each project and the contribution to the sustainability goal. The Yucaipa Basin GSA members began working on the elements of a Groundwater Management Plan together in 2014 and have identified supplemental recharge of imported and recycled water as projects that can help achieve sustainability.

The team will develop a preliminary list of potential projects and management actions that build upon previous efforts to help in achieving sustainability and avoiding overdraft.

TAC Meetings

- ***Actions to Achieve Sustainability – Project brainstorm of existing and planned management and new actions to achieve sustainability***
- ***Actions to Achieve Sustainability – Review results of project ranking system and develop groundwater model scenarios to evaluate project and management actions***

Deliverables: TM that will become the "Projects and Management Actions to Achieve Sustainability Goal" chapter of the Yucaipa GSP.

TASK 8.0 INFILTRATION TESTING

Considerable work has been conducted by basin stakeholders to assess the potential to recharge the groundwater in the Yucaipa basin. The most recent activity includes conducting pilot infiltration testing at 13 sites across the valley, and the regional infiltration study is currently underway. Our team will incorporate the results of the infiltration study into the USGS model which will then be used to assess future management activities, including groundwater recharge from stormwater, imported water, or from recycled water, and to evaluate the impacts of groundwater recharge projects on sustainability goals. Our team will summarize the infiltration test results and the implications of those results on future projects and sustainable management.

Deliverables: TM that will become the "Summary of Infiltration Test Results" chapter of the Yucaipa GSP.

IMPLEMENTING THE PLAN AND ADAPTIVE MANAGEMENT

TASK 9.0 DEFINE IMPLEMENTATION ACTIONS

In this task, our team will develop a plan of action for implementing the projects and management actions identified in Task 7. The plan includes costs, schedule, annual reporting, and a periodic assessment of progress towards sustainability.

Deliverables: TM that will become the "Plan Implementation Actions" chapter of the Yucaipa GSP.

TASK 10.0 DESCRIBE EXISTING AND PLANNED MONITORING NETWORK

Our team currently has an updated database of water levels in the basin. We will summarize the known monitoring programs and activities within the groundwater basin that can be used to meet SGMA requirements. Identifying existing monitoring points will help our team determine the scale of the monitoring plan needed to consistently collect data to evaluate progress and meet all sustainability goals. There are sufficient monitoring points to develop a groundwater monitoring network to provide on-going monitoring for SGMA thresholds. However, specific monitoring points, including the USGS monitoring system, will be selected to collect data that will be used for on-going evaluation of the sustainability indicators.

Subsidence monitoring is a unique subset of the monitoring program. In other regions, land subsidence in relation to groundwater withdrawals has occurred where fine-grained soils have been dewatered resulting in hydrocompaction. We will confirm or expand on our current understanding from previous project areas with soils that are potentially susceptible to hydrocompaction. Geoscience has provided subsidence condition monitoring and assessment for more than 20 years. Geoscience designed and is currently overseeing extensometer construction for the Rancho California Water District to help assess land subsidence. More recently, we have added InSar imagery evaluation to the extensometer data to

monitor for potential land subsidence in the groundwater basin. The initial data assessment may or may not disclose evidence for historical subsidence in the Valley. However, we will prepare a step-by-step approach to develop a defendable and cost-effective monitoring program for subsidence.

The scale and frequency of the monitoring plan will be formulated to provide a cost-effective means to evaluate if the on-going water quality conditions are consistent with water quality objectives defined in the Basin Plan and to track progress towards achieving sustainability goals for the subbasins. As appropriate, the monitoring plan will include a recommendation to install pressure transducers in several key wells to allow collection of data between quarterly monitoring events which will allow evaluation of the interaction of surface water and groundwater seasonal events. The extent of monitoring will be dependent upon site-specific conditions investigated as a part of this work. The basin conditions identified by our team will be used to prepare rationale for the scale, location, and frequency proposed in the monitoring and sampling plan.

Deliverables: TM that will become the "Existing and Planned Monitoring" chapter of the Yucaipa GSP.

TASK 11.0 DEVELOP FRAMEWORK FOR DATA MANAGEMENT SYSTEM

Our team will upload data into your database as directed by the GSA. If a GSP database has not yet been established as a platform for your SGMA projects, we would recommend considering Earthsoft's EQuIS geospatial database used in conjunction with ArcMap GIS. EQuIS is the industry standard for geospatial water quality and water level electronic data and has a library of standard Electronic Data Delivery (EDD) formats used to directly upload electronic water quality data and level data without the need to reformat. EDD standards have been adopted by numerous agencies including EPA Region 9 and the California Department of Water Resources. This platform is industry standard and can be configured for web-based access.

Deliverables: TM that will become the "DMS Memorandum" chapter of the Yucaipa GSP.

TASK 12.0 DRAFT AND FINAL GSP

Administrative Draft

The team will prepare a comprehensive Administrative Draft GSP that will incorporate all of the GSP elements and combine previously reviewed technical memorandums generated at the conclusion of each task. The Administrative Draft will be provided for review by the Yucaipa Basin GSA.

Draft GSP

The comments from the administrative draft will be addressed and edits will be incorporated in a Draft GSP document. The Draft GSP will be reviewed by the GSA, local stakeholders, and the general public. Draft comments will be compiled, organized, and responded to in a comments and responses document.

Final GSP

The Draft GSP comments will be incorporated into a Final GSP document. The Final GSP will be submitted to the Yucaipa GSP for adoption.

TAC Meetings

- ***Administrative Draft GSP– Review Admin Draft and provide comments***
- ***Draft GSP– Review Draft GSP***

Deliverables: Prepare draft GSP, respond to comments, and prepare final Yucaipa GSP.

TASK 13.0 GSP SUBMITTAL TO DWR FOR REVIEW AND APPROVAL

Following approval of the Final GSP by the Yucaipa GSA, we will electronically submit the final GSP for review and approval. The project team understands that a 60-day comment period is required per SGMA for DWR to receive comments on the adopted GSP. Following the 60-day comment period, we will receive a copy of the DWR final approval.

Deliverables: Copy of DWR confirmation of receipt of GSP and approval letter

TASK 14.0 GRANT ADMINISTRATON

The Valley District will perform the Grant Administration Task including the preparation of quarterly invoices to DWR. Our team will provide monthly progress reports that can be used prepare the quarterly invoices as described in Task 18.

ESTABLISH FRAMEWORK FOR LOCAL MANAGEMENT OF GROUNDWATER RESOURCES

TASK 15.0 ESTABLISH GOVERNANCE GSA

We will incorporate the existing documents already created by the Yucaipa GSA members and incorporate governance structure of the GSA into the "Governance" chapter of the Yucaipa GSP.

Deliverables: Governance chapter

TASK 16.0 DEVELOP AND IMPLEMENT COORDINATED OUTREACH PLAN

An effective, proactive, and transparent stakeholder engagement process is critical to developing a supported GSP and to foster support from the community and appreciation for the plan's benefits. Our approach involves listening carefully to all GSA agencies and establishing a clear decision-making process that will lead to a compliant, supported regional groundwater management plan. WSC is a leader in multi-agency stakeholder facilitation and planning that leads to viable, supported water solutions, with experience effectively facilitating collaborative regional water approaches among leading California agencies. Our approach to developing and implementing a coordinated outreach plan includes the following key steps:

- **Assessment:** Conduct listening sessions to understand the objectives of GSA partner agencies and key stakeholder groups, and determine communication and collaboration needs.
- **Visioning:** Develop a supported Outreach Plan that establishes a prioritized communications schedule, identifies beneficial users and interested parties for participation in the TAC, and outlines products, materials, overall guiding messaging, and high-impact opportunities to connect with stakeholders, including DAC groups. Create direction and concepts for prioritized outreach collateral including brochures, handouts, educational material, signs, and more that support outreach, education, and communication goals. Create vision and direction for website including use of photos/imagery and content in support of project vision and goals.
- **Creation:** Using the top-line messaging established in the Visioning stage, develop graphics and content for all website pages and printed materials, including handouts. Develop presentation templates and materials for use by the Yucaipa GSA. Facilitate reviews and edits with GSA partners.

- **Creation:** Using the top-line messaging established in the Visioning stage, develop graphics and content for all website pages and printed materials, including handouts. Develop presentation templates and materials for use by the Yucaipa GSA. Facilitate reviews and edits with GSA partners. Coordinate with website developer (contracted separately) to direct website structure, functionality, and flow that supports overall messaging, promotes intended use, and draws use of site.
- **Engagement:** Use new messaging and content to foster engagement and participation among interested stakeholders in the development and implementation of the GSP. Specific engagement activities will be driven by the findings of the Assessment and Visioning phases, and will include potential efforts such as, but not limited to:
  - Press releases, newsletters, and emails to enhance participation and interest in the GSP development process.
  - Presentation support and talking points for outreach to partner organizations and the public.
  - Strategies for social media use to enhance traffic or use of the website.
  - Design booths/informational outreach at local events to promote program understanding, water learning, and knowledge sharing.

Deliverables: Outreach Plan

TAC Meeting

- ***GSP Kick-off***

TASK 17.0 STAKEHOLDER MEETINGS

Meetings with the GSA, TAC, and stakeholders will drive the GSP process. The 13 TAC meetings identified in the RFP have been woven into the tasks throughout the Project Approach. Our team has identified two additional TAC meetings during Tasks 4 and 5, which will discuss the sustainable yield and management areas, for a total of 15 TAC meetings. The monthly administrative meetings will be used to present draft TMs associated with each task. Our team will provide the Yucaipa GSA members with the draft TM two weeks prior to the regularly scheduled monthly meeting and prepare a PowerPoint presentation describing the key aspects of the TM.

Deliverables: TAC Distribution List, TAC Meeting Summaries

TASK 18.0 PROJECT MANAGEMENT

WSC's approach to effectively manage the GSP development process includes:

- **Progress Reports.** We will prepare progress reports that document project activities, progress, and an overall budget and schedule status to be submitted with each monthly invoice.
- **Meetings.** We will coordinate meetings to present interim results, discuss project methodologies, and review draft and final deliverables. It is assumed that the Project Manager will attend all of the monthly meetings and key members of the team will attend when presenting information to the GSA. Budget includes meeting preparation and travel time.
- **QA/QC.** We will perform comprehensive quality control of all work items being prepared for delivery to the Yucaipa GSA members.

TEAM ORGANIZATION

WSC's proposed project team is functionally organized to take advantage of the strengths of our expert staff within a streamlined structure to provide the highest level of responsiveness and quality.

Mr. Cruikshank has completed hydrogeologic analyses in every groundwater basin within the Santa Ana River Watershed, including the Yucaipa Basin area, and has a comprehensive understanding of the Yucaipa Basin's groundwater resources. He has been actively involved in the development of all components required in a GSP, including groundwater flow models, water budgets, sustainable yield estimations, and adaptive management programs in large diverse stakeholder groups. Michael will be supported by a strategically selected team, including WSC's President and CEO, Jeffery Szytel, and WSC's Chief Operating Officer, Jeroen Olthof, both of whom can deploy any necessary resources to support the development of the Groundwater Sustainability Plan. Additionally, our depth of resources includes members with significant experience working with numerous local agencies and has a comprehensive understanding of the regulatory, political, and geographical elements of the Yucaipa Basin area.

Geoscience supplements the WSC team to provide more than 20-years of basin and regional knowledge. We will leverage their data and local expertise to streamline data collection and the development of the GSP. Additionally, WSC and Geoscience have a seamless working relationship through our collaborative work on Central Coast Blue, a regional Indirect Potable Reuse project in Pismo Beach that will provide a sustainable water source while protecting the basin from seawater intrusion. WSC and Geoscience are working in similar roles where WSC is managing the program, facilitating meetings, and providing stakeholder outreach and Geoscience is leading the development and evaluation of the groundwater model.

FIRM:	OFFICE LOCATION:
WSC	[1] San Diego, CA
Geoscience	[2] Laguna Hills, CA
	[3] Inland Empire, CA
	[4] San Luis Obispo, CA
	[5] Rocklin, CA
	[6] Portland, OR

San Bernardino Valley Municipal Water District

PRINCIPAL IN CHARGE
Jeffery Szytel, *PE, MS, MBA* [4]

PROJECT MANAGER
Michael Cruikshank, *PG, CHG, MS* [2]

QA/QC
Jeroen Olthof, *PE, MS, MBA* [1]

STAKEHOLDER OUTREACH
Holly Tichenor [6]
Laine Carlson, *PE, D2 & T2 Water Operator* [3]

SUPPLIES & DEMAND PLANNING
Spencer Waterman [4]

GROUNDWATER MODELING
Johnson Yeh, *PhD, PG, CHG* [3]
Kapo Coulibaly, *PhD, PG* [3]
Lauren Wicks, *PG* [3]
Si Si, *MS, EIT* [3]
Leo Liu, *MS, EIT* [3]

ENGINEERING SUPPORT
Daniel Heimel, *PE, MS, D4 & T2 Water Operator* [4]
Eric Cadaret [2]
Kendall Stahl, *MS* [1]

MANAGEMENT ACTIONS & PROJECT DEVELOPMENT
Laine Carlson, *PE, D2 & T2 Water Operator* [3]
Kaylie Ashton [5]

GEOHYDROLOGY
Brian Villalobos, *PG, CHG, CEG* [3]
Nathan Reynolds, *PG* [3]
Lauren Wicks, *PG* [3]

WSC Water Systems Consulting, Inc.

WATER SYSTEMS CONSULTING, INC. | STAFF TABLE

NAME/ROLE	CONTACT INFORMATION
Michael Cruikshank Project Manager	(949) 528-0960 | mcruikshank@wsc-inc.com 23232 Peralta Drive, Suite 215, Laguna Hills, CA 92653
Jeffery Szytel Principal in Charge	(805) 457-8833 ext. 101 | jszytel@wsc-inc.com 805 Aerovista Place, Suite 201 San Luis Obispo, CA 93401
Jeroen Olthof QA/QC	(858) 397-2617 ext. 301 | jolthof@wsc-inc.com 9815 Carroll Canyon Rd, Suite 205, San Diego, CA 92131
Laine Carlson Management Actions & Project Development/Stakeholder Outreach	(909) 483-3200 ext. 201 | lcarlson@wsc-inc.com 9375 Archibald Ave, Suite 200 Rancho Cucamonga, CA 91730
Daniel Heimel Engineering Support	(805) 457-8833 ext. 104 | dheimel@wsc-inc.com 805 Aerovista Place, Suite 201, San Luis Obispo, CA 93401
Holly Tichenor Stakeholder Outreach	(503) 419-6336 ext. 401 | htichenor@wsc-inc.com 12901 SE 97th Ave, Suite 370, Clackamas, OR 97015
Eric Cadaret Engineering Support	(949) 528-0960 | ecadaret@wsc-inc.com 23232 Peralta Drive, Suite 215, Laguna Hills, CA 92653
Spencer Waterman Planning	(805) 457-8833 ext. 102 | swaterman@wsc-inc.com 805 Aerovista Place, Suite 201, San Luis Obispo, CA 93401
Kendall Stahl Engineering Support	(805) 457-8833 ext. 120 | kstahl@wsc-inc.com 805 Aerovista Place, Suite 201, San Luis Obispo, CA 93401
Kaylie Ashton Management Actions & Project Development	(916) 778-4288 | kashton@wsc-inc.com 2351 Sunset Blvd, Suite 170 #946, Rocklin, CA 95765

GEOSCIENCE | STAFF TABLE

NAME/ROLE	CONTACT INFORMATION
Brian Villalobos Geohydrology	(909) 451-6645 | bvillalobos@gssiwater.com 620 Arrow Highway, Suite 2000, La Verne, CA 91750
Johnson Yeh Groundwater Modeling	(909) 451-6645 | jyeh@gssiwater.com 620 Arrow Highway, Suite 2000, La Verne, CA 91750
Kapo Coulibaly Groundwater Modeling	(909) 451-6645 | kcoulibaly@gssiwater.com 620 Arrow Highway, Suite 2000, La Verne, CA 91750
Nathan Reynolds Geohydrology	(909) 451-6645 | nreynolds@gssiwater.com 620 Arrow Highway, Suite 2000, La Verne, CA 91750
Lauren Wicks Groundwater Modeling	(909) 451-6645 | lwicks@gssiwater.com 620 Arrow Highway, Suite 2000, La Verne, CA 91750
Si Si Groundwater Modeling	(909) 451-6645 | ssi@gssiwater.com 620 Arrow Highway, Suite 2000, La Verne, CA 91750
Leo Liu Groundwater Modeling	(909) 451-6645 | lliu@gssiwater.com 620 Arrow Highway, Suite 2000, La Verne, CA 91750

PROJECT SCHEDULE

Task duration — *13 TAC Meetings* — *Two (2) Additional Recommended TAC Meetings*

	TASK	2018					2019											2020											2021										
		A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D
Evaluate Supplies and Demands																																									
1	USGS Groundwater Model																																								
2	Current and Historical Groundwater Conditions																																								
3	Plan Area																																								
4	Water Budget and Sustainable Yield																																								
5	Define Management Areas																																								
Establish Sustainbility Goals																																								
6	Define Undesireable Results, Minimum Thresholds, Measureable Objectives																																								
Identify and Evaluate Management Actions																																								
7	Identify Projects and Management Actions to Achieve Sustainability Goal																																								
8	Infiltration Testing																																								
Implementing the Plan and Adaptive Management																																								
9	Define Implementation Actions																																								
10	Describe Existing and Planned Monitoring Network																																								
11	Develop Framework for Data Management System																																								
12	Draft and Final GSP																																								
13	GSP Submittal to DWR for Review and Approval																																								
14	Grant Administraton																																								
Implementing the Plan and Adaptive Management																																								
15	Establish Governance GSA																																								
16	Develop and Implement Coordinated Outreach Plan																																								
17	Stakeholder Meetings																																								
18	Program Management (monthly GSA meetings)																																								

WSC Water Systems Consulting, Inc.

Detailed project cost information has been removed for evaluation purposes.

APPENDIX. A
QUALIFICATIONS

WHY SELECT THE WSC-GEOSCIENCE TEAM?

HISTORY AND TECHNICAL KNOWLEDGE

Geoscience supplements our team to provide insight, experience, and data for the Yucaipa Basin and the participating agencies. Geoscience will leverage their lessons learned from more than 40 projects that they have completed for the GSA members, 11 of which were in the Yucaipa Basin. Our team has a significant amount of the data required for the GSP and can leverage it to efficiently and effectively develop a reliable planning document, saving the participating agencies time and money.

LOCAL AND RESPONSIVE TEAM

From WSC's local office in Rancho Cucamonga, and Geoscience's office in La Verne, key members of our team are only minutes away from the GSA members. Whether it is conducting workshops, attending impromptu meetings, or providing stakeholder outreach, WSC team members are available to the GSA members. Additionally, WSC's team can host other team members within our office spaces on an as-needed and timely basis.

EXISTING RELATIONSHIP

WSC and Geoscience have developed a seamless working relationship through our extensive work on Central Coast Blue, an Indirect Potable Reuse project. Members from both firms have experience working together and have developed an understanding of each other's high expectations. This level of understanding will lead to high-quality, reliable deliverables and models.

PROJECT TEAM

MICHAEL CRUIKSHANK,
PG, CHG, MS

Project Manager | Mr. Cruikshank is a certified hydrogeologist with more than a decade of professional experience. He has extensive experience in hydrogeologic basin analysis, water resource planning, and evaluating water quality. Mr. Cruikshank has completed hydrogeologic analyses in every groundwater basin within the Santa Ana River Watershed, including the Yucaipa Basin area, and has a comprehensive understanding of the Yucaipa Basin's groundwater resources. He has been actively involved in the development of all components required in a GSP, including groundwater flow models, water budgets, sustainable yield estimations, and adaptive management programs in large diverse stakeholder groups.

SAMPLE PROJECTS:

- Groundwater Sustainability Plan, Fox Canyon Groundwater Management Agency. Senior Hydrogeologist. Developed groundwater balances used in the Groundwater Sustainability Plans for the four groundwater basins within the Agency's jurisdiction, including a water budget.
- Central Coast Blue, Multiple Agencies. Program Manager and QA/QC. Providing technical oversight for the development of the Santa Maria Groundwater Basin model and managing the hydrogeologic investigations of the Santa Maria Groundwater Basin.
- Update and Recalibration of the Chino Basin Groundwater Model, Chino Basin Watermaster. Senior Hydrogeologist. Assisted in the update and recalibration of the Chino Basin groundwater and surface water model.
- Recomputation of Ambient Water Quality, Basin Monitoring Program, Santa Ana Watershed Project Authority. Project Manager and Senior Hydrologist. Conducted the hydrogeologic modeling and mapping of the Santa Ana River Basin.

JEFFERY SZYTEL,
PE, MS, MBA

Principal in Charge | Mr. Szytel has 20 years of planning, project implementation, and multi-agency facilitation in the water resources industry. He is an industry leader who works alongside clients to achieve watershed-wide solutions which maximize the environmental, economic, and social benefits to the community. As Founder and CEO, Mr. Szytel can deploy the necessary resources needed to successfully complete the Yucaipa Basin Groundwater Sustainability Plan accurately and efficiently, as well as provide direct accountability for WSC's performance.

SAMPLE PROJECTS:

- Regional Recycled Water Concept Study & Regional Urban Water Management Plan. San Bernardino Valley Municipal Water District. Principal in Charge. Facilitated the collaboration of numerous local agencies to request and compile data to develop comprehensive planning documents. Established relationships with several local stakeholders.
- Paso Basin Supplemental Water Supply Plan, County of San Luis Obispo. Principal in Charge. The project included collaboration with multiple stakeholders and evaluation of three different supplemental water supply options to achieve groundwater sustainability.
- Regional Groundwater Management Services, Northern Cities Management Area Technical Group. Principal in Charge. Developed decision-support tools, conducted feasibility studies, implemented a groundwater management plan, and is implementing a supplemental supply project to enhance Santa Maria Groundwater Basin sustainability.

JEROEN OLTHOF,
PE, MS, MBA

QA/QC | Mr. Olthof has more than 25 years of water resources engineering experience. He is a nationally recognized expert in the application, adaptation, and use of databases, GIS, and modeling technology to solve problems related to water and recycled water systems. His experience includes hydraulic modeling and analysis, water supply and demand analysis, system optimization, condition assessment, and master planning. He has completed more than 125 water resource and planning projects and over 30 Master Plans throughout California.

SAMPLE PROJECTS:

- Regional Recycled Water Concept Study, San Bernardino Valley Municipal Water District. QA/QC. Supported data management, analysis, and database development for nine local agencies, as well as evaluated numerous alternatives to recommend a preferred project.
- Regional Urban Water Management Plan, San Bernardino Valley Municipal Water District. Project Manager. Managed the development of the Regional Urban Water Management Plan which included collaboration and facilitation with 10 local agencies and developed a comprehensive understanding of the local water supplies and demands.
- Recharge Water Sediment Removal Feasibility Study, Orange County Water District. Project Engineer. Conducted a feasibility study and evaluated alternatives to maximize groundwater recharge within the Santa Ana River. Recommended results served as the foundation of a capital improvement program.

BRIAN VILLALOBOS,
PG, CHG, CEG

Geohydrologist | Mr. Villalobos has more than 28 years of experience in geohydrology throughout Southern California. He specializes in groundwater sustainability, safe yield, water budgets, and groundwater recharge. He has studied and modeled groundwater basins across the State including the Yucaipa and surrounding basins. He has experience working with several GSA members, allowing him to be familiar with the hydrogeologic conceptual models and sustainability strategies and studies that can be leveraged to develop comprehensive GSP components efficiently and cost-effectively.

SAMPLE PROJECTS:

- Yucaipa Basin Safe Yield Determination, San Bernardino Valley Municipal Water District. Project Manager. Led efforts to reevaluate sub-basin boundaries and assess the safe yield and storage capacity of each sub-basin and developed the watershed model of the Yucaipa Valley.
- Urban Water Management Plan, City of Banning. Project Manager. Prepared the City's 2010 Urban Water Management Plan which included the assessment of local water sources and the evaluation of local water supplies and demands.
- Recycled Water Use Evaluation, Yucaipa Valley Water District. Project Manager. Developed a groundwater flow and solute transport model to evaluate potential recycled water movement from a local basin.

JOHNSON YEH,
PHD, PG, CHG

Groundwater Modeling | Mr. Yeh has over 28 years of experience and has managed numerous groundwater modeling efforts, hydrogeologic investigations, groundwater basin and water quality studies, and artificial recharge projects. He routinely collaborates with the USGS to develop models in the Yucaipa and San Bernardino areas and will work closely with GSA members to develop accurate models with sufficient detail to inform groundwater sustainability strategies. His breadth of experience and in-depth local knowledge will enable him to run scenarios and develop an accurate sustainable yield calculation.

SAMPLE PROJECTS:

- Upper Santa Ana River Integrated Model, San Bernardino Valley Municipal Water District. Project Manager. Leading efforts to use existing groundwater and surface water models to develop an integrated groundwater model for the Santa Ana River.
- Surface and Groundwater Model for Murrieta-Temecula Basin. Project Manager. Refined existing USGS models to understand, analyze, and evaluate remediation strategies.
- Central Coast Blue, Hydrogeologist Project Manager. In a partnership with WSC, he is leading efforts to evaluate existing characterization studies, groundwater models, and water quality data for a regional recycled water project.

LAINE CARLSON,
PE, D2 & T2 WATER OPERATOR

Mgmt. Actions & Project Development | Stakeholder Outreach | Ms. Carlson has more than 13 years of local engineering experience working for public utilities and as a consulting engineer. She specializes in water system planning and design which allows her to take innovative approaches to the evaluation of water supply and demand scenarios with the goal of providing cost-effective solutions. She has completed planning documents for more than 10 local agencies and is adept at working with engineering and operations departments to analyze data, identify issues, and recommend implementable solutions.

SAMPLE PROJECTS:

- Santa Ana Conservation & Conjunctive Use Program Decision Support Model, Santa Ana Watershed Protection Agencies. Project Manager. Served as a co-lead with another consulting agency for agency coordination and data collection for a tool to support optimization of a proposed watershed-scale conjunctive use program.
- Regional Recycled Water Supply Planning Study, San Bernardino Valley Municipal Water District. Project Manager. Collaborated with nine local agencies to identify regional solutions to improve local water supply reliability and sustainability.
- Regional Urban Water Management Plan, San Bernardino Valley Municipal Water District. Regional Liaison and Technical Advisor. Coordinated with 10 local agencies to update local water supply and demand projections through 2035, providing a holistic view on local resources and obtaining data that can be leveraged for the Groundwater Sustainability Plan.

KAPO COULIBALY,
PHD, PG

Groundwater Model | Mr. Coulibaly has 15 years of focused experience with geologic and hydrogeologic investigations and groundwater modeling. He has in-depth experience investigating salt and nutrients and completing solute transport studies. His background also includes in-depth experience with 3D modeling software and developing accurate and complete lithologic models. Through his experience conducting the Yucaipa Basin Groundwater Model Update and Study, he brings a comprehensive understanding of the Basin that can be leveraged to provide an efficient and accurate study.

SAMPLE PROJECTS:

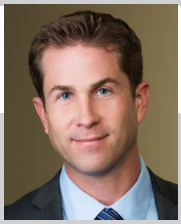
- Groundwater Model Update and Annual Water Budget, Yucaipa Valley Water District. Lead Modeler. Constructed a groundwater model to assess water budget and change in storage needs.
- Upper Santa Ana River Integrated Model, San Bernardino Valley Municipal Water District. Lead Modeler. Utilizing existing groundwater and surface water models to develop an integrated watershed model for the upper Santa Ana River.
- Salt and Nutrient Loading Model, Mojave Water Agency. Project Manager. Developed a salt and nutrient balance model using a system dynamic approach to support the Salt and Nutrient Management Plan.

DANIEL HEIMEL,
PE, MS, D4 & T2 WATER OPERATOR

Engineering Support | Mr. Heimel has spent the majority of his 15-year career providing engineering and operations support for municipal water agencies. Prior to joining WSC, he worked for two public water utilities and his experience includes program management, master planning, hydraulic modeling, GIS implementation, evaluation of supplemental water supply options, groundwater recharge facility operations and management, and water quality data analysis.

SAMPLE PROJECTS:

- Central Coast Blue, Multiple Agencies. Program Manager. Evaluated numerous recycled water options to improve water reliability for the agencies and recommended, and now implementing, an Indirect Potable Reuse Project to recharge the groundwater basin.
- Paso Basin Supplemental Water Supply Plan, County of San Luis Obispo. Project Manager. Identified and evaluated potential supply options which could be delivered using existing State Water Project infrastructure to achieve groundwater sustainability.
- Groundwater Management Services, Northern Cities Management Agencies. Project Manager. Providing water resources planning support, including analysis of the groundwater basin and available surface water supplies, to determine optimum water supply usage and protect groundwater supplies from seawater intrusion.

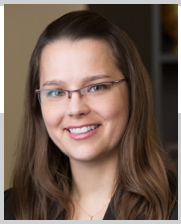


NATHAN REYNOLDS, PHD, PG

Geohydrologist | Mr. Reynolds has 13 years of experience completing hydrogeologic investigations, groundwater quality studies, artificial recharge projects, water well test drilling programs, and inspection for a variety of drilling projects. He also develops and maintains project data and data management systems for large well, and groundwater study projects. His experience will provide the GSA members with a thorough and accurate data management system to track basin conditions and complete the GSP.

SAMPLE PROJECTS:

- Bunker Hill Basin Conjunctive Use Project, San Bernardino Valley Municipal Water District. Project Geohydrologist. Evaluated extracting well and spreading ground locations, and determined well capacities and updated modeling assumptions.
- Warm Springs Groundwater Basin Hydrogeologic Study, Elsinore Valley Municipal Water District. Project Geohydrologist. Develop HSPF model and quantify basin storage capacity and safe yield.
- Salt and Nutrient Loading Model, Mojave Water Agency. Project Geohydrologist. Supported efforts to develop a salt and nutrient balance model.



LAUREN WICKS, PG

Engineering Support | Ms. Wicks has experience with groundwater and environmental investigations performed for numerous municipalities, state agencies, and private clients throughout California. She performs groundwater flow and transport modeling, hydrogeologic investigations, groundwater basin and water quality studies, artificial recharge projects, and has experience in GIS mapping, watershed management, database development and management. She will develop accurate and complete written reports and documents, and perform quality reviews on data.

SAMPLE PROJECTS:

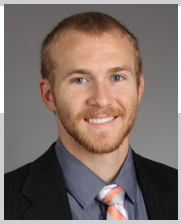
- Upper Santa Ana River Integrated Model, San Bernardino Valley Municipal Water District. Project Geohydrologist. Using existing groundwater and surface water models to develop an integrated watershed model for the upper Santa Ana River.
- Joint Groundwater Model for the Rialto-Colton Basin, San Bernardino Valley Municipal Water District. Project Geohydrologist. Prepared a technical memorandum comparing previous groundwater models of the Rialto-Colton area and helped with subsequent model construction and calibration reports.
- Murrieta-Temecula Surface and Groundwater Model. Project Geohydrologist. Helped evaluate and report on the model update and refinement process.

HOLLY TICHENOR

Stakeholder Outreach | Ms. Tichenor brings more than 20 years of stakeholder outreach and communications experience in the water and recycled water industry. She works collaboratively with project stakeholders and gain consensus and results that support the interest of all participants. She has been an advocate, creator, and supporter of communication services that advance programs, projects, organizations, and initiatives

SAMPLE PROJECTS:

- Central Coast Blue, Multiple Agencies, Pismo Beach. Communications Project Manager. Facilitated a full-scale rebranding effort for a $30 million Indirect Potable Reuse program that included the participation of five separate agencies.
- Utilities Department Strategic Plan, City of San Luis Obispo. Strategic Planning Facilitator. Conducted interviews and led a strategic planning workshop with the Department's managers to assist in assessing the needs of the nine sections within the Department.
- Bear Valley Water Sustainability Project, Big Bear Area Regional Wastewater Agency. Communications and Outreach Lead. Leading communications and outreach efforts for four agencies within the Big Bear Valley to implement and gain funding for a regional One Water solution.



ERIK CADARET, MS, GIT

Engineering Support | Mr. Cadaret is a Geologist-in-Training with extensive field and rigorous scientific research experience. He has technical expertise in experimental design, data analysis and interpretation, and conducting field data collection activities. His technical experience includes managing field operations, training staff, well logging, piezometric data collection and interpretation, aquifer testing and analysis, GIS applications, and data management and visualization.

SAMPLE PROJECTS:

- Groundwater Model Update, Consumers Energy Corporation. Hydrogeologist. Compiled and analyzed water level and geologic data, conducted geologic interpretations and identified hydrostratigraphic units, developed piezometeric contour maps, and assisted in updating an existing groundwater model.
- SR-520, Washington State Department of Transportation. Hydrogeologist. Compiled and analyzed water level and geologic data, conducted geologic interpretation and identified hydrostratigraphic units, and developed piezometeric contour maps.

SPENCER WATERMAN

Supplies & Demand Planning | Mr. Waterman is an experienced Planner who has completed more than 50 technical planning studies. He is the lead author or technical advisor for nearly 30 Urban Water Management Plans and has served in an integral role on more than 10 master plans. He has experience evaluating water supply scenarios, developing state water law compliance documents, providing water use efficiency and conservation services, and utilizing GIS to spatially allocate water demands and develop maps for clients.

SAMPLE PROJECTS:

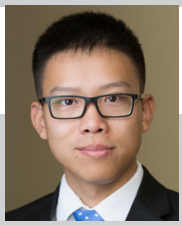
- Regional Recycled Water Concept Study, San Bernardino Valley Municipal Water District. Staff Planner. To support nine local agencies, applied Triple Bottom Line scoring process to evaluate alternatives and has a holistic understanding of the local water supplies and demands.
- Regional Urban Water Management Plan, San Bernardino Valley Municipal Water District. Supporting Author & QA/QC Lead. Collaborated and collected data from 10 participating agencies to update water supply and demand projections through 2035.
- Regional Supply & Demand Planning, Northern Cities Management Area Technical Group. Staff Planner. Analyzed water supply and demand data to inform water resources management decisions and was incorporated into the groundwater planning documents.

SI SI, MS, EIT

Groundwater Modeling | Ms. Si has more than five years of experience in groundwater and environmental investigations performed for numerous municipalities, state agencies, and private clients throughout California. She regularly performs groundwater flow and solute transport modeling, hydrogeologic investigations, groundwater basin and water quality studies, watershed modeling and management, groundwater waste discharge permitting, GIS mapping, and database development and management.

SAMPLE PROJECTS:

- Gateway Subbasin Recycled Water Use Evaluation, Yucaipa Valley Water District. Staff Modeler. Helped develop a model for the unconsolidated sediments, and solute transport. Also assessed travel times and recharge scenarios.
- Upper Santa Ana River Integrated Model, San Bernardino Valley Municipal Water District. Staff Modeler. Combined multiple surface and groundwater models.
- US EPA Model, City of San Bernardino. Staff Modeler. Prepared the SBBA HSPF watershed model input data and run model; prepared recharge packages for stream bed percolation, mountain front runoff and areal recharge for Groundwater Flow Model based on water balance analysis from HSPF.



LEO LIU, MS, EIT

Groundwater Modeling | Mr. Liu has over five years of experience with groundwater and environmental investigations while working for municipalities, state agencies, and private clients throughout California.. He routinely performs groundwater flow and solute transport modeling, hydrogeologic investigations, groundwater basin and water quality studies, watershed modeling and management, artificial recharge projects, and has experience in GIS applications, database development and management, and well design.

SAMPLE PROJECTS:

- Groundwater Model Update & Annual Water Budget, Yucaipa Valley Water District. Staff Modeler. Constructed a groundwater model to assess water budget and change in storage needs.
- Upper Santa Ana River Integrated Model, San Bernardino Valley Municipal Water District. Staff Modeler. Collected and digitized data using GIS software and calculated water budget including evapotranspiration.
- Joint Groundwater Model for the Rialto-Colton Basin, San Bernardino Valley Municipal Water District. Project Geohydrologist. Prepared a technical memorandum comparing previous groundwater models of the Rialto-Colton area and helped with subsequent model construction and calibration reports.

KENDALL STAHL, MS

Engineering Support | Ms. Stahl is an Engineer in Training who specializes in hydrology and hydraulics analysis and water resources planning. She has experience in water resources engineering, water quality assessment, groundwater contamination analysis, Groundwater Sustainability Agency formation, and water supply assessments for agencies on the Central Coast.

SAMPLE PROJECTS:

- Groundwater Sustainability Agency Formation, Northern Cities Management Area Technical Group. Staff Engineer. Prepared GSA formation notification for the California Department of Water Resources for the intent to undertake sustainable groundwater management in accordance with the Sustainable Groundwater Management Act.
- Water Resources Analysis Technical Memorandum, Avila Beach Community Services District. Staff Engineer. Evaluation and assembly of water resource reliability data, supply and demand characterization, and conditional dry and average supply and demand comparison information.
- Central Coast Blue, Multiple Agencies, Pismo Beach. Staff Engineer. Providing engineering services for the Indirect Potable Reuse project that will recover secondary effluent from two local wastewater treatment plants before being injected into the Santa Maria Groundwater Basin to supplement groundwater supplies and protect the basin from seawater intrusion.

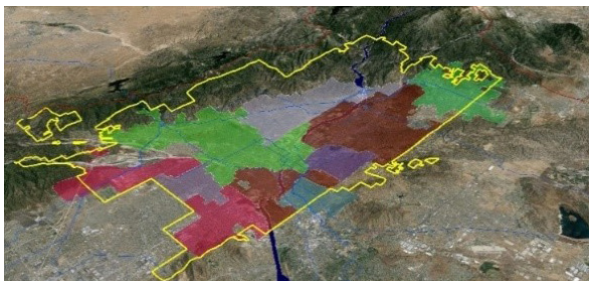
KAYLIE ASHTON

Mgmt. Actions & Project Development | Ms. Ashton is a highly organized Engineer in Training with a practical understanding of how to apply engineering practices to deliver valuable and sustainable projects. She has served in an integral role on several local projects and has developed a comprehensive understanding of the local water resources and agencies. She provides strong data management and analytical skills.

SAMPLE PROJECTS:

- Santa Ana Conservation & Conjunctive Use Program Decision Support Model, Santa Ana Watershed Protection Agencies. Engineering Support. Supported agency coordination and data collection for a tool to support optimization of a proposed watershed-scale conjunctive use program.
- Regional Recycled Water Concept Study, San Bernardino Valley Municipal Water District. Engineering Support. Supported the collaboration of nine local agencies in facilitation, data management, and evaluation of a local regional recycled water solution.

PROJECT QUALIFICATIONS



Regional Recycled Water Concept Study
San Bernardino Valley Municipal Water District

Mr. Robert Tincher, PE, Manager of Engineering & Planning | (909) 387-9215 | bobt@sbvmwd.com

WSC collaborated with Valley District and nine local partners to identify and evaluate regional recycled water projects that maximize regional benefits. WSC facilitated individual and regional stakeholder meetings to establish goals and objectives and brainstorm conceptual recycled water alternatives.

WSC developed a conceptual design for each of the nine projects that were identified for evaluation, including an evaluation of recycled water beneficial uses, expected regulatory requirements, treatment alternatives, required facilities, and capital and operating costs. The alternatives were evaluated using environmental, economic, and social factors, and a preferred project portfolio was identified.

Staff assigned: Jeffery Szytel, Jeroen Olthof, Laine Carlson, Spencer Waterman, Kaylie Ashton.

Relevance to Project:

- Developed a GIS geodatabase of local and regional water resources information to support effective data visualization and drive regional project brainstorming
- Facilitated stakeholder discussions to develop a ranking framework that encompasses economic, social, and environmental criteria to identify recycled water projects that achieve regional benefits

Regional Urban Water Management Plan
San Bernardino Valley Municipal Water District

Mr. Robert Tincher, PE, Manager of Engineering & Planning | (909) 387-9215 | bobt@sbvmwd.com

WSC prepared the 2015 Regional Urban Water Management Plan (RUWMP) for Valley District and 10 local water suppliers. The water supply analysis included an evaluation of groundwater, local surface water, State Water Project water, and recycled water supplies and identified the water rights and regional water management framework.

WSC coordinated with nearly all participating agencies to request, receive, and manage each agencies' data and utilized a robust data management platform to store regional water supply and demand information in a single database to facilitate future updating and use. WSC also facilitated individual and group discussions and incorporated those findings into regional solutions.

Staff assigned: Jeffery Szytel, Jeroen Olthof, Laine Carlson, Spencer Waterman, Kaylie Ashton.

Relevance to Project:

- Established familiarity with the regional planning toolset and can leverage existing data
- Developed a water supply and demand database that can generate custom outputs for regional water resource management activities, such as the GSP
- Facilitated numerous progress meetings and coordinated with project participants

WSC Water Systems Consulting, Inc.

Usable Capacity & Safe Yield for the Yucaipa Basin | San Bernardino Valley Municipal Water District

Mr. Robert Tincher, PE, Manager of Engineering & Planning | (909) 387-9215 | bobt@sbvmwd.com

Geoscience helped determine both the usable capacity and the maximum sustainable yield for a series of groundwater sub-basins within the Yucaipa Basin area. The first stage of the project included background research data collection and review. Then a layered base map to visually display project results was developed. Once the base map was developed, previously delineated subbasin boundaries were reevaluated in light of more recent geologic data.

After this step, the local geology and hydrology were characterized faults and their impact on groundwater. The usable storage capacity of each newly-delineated subbasin was then determined and sustainable yields were calculated for each subbasin using a water balance technique. At the conclusion of the project, Geoscience prepared a report containing the project's results, which was presented to basin stakeholders during project meetings.

Staff assigned: Johnson Yeh, Brian Villalobos, Kapo Coulibaly, Leo Liu

Relevance to Project:

- Ability to utilize existing data to expedite and streamline the development of the GSP and reduce cost and schedule
- Completed the Sustainable Yield and Water Budget which are the same components required in a GSP
- Completed the Yucaipa Basin geologic characterization and can utilize that information

Recycled Water Use Evaluation Using the Gateway Subbasin Focused Groundwater Model | Yucaipa Valley Water District

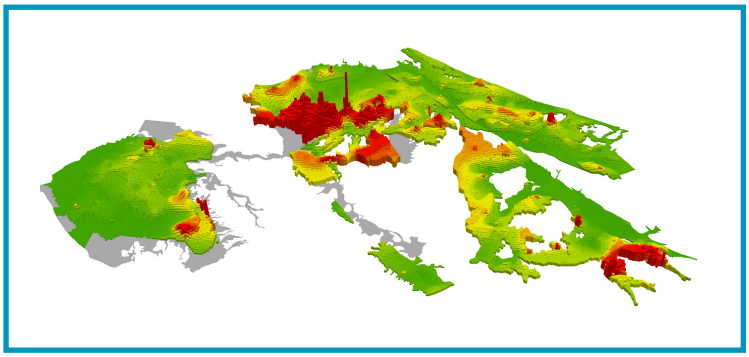
Mr. Joseph Zoba, General Manager | (909) 797-5117 | jzoba@yvwd.dst.ca.us

Geoscience evaluated the effect of recycled water recharge in the Wilson Creek Spreading Basin located within the Gateway Subbasin. Geoscience developed a subbasin focused groundwater model to assess recycled water travel times the nearest production well, and estimated the percentage of recycled water that would be produced by the wells. They developed the model using existing data collected from previous work in the basin. The model also assessed geologic conditions, and was used to evaluate multiple recharge scenarios.

Staff assigned: Johnson Yeh, Brian Villalobos, Kapo Coulibaly, Leo Liu

Relevance to Project:

- Study was conducted within the Yucaipa Groundwater Basin
- Leveraged existing data collected from previous work to develop the model using MODFLOW
- Conducted a hydrogeological characterization



Ambient Water Quality Recomputation for the Santa Ana River Watershed Groundwater Management Zones | Basin Monitoring Program Task Force

Mr. Mark Norton, Water Resources & Planning Manager
(951) 354-4221 | mnorton@sawpa.org

The Water Quality Control Plan (Basin Plan) for the Santa Ana River Basin requires the implementation of a watershed-wide total dissolved solids (TDS) and nitrogen groundwater monitoring program. This will determine ambient water quality in groundwater, assess compliance with groundwater quality objectives, and determine if assimilative capacity exists in groundwater management zones.

Mr. Cruikshank managed the 1996-2015 version of the triennial AWQ recomputation. The study computed current AWQ for TDS and nitrate-nitrogen in all 40 groundwater management zones in the Santa Ana River watershed and interpreted the results. The project involved collecting, processing, and storing all groundwater quality and groundwater levels data from 1996-2015 in a centralized database. The database developed point statistics for nitrate and TDS, and groundwater quality and elevation contour maps were prepared in the management zones with requisite data, and computed the volume-weighted ambient TDS and nitrate-nitrogen concentrations using the data generated from the contour maps. Interpretive tools included a spatial analysis of groundwater quality change, a temporal analysis of groundwater change comparing basin-scale trends to trends observed in key well locations, and a forward-looking well attrition analysis.

Staff assigned: Michael Cruikshank

Relevance to Project:

- Facilitated SAR Watershed Stakeholder Engagement
- Extensive knowledge of groundwater management zones and water quality objectives

Upper Santa Ana River Integrated Model | San Bernardino Valley Municipal Water Distct

Mr. Robert Tincher, PE, Manager of Engineering & Planning | (909) 387-9215 | bobt@sbvmwd.com

Currently the Santa Ana River (SAR) passes over four groundwater basins, multiple water districts, and has nine separate groundwater and watershed models—making it difficult to identify current conditions and potential impacts that planned projects could have on groundwater and the watershed as a whole. Complicating matters is that the basins are hydrologically connected to several other basins in the area. Geoscience is developing a combined model for the Santa Ana River that will help determine baseline hydrological conditions and the potential effects of proposed projects on the Santa Ana River and groundwater levels for the entire upper watershed.

Staff assigned: Johnson Yeh, Brian Villalobos, Kapo Coulibaly, Nathan Reynolds, Lauren Wick, Leo Liu

Relevance to Project:

- Ability to identify effects of current and proposed projects on the watershed as a whole
- Combining multiple models and working with stakeholders that will also be involved in this project
- Use and refinement of groundwater and surface water models, including GSFLOW and HSPF provided by multiple parties, including USGS

Groundwater Audit & Water Budget | Rancho California Water District

Mr. Andrew Webster, Chief Engineer
(951) 296-6900 | webstera@ranchowater.com

The Rancho California Water District (RCWD) overlies a groundwater basin encompassing approximately 90 square miles and contains geologic faults that impact groundwater movement. Approximately half of the annual water needed by the District is produced from saturated alluvial deposits through a system of 100 deep wells. For almost 30 years, Geoscience has conducted annual water audits to maintain sustainable yield and recommend groundwater production for the following water year.

Staff assigned: Johnson Yeh, Brian Villalobos, Kapo Coulibaly, Nathan Reynolds, Lauren Wicks

Relevance to Project:

- Santa Ana River Watershed Stakeholder Engagement
- Knowledge of groundwater management zones and water quality objectives

Central Coast Blue | City of Pismo Beach, Arroyo Grande, Grover Beach, Oceano Community Services District, South San Luis Obispo County Sanitation District

Mr. Benjamin Fine, PE, City Engineer/Public Works Director | (805) 773-7037 | bfine@pismobeach.org

WSC developed a Recycled Water Facilities Planning Study (RWFPS) that evaluated numerous project alternatives. By implementing triple bottom line ranking criteria, the Central Coast Blue project was recommended.

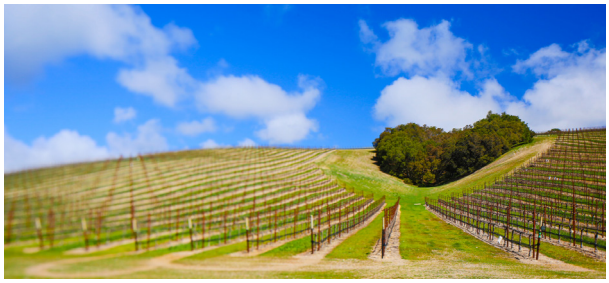
WSC is providing program management, preliminary design, funding, communications and outreach, and document support services for the indirect potable reuse project. The advanced treatment facility will use conventional advanced treatment before injecting the treated effluent into the Santa Maria Groundwater Basin to supplement water supplies and protect from seawater intrusion.

Communications and outreach support includes facilitation of the full rebrand of the project and outreach campaign, including numerous collaborative working sessions.

Staff assigned: Michael Cruikshank, Jeffery Szytel, Jeroen Olthof, Johnson Yeh, Laine Carlson, Daniel Heimel, Holly Tichenor, Spencer Waterman, Kendall Stahl, Kaylie Ashton

Relevance to Project:

- Organizing and facilitating numerous stakeholder and regulatory outreach meetings to inform and generate regional project support
- Developed a RWFPS that evaluated alternatives and resulted in a recommended alternative
- Assigned project ranking criteria that included social, economic, and environmental considerations



Paso Basin Supplemental Supply Options Study | County of San Luis Obispo

Ms. Courtney Howard, Water Resources Division Manager | (805) 781-1013 | choward@co.slo.ca.us

The Paso Basin has experienced dropping groundwater levels over several decades and recent increased declines have caused numerous wells to go dry. WSC served in an integral role in the study of potential supplemental water supply options to bring the basin back into balance.

The project included preliminary identification and quantification of potential supplemental supply alternatives sources, a fatal flaw analysis, and a rough screening analysis to identify areas for further study. Groundwater levels in the area are a topic of public concern, and extensive public outreach and coordination was included. Outreach efforts included coordination with the Paso Basin Blue Ribbon Committee to provide updates on study status and findings, presentation at a Paso Basin Open House, and facilitation of review meetings with local rural landowners, farmers, water agency representatives, and other key stakeholders.

Staff assigned: Jeffery Szytel, Jeroen Olthof, Daniel Heimel, Spencer Waterman

Relevance to Project:

- Evaluated numerous supplemental supply alternatives to achieve sustainability in the Paso Basin
- Facilitated numerous stakeholder meetings, forums, and open houses to obtain input and build stakeholder buy-in
- Worked with regional stakeholders to identify exchange and other innovative solutions to enhance utilization of existing infrastructure and storage to improve long-term water supply resiliency

Groundwater Management Services | Northern Cities Management Agency

Mr. Benjamin Fine, PE, City Engineer/Public Works Director | (805) 773-7037 | bfine@pismobeach.org

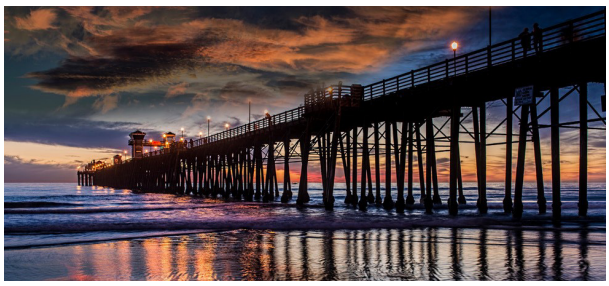
WSC is providing ongoing groundwater management services to support the Northern Cities Management Area Technical Group (NCMA TG) in managing groundwater and local surface water resources in the northern portion of the Santa Maria Groundwater Basin (SMGB). The NCMA TG must fulfill established requirements and goals under the Adjudication, which includes monitoring the groundwater conditions, assessing hydrologic conditions, and preparing an Annual Report annually.

For nearly 10 years, WSC has been actively involved in assisting the NCMA TG in managing their diverse supplies and regional infrastructure. WSC performs technical analyses, provides managerial guidance, and facilitates groundwater management activities to aid in the sustainable management of the basin. WSC also assists the NCMA TG in collaborating with its regional partners and local stakeholders.

Staff assigned: Michael Cruikshank, Jeffery Szytel, Jeroen Olthof, Johnson Yeh, Laine Carlson, Daniel Heimel, Spencer Waterman, Kendall Stahl

Relevance to Project:

- Coordinate regional surface water and groundwater management activities
- Provide technical review and oversight to the development of the Annual Report
- Facilitate outreach to agricultural growers and other stakeholders
- WSC leads collaboration within the NCMA TG and amongst the regional partners and stakeholders to improve coordination efforts and finding solutions to challenging groundwater supply and management problems



Mission Basin Water Supply, Indirect Potable Reuse, & Pathogen Removal Study | City of Oceanside

Ms. Cari Dale, Water Utilities Director
(760) 435-5812 | cdale@ci.oceanside.ca.us

Geoscience evaluated indirect potable reuse (IPR) feasibility and a technical study to evaluate pathogen removal through a water reclamation facility. The study will help the City enhance water supply reliability for its customers. As a result of their efforts, the City will soon be able to improve groundwater conditions, increase local supply reliability, optimize water recycling at the San Luis Rey Water Treatment Facility with IPR supplementing conventional Non-Potable Reuse opportunities, and maximize opportunities for outside funding to limit potential impacts to ratepayers. When completed, the project will use between 2,000 and 5,000 acre feet of purified recycled water per year to recharge the Mission Subbasin.

Staff assigned: Johnson Yeh, Brian Villalobos

Relevance to Project:

- Develop, apply, and review groundwater and groundwater flow models
- Data gap assessment and monitoring well network
- Hydrogeologic characterization studies/ recharge

Third Party Review, Various Projects | Western Heights Water Company

Mr. William Brown, General Manager
(909) 790-1901 | w.brown@westernheightswater.org

Geoscience provided as-needed review and consulting for Western Heights Water Company (WHWC) on a variety of projects and issues. From 2011-2017, Geoscience provided third party reviews for monitoring reports, well siting studies, and subsurface investigations. They also helped coordinate on behalf of WHWC with the Regional Water Quality Control Board, and helped complete well engineering estimates.

Staff assigned: Brian Villalobos

Relevance to Project:

- In-depth understanding of the characteristics of the Yucaipa Basin
- Conducted hydrogeologic condition assessments within the basin
- Coordination with project stakeholders

APPENDIX. B

CONSULTING SERVICES AGREEMENT REQUESTED REVISIONS

WSC has reviewed the Consulting Services Agreement provided by San Bernardino Valley Municipal Water District and is in substantial agreement. We are confident that we can quickly and efficiently come to mutually agreed upon terms.

2. Consulting Services and Responsibilities. During the term of this Agreement, Consultant shall provide _____ consulting services to the District, which shall include those services and activities specifically identified in the Consultant's proposal for the Project, or such other services requested by District, each of which is attached to this Agreement as Exhibit "A", and by this reference incorporated herein ("Services"). All Services provided under this Agreement shall be performed in a manner consistent with current industry standards by individuals who possess ~~the proper~~the professional skill, care and knowledge ordinarily provided by firms practicing in the same or similar locality under the same or similar circumstances (herein the "Standard of Care"), as necessary to effectively complete the Services. The performance of all Services and obligations hereunder shall be made consistent with the Standard of Care in order to be in accordance with all federal, state and local laws, rules, regulations or ordinances applicable to the Services or obligations.

6. Work Product; Confidential Information.

6.1 Work Product. Consultant shall provide to District, and such other consultants approved by District, all work product, works in progress or other deliverables developed from or associated with the Services or the Project. Upon completion of the Services, Consultant shall provide one reproducible physical copy and one electronic copy of all final work products described in Exhibit "A", in such forms acceptable to District. Consultant acknowledges that all work performed or prepared for District by Consultant hereunder, including without limitation all data, reports, models, working notes, drawings, designs, improvements, trademarks, patents, copyrights (whether or not registered or patentable) and specifications developed or prepared by Consultant in connection with, or related to such Services shall become the sole and exclusive property of District, unless specifically otherwise agreed upon in writing by District and Consultant, provided Consultant has been paid all amounts due. Consultant hereby unconditionally assigns, transfers and conveys to District all rights, interests and claims of any kind related thereto, including copyright. Consultant shall promptly disclose such work product to District and, at the District's expense, perform all actions reasonably requested by District (whether during or after the Term) to establish and confirm such ownership (including, without limitation, executing any necessary assignments, consents, powers of attorney and other instruments). District agrees to indemnify, defend and hold the Consultant harmless from and against any claims or damages that may result from the subsequent use, reuse, transfer or modification of the Work Product, except on projects where the Consultant has been retained to provide services.

11. Abandonment or Termination. Agreement may be terminated by either Party upon ten (10) days written notice. In the event the Project is terminated or abandoned before completion of the Services, all Services of Consultant shall immediately terminate. In the event of termination or abandonment, Consultant shall be compensated for the Services in proportion to the amount of work actually completed as of the termination date or date of abandonment, as well as reasonable termination expenses for termination without cause. Notwithstanding the foregoing, in the event of telephone notification to stop work, no further work shall be performed on any portion of the Project pending receipt of the written notification. The continuation of work after telephone notification to stop work, shall be at Consultant's sole cost and expense, without the right to seek any form of reimbursement.

12. Indemnification. Consultant shall indemnify, defend and hold harmless the District and its ~~agents~~, officers, directors and assigns, from and against any and all claims, damages, loss and expense, including reasonable attorneys' fees, awards, fines, penalties, judgments or appeals based on a third party tort claim, ~~arising out of or related to~~ the extent caused by the negligent performance of the Services, breach of this Agreement, or any misrepresentations or any other claim arising out of or related to this Agreement, provided however, that any duty to defend in this agreement shall not apply to professional liability claims. Consultant's indemnification obligations contained in this Section 12 shall extend to all

negligent acts or omissions of its officers, employees, agents or representatives.

The indemnification responsibility of Consultant, with respect to the Services shall exist and continue regardless of the extent to which District may have reviewed and approved the Services performed by Consultant, except that Consultant shall not be responsible for claims attributable to the Services in any case in which the claim is attributable to a decision made by District with respect to which Consultant and District have specifically agreed in writing that District shall be the responsible party.

13. Liability and Insurance. Consultant shall assume responsibility and liability for any damage, loss or injury of any kind or nature whatsoever to any person or property, to the extent such damage, loss or injury was caused by ~~or resulting from~~ a~~n~~ negligent act, error or, omission, or ~~negligent or~~ willful ~~act~~ misconduct caused by Consultant, its officers, directors, employees, agents or representatives in connection with the performance of the Services under this Agreement.

Consultant shall, at its sole cost and expense, maintain in effect at all times during the performance of the Services, the greater of: (i) the coverage and limits of insurance described herein; or (ii) such coverage and limits as is generally determined to be the general industry standards, which coverage shall be maintained with an insurance company licensed to do business in California and having a minimum A.M. Best rating of A-IX, or better, and under forms of policies satisfactory to District.

Consultant shall, at its sole cost and expense, procure and maintain in effect for the Term the following insurance policies, and to the extent permitted, naming District as an additional insured: (i) professional liability insurance, with policy limits of no less than $1,000,000 (combined single limit per claim and annual aggregate); (ii) workers' compensation insurance, in such amounts and coverage as required by law, and employer's liability insurance policy of at least

$1,000,000 per occurrence; (iii) general liability insurance policy of at least $1,000,000 per occurrence, and in the aggregate $2,000,000; and (iv) automobile liability, or equivalent form, with a combined single limit of no less than $1,000,000 per occurrence; such insurance shall include coverage for non-owned and hired automobiles and owned. The workers' compensation policy must include a waiver of Consultant's right to recover from other endorsements.

Certificates evidencing such coverage and adding District as additional insured, where permitted, shall be delivered to District prior to the commencement of the Services by Consultant under this Agreement. Such insurance shall provide no cancellation unless thirty (30) days' prior notice of such cancellation is given to District ~~or ten (10) days notice in the event of cancellation for non-payment of premium.~~ Consultant agrees to timely pay the premiums as required and use its best efforts to maintain said insurance in effect for a period of at least two (2) years after completion of the Services under this Agreement.

14. Representations and Warranties. Each Party individually represents or~~and~~ warrants the following:

a. Each Party warrants that it is duly organized, validly existing and in good standing under the laws of the state of formation or incorporation and has all requisite power and authority to conduct the business with which it conducts and proposes to conduct;

b. Each Party represents that ~~A~~all action on the part of each Party necessary for the authorization, execution, delivery, and performance of this Agreement, and the consummation of the transactions contemplated herein, has been properly taken and obtained in compliance with applicable law;

c. Each Party has not entered into nor will either enter into any agreement (whether written or oral) in conflict with this Agreement or which would prevent a Party from performing its obligations under this Agreement; and

d. Each Party represents that it has the contacts and expertise, and will reasonably allocate its financial and time resources on a reasonable best efforts basis, consistent with the Standard of Care, to enable it to perform its obligations hereunder.

Notwithstanding any clause in this Agreement to the contrary, Consultant expressly disclaims all express or implied warranties and guarantees with respect to the performance of professional services.

APPENDIX. C
TEAM RESUMES

Michael Cruikshank, PG, CHG, MS

Education
MS, Civil and Environmental Engineering, California State University, Fullerton, CA

BS, Geology, California State University, Fullerton, CA

Professional Registrations
Professional Geologist, California, No. 8854

Certified Hydrogeologist, No. 994

Engineer-in-Training No. 142007

Professional Experience

Mr. Cruikshank is a certified hydrogeologist with more than a decade of professional experience. He has technical expertise in hydrogeologic basin analysis, water resource planning, and evaluating water quality. Mr. Cruikshank has managed projects in large stakeholder environments and assisted in the development of groundwater and surface water models that are used to make important water resource management decisions. His technical experience includes hydrologic data analysis, piezometric data collection and interpretation, production and monitoring well installation, well design, aquifer testing and analysis, managing field data collection programs, geographical information systems (GIS) applications, data management, data visualizations, and report graphics.

Representative Projects

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

Central Coast Blue, Multiple Agencies, Pismo Beach, CA. Program Manager and QA/QC. Providing technical oversight for the development of the Santa Maria Groundwater Basin model and managing the hydrogeologic investigations of the Santa Maria Groundwater Basin. The project will create an advanced treatment facility to treat effluent for injection into the groundwater basin for indirect potable reuse and to prevent seawater intrusion.

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, CA. Project Manager and Senior Hydrogeologist. The Water Quality Control Plan (Basin Plan) for the Santa Ana River Basin requires the implementation of a watershed-wide total dissolved solids (TDS) and nitrogen groundwater monitoring program to determine ambient water quality in groundwater, assess compliance with groundwater quality objectives, and determine if assimilative capacity exists in groundwater management zones. The Basin Plan requires that the ambient water quality (AWQ) be computed every three years. Mr. Cruikshank has been involved in four ambient water quality determinations. In the 1996 to 2015 version, Mr. Cruikshank oversaw the development of point statistics for nitrate and TDS, the preparation of groundwater quality and groundwater elevation contour maps in the management zones with requisite data, and computed the volume-weighted ambient TDS and nitrate-nitrogen concentrations using the data generated from the contour maps. He also led the development of the interpretive tools which included a Spatial analysis of groundwater quality change, a temporal analysis of groundwater change comparing basin-scale trends to trends observed in key well locations, and a forward looking well attrition analysis.

Update and Recalibration of the Chino Basin Groundwater Model, Chino Basin Watermaster, Chino Basin, CA. Senior Hydrogeologist. Assisted in the update and recalibration of the Chino Basin groundwater and surface water model. The basin geometry and layering was updated to take into account newly drilled wells. The surface water model was improved to account for improved resolution of land use data and refined historical/ planning estimates of the deep infiltration of precipitation and applied water. The model was used to determine the safe yield of the basin, the safe yield created by desalter wells and reoperation and the state of hydraulic control.

San Juan Basin Groundwater Management Plan and Facilities Plan Update, San Juan Basin Authority, San Juan Capistrano, CA. Senior Hydrogeologist. Completed a comprehensive hydrogeologic assessment of the groundwater basin that included recalculating the storage capacity of the groundwater basin in order to provide a clear understanding of the basins groundwater resources. The updated plan represents the most comprehensive "state of the basin" assessment ever done for the San Juan Basin.

Ventura River Integrated Groundwater/Surface-water model, California State Water Resources Control Board, Ventura County, CA. Senior Hydrogeologist. Provided hydrogeologic services for the development of an integrated groundwater/surface water model for the Ventura River watershed. He is responsible for the development of the conceptual hydrogeologic models for four groundwater basins.

Groundwater Level Monitoring Program, City of Malibu, CA. Senior Hydrogeologist/Engineer. Managed the groundwater monitoring network with pressure transducers and monthly manual measurements. Maintains a database of water level data of the Malibu Civic Center Area for the City of Malibu.

Develop and Apply a Groundwater Flow Model for the Cucamonga Basin, Cucamonga Valley Water District, Rancho Cucamonga, CA. Senior Hydrogeologist. Developed the conceptual model and hydrology for the calibration of the groundwater model. Developed the initial hydrologic budget for the calibration period which includes the subsurface inflow, deep infiltration of precipitation and applied water, artificial recharge, stormwater recharge in channels and Conservation/Flood Control Works, groundwater production, and subsurface outflow. The model will be used to evaluate several future groundwater management plans.

Six Basins Groundwater Flow Model, Six Basins Watermaster, Claremont, CA. Senior Hydrogeologist. Developed the conceptual model and hydrology for the calibration of the groundwater model. Developed the initial hydrologic budget for the calibration period which includes the subsurface inflow, deep infiltration of precipitation and applied water, artificial recharge, stormwater recharge in channels and Conservation/Flood Control Works, groundwater production, and subsurface outflow. The model will be used to evaluate several future groundwater management plans.

Temescal Basin Recharge Master Plan, City of Corona, Corona, CA. Project Manager/Engineer. The Temescal recharge master plan was developed to provide a solution to the overdraft of the Temescal Basin which is estimated to be about 3,000 acre-ft/yr. Mr. Cruikshank was responsible for the development and hydraulic simulations of multiple recharge scenarios involving the capture of storm water and imported water and recycled water at both existing and improved basins, as well as detailed cost analysis that was applied to evaluate each alternative.

Six Basins State of the Basin Report, Six Basins Watermaster, Claremont, CA. Senior Hydrogeologist. Constructed hydrogeologic cross sections, created several historic regional groundwater elevation contours maps, evaluated aquifer parameters, mapped the depth to bedrock, analyzed groundwater in storage and developed yield through GIS applications. Created the associated report graphics.

Jeffery Mitchell Szytel, MS, MBA, PE

Education
MBA, UCLA Anderson School of Management

MS, Civil Engineering, University of California Los Angeles

BS, Civil and Environmental Engineering, University of California Davis

Professional Registrations
Professional Engineer - Civil, California, No. C63004

Professional Affiliations
American Water Works Association, Member

American Public Works Association, Member

American Society of Civil Engineers, Member

Association of California Water Agencies, Committee Member

Association of Clean Water Administrators

California Water Environment Association

Water Environment Federation

WateReuse

Dale Carnegie Training

Toastmasters International

Publications
Supply from the Sea: Exploring Ocean Desalination. Journal AWWA, February 2005, 97:2

The Business of Water. Contributing Author for *Supply from the Sea: Exploring Ocean Desalination*. AWWA. March, 2008.

Professional Experience

Mr. Szytel has more than 20 years of experience in civil and environmental engineering specializing in water, wastewater and recycled water systems. His experience includes project and program management, construction management, capital improvement planning, water and wastewater treatment facility evaluation, optimization and design, hydraulic analysis, pilot studies, water and wastewater master planning, integrated resource planning, water and sewer infrastructure planning and design and management consulting.

Representative Projects

San Bernardino Valley Municipal Water District, Regional Recycled Water Concept Study & Grant Application, San Bernardino, CA. Principal in Charge. Collaborating with nine local water and wastewater agencies to identify potential regional recycled water projects to improve local water supply reliability and sustainability. Applying a triple bottom line scoring process to evaluate alternatives on the basis of economic, social and environmental criteria. The process is being integrated with the ongoing Upper Santa Ana River Habitat Conservation Plan, which is critical to achieving local habitat sustainability and permitting regional recycled water projects. The project is being completed under an aggressive schedule to advance the most beneficial regional projects into funding and implementation as soon as possible.

San Luis Obispo County Flood Control and Water Conservation District, Paso Basin Supply Options Study, Principal in Charge. Identified potential supply options for the Paso Robles Groundwater Basin that could be delivered using existing State Water Project (SWP) infrastructure. Developed updated buy-in cost estimates for purchasing additional capacity within the Coastal Branch pipeline. Identified capacity limitations for each section of the Coastal Branch pipeline and quantified unutilized capacity, based on analysis of historical delivery data. Completed a fatal flaw analysis to identify SWP supply options for further evaluation (i.e. rough screening). Further developed the identified SWP supply options and compared them against potential recycled water and Nacimiento supply options to identify preferred supplemental water supply options for the Paso Basin.

Northern Cities Management Area Technical Group, Regional Groundwater Management Services, Central Coast, CA. Principal in Charge. Prepared a water supply, production and delivery plan for the City of Arroyo Grande, City of Grover Beach, City of Pismo Beach and Oceano Community Services District. Developed spreadsheet model to identify the most reliable scenario for potable water supply and delivery while considering implications of contractual surface water allocations and declining groundwater basin yields. Evaluated intertie pipeline capacity between two separate potable water distribution systems using a merged hydraulic model of the two systems. Developed shared cost structure for implementation, operation and maintenance of the intertie pipeline.

Multiple Agencies, Central Coast Blue, Pismo Beach, CA. Principal in Charge. Providing program management and design engineering services for the development of an Indirect Potable Reuse (IPR) project to recharge the Santa Maria Groundwater Basin. The RGSP will provide additional treatment of the water, including micro/ultra-filtration, reverse osmosis and advanced oxidation, and injection of the advanced purified water into the groundwater basin to maintain groundwater levels and prevent seawater intrusion. Project is being funded by approximately $30 million in regional, state, and federal funding initiatives.

San Bernardino Valley Municipal Water District, 2015 Regional Urban Water Management Plan, San Bernardino, CA . Principal in Charge. Being developed with the participation of the following agencies: SBVMWD, East Valley Water District, Riverside-Highland Water Company, West Valley Water District, Yucaipa Valley Water District, the City of San Bernardino Municipal Water District, and the Cities of Colton, Loma Linda, Redlands, and Rialto. Collaborating and collecting data from the agencies listed above to update water supply and demand projections through 2035 based on changes since the 2010 UWMP and compliance with SB-7. New requirements will be addressed, such as distribution system losses reporting as part of demand and digital submittal through DWR's new templates and online submittal database. Voluntary analysis of energy intensity in water deliveries and climate change impacts will also be completed during the update.

City of Pismo Beach, Recycled Water Facilities Planning Study, Pismo Beach, CA. Principal in Charge. Prepared a facilities planning study, funded in part by a planning grant from the California State Water Resources Control Board Water Recycling Funding Program. Investigated multiple alternatives to put the City's treated wastewater, which is currently discharged to the ocean, to beneficial use, including 1) landscape irrigation within the City to offset potable water use, 2) coastal injection wells to protect the basin from seawater intrusion and 3) inland recharge using existing storm water basins or new inland injection wells to optimize seasonal groundwater recharge. Evaluated regulatory, water supply and stakeholder considerations affecting the development of a recycled water program. Identified and evaluated treatment and conveyance alternatives, including repurposing abandoned facilities and maximizing the use of existing facilities to develop a cost-effective recycled water program.

Santa Barbara County Water Agency, Long Term Supplemental Water Supply Alternatives Report. Principal in Charge. Identified and evaluated potential supplemental surface water supply alternatives for the Santa Barbara County Water Agency. Analyzed historical State Water Project (SWP) deliveries through the Coastal Branch pipeline to identify estimates of available capacity and underutilized SWP supplies. Investigated potential opportunities to increase surface water storage through expansion of existing dams or construction of new reservoirs. Evaluated sediment removal alternatives for existing reservoirs to increase capacity and yield. Developed planning level cost estimates for proposed supplemental water supply alternatives. Participated in inter-regional, regional and intra-regional stakeholder meetings to identify, discuss, review and receive feedback on potential supplemental water supply alternatives.

Big Bear Area Regional Water Agency, Bear Valley Water Sustainability Project, Big Bear, CA. Principal in Charge. Evaluating conceptual recycled water use alternatives to retain treated water and create a sustainable water resource to augment the potable water supply. Alternatives will be analyzed based on treatment and regulatory requirements of use, water supply yield, social and environmental benefits, and life cycle cost. Project includes assisting in the procurement of state and federal funding.

Yucaipa Valley Water District, Yucaipa Valley Regional Water Filtration Facility Design and Construction, Yucaipa, CA. **Design Manager.** Completed design and bidding assistance for a new 12 mgd microfiltration and nanofiltration facility. Design included influent flow control, microfiltration using Pall membranes, nanofiltration and blending facilities for DBP precursor removal, dissolved air floatation treatment for MF backwash, disinfection using sodium hypochlorite, 7-million gallon prestressed concrete reservoir for finished water storage, 1000 feet of 48" diameter finished water piping including 600' of 66-inch jack-and-bore tunnel, security features, and slope protection for the adjacent flood control channel.

Jeroen Olthof, MS, MBA, PE

Education
MBA, USC

MS, Civil Engineering, University of Washington

BS, Civil Engineering, University of Colorado Boulder

Professional Registrations
Professional Engineer- Civil, California, No. C58597

Articles
San Diego's Recipe for Overflow Reduction, Public Works, June, 2004.

Capacity Assurance Sets Stage for CMOM Success, Waterscapes, Vol. 13, No. 2, May, 2002

Presentations
Management of Sewers in Environmentally Sensitive Areas, ASCE Pipelines Conference, San Diego, CA 2004

Lessons Learned in San Diego's Collection System Assessment Program, Water Environment Federation (WEF) Collection Systems Conference, Austin, TX, June, 2003

Automated Decision Tools for Sewer Collection System Assessment, California Water Environment Association Conference (CWEA), Ontario, CA, 2003

Improved Collection System Management Using GIS, Water Environment Federation Technology and Exposition Conference (WEFTEC), Chicago, IL, October, 2002

An Incremental Approach to GIS and Floodplain Mapping, Floodplain Management Association Conference, Sacramento, CA, September, 2000

A Hydrogen Sulfide Screening Tool Within GIS, WEFTEC, Collection Systems Conference, Salt Lake City, UT, May, 1999

Professional Experience

Mr. Olthof brings more than 25 years of experience in planning, design, and management of water and recycled water systems. He specializes in hydraulic modeling of pipe networks, feasibility studies, infrastructure condition assessment, and comprehensive master planning. His experience includes database development and integration of geographic information systems (GIS) with hydraulic models, recycled water customer databases, and asset databases. He has developed and maintained custom databases to track recycled water customers and generate reports for regulatory agencies and other stakeholders. He has also developed condition assessment programs and decision algorithms to support capital improvement planning and maintenance optimization. He has published several technical papers on hydraulic modeling and infrastructure condition assessment.

Representative Projects

San Bernardino Valley Municipal Water District, Regional Recycled Water Concept Study & Grant Application, San Bernardino, CA. Senior Engineer. Collaborating with nine local water and wastewater agencies to identify potential regional recycled water projects to improve local water supply reliability and sustainability. Applying a triple bottom line scoring process to evaluate alternatives on the basis of economic, social and environmental criteria. The process is being integrated with the ongoing Upper Santa Ana River Habitat Conservation Plan, which is critical to achieving local habitat sustainability and permitting regional recycled water projects. The project is being completed under an aggressive schedule to advance the most beneficial regional projects into funding and implementation as soon as possible.

San Bernardino Valley Municipal Water Distrct, 2015 Regional Urban Water Management Plan, San Bernardino, CA . Project Manager. Being developed with the participation of the following agencies: SBVMWD, East Valley Water District, Riverside-Highland Water Company, West Valley Water District, Yucaipa Valley Water District, the City of San Bernardino Municipal Water District, and the Cities of Colton, Loma Linda, Redlands, and Rialto. Collaborating and collecting data from the agencies listed above to update water supply and demand projections through 2035 based on changes since the 2010 UWMP and compliance with SB-7. New requirements will be addressed, such as distribution system losses reporting as part of demand and digital submittal through DWR's new templates and online submittal database. Voluntary analysis of energy intensity in water deliveries and climate change impacts will also be completed during the update.

Orange County Water District, Recharge Water Sediment Removal Feasibility Study, Santa Ana, CA. Project Engineer. Conducted a feasibility study to determine the most cost-effective alternatives to remove sediments from the Santa Ana River (SAR) so more water can be recharged through existing and future facilities into the aquifer system. Evaluated potential technologies and strategies, including in-river management and removal, chemical/physical removal, and mechanical removal. The results of this feasibility study served as the foundation upon which a capital improvement program will be developed to maximize groundwater recharge.

Duke Energy, Catawba-Wateree - Water Supply Study, Charlotte, NC. **Task Manager**. Compiled and analyzed the available data concerning current and future withdrawals and discharges in the Catawba-Wateree Basin; examined and quantified the impacts of drought; and estimated the safe yield for water supplies for a long-term planning period (50 years).

City of Riverside Public Utilities Department, Recycled Water Facilities Plan, Riverside, CA. **Task Lead**. Developed a recycled water facilities plan. Developed a rational, cost-effective program of recycled water supply for integration with the city's existing potable and agricultural water supplies. Developed a database of potential use sites for conversion to recycled water and a hydraulic model of the proposed distribution system using H2OMap Water.

Walnut Valley Water District, Walnut Valley and Rowland Water Districts' Regional Water Supply Plan, Walnut, CA. Project Engineer. Worked with the Walnut Valley Water District and three related agencies on a water supply evaluation. The four agencies operate a jointly-owned pipeline that runs parallel to the Orange County Feeder. The study evaluated the use of local groundwater wells and water quality blending in the pipeline to provide a new source of supply that would reduce dependency on imported water.

City of Broomfield, Water Budget Analysis Tool, Broomfield, CO. **QC Review**. Assisted with development of a custom computer software program called the Broomfield Water Supply and Conveyance Tool that enables city staff to quickly change supply, conveyance, and demand inputs to emulate system operation during various operational and seasonal scenarios.

Baldy Mesa Water District, Water Supply Plan, Victorville, CA. **Project Manager.** Prepared a water supply plan to address the high arsenic levels in the district's groundwater wells, which included evaluation of combinations of groundwater treatment and new surface water supply that could help the district meet future demands and the new federal arsenic limit of 10 ppb.

County of San Luis Obispo, Energy Watch – Facility Inventory and Database Project, San Luis Obispo, CA. Project Manager. Developed an interim data management system that will allow the County to assemble the comprehensive facility inventory. Phase 1 of the project focused on coordination with energy utilities and County departments on data sources, data collection and validation for a specified set of pilot facilities, and development of an interim data management system, an MS Access database. Phase 2 of the project is focused on expanding the number of facilities in the database, including facilities not currently tracked in Utility Manager, creating custom uploads that integrate with Energy Star Portfolio Manager, and training for County staff.

City of Farrell, Infiltration and Inflow Study, Farrell, PA. Field Engineer. Performed an infiltration and inflow study of the city's municipal sewer system. Project including flow monitoring, manhole inspections, and smoke and dye testing. Worked on a survey crew conducting sewer layouts, wetland delineation, topographic mapping, and as built surveys.

U.S. Army Corps of Engineers, Huntsville District, Comprehensive Energy and Water Master Plans, Huntsville, AL. **Project Engineer**. Assisted with development of comprehensive energy and water master plans for six installations on behalf of the Installation Management Command (IMCOM) and the U.S. Army Engineering and Support Center in Huntsville. Developed sustainable return on investment (SROI) and other assessment tools to help select appropriate measures. Prepared profiles of existing water use and strategies for achieving water conservation goals established by federal executive orders.

Calaveras County Water District, Water Supply Feasibility Study, San Andreas, CA. **Project Engineer**. Provided quality assurance/quality control (QA/QC) for study that evaluated the feasibility of improvement projects identified in the master plan. The feasibility report summarized recommendations for water system improvements and evaluated multiple projects, including a lake embankment replacement, intake facilities, and water storage and conveyance infrastructure.

Brian Villalobos, PG, CHG, CEG

Years of Experience: 28
Years with GEOSCIENCE: 9
Education:
BS, Geology, California State University, Los Angeles
Professional Registrations:
California Professional Geologist (No. 4153)
Certified California Hydrogeologist (No. 794)
California Certified Engineering Geologist (No. 1298)

What Brian Brings to the Project:

- Brian has worked heavily in refining hydrogeologic conceptual models and is well acquainted with sustainability strategies and studies—augment and partner with GSA member staff to develop comprehensive GSP components efficiently and cost-effectively
- 28+ years of sustainable groundwater resource studies and reports—work with you to efficiently complete thorough and defensible GSP components
- Specializes in groundwater recharge and water reuse—identify options to improve basin sustainability

Brian has more than 28 years of professional experience in geohydrology and environmental geology throughout the Southern California region. His specific areas of expertise are in hydrogeologic investigations to support groundwater sustainability and determine safe yield, water budgets, indirect potable reuse and groundwater recharge. He has studied and modeled Groundwater Basins across the State and has led efforts to develop studies and reports that are required to complete a GSP, including, monitoring well networks, sustainable yield, water budgets and more. He currently several cities and water districts to sustainably manage their groundwater resources, including the city of Oceanside, Olivenhain Municipal Water District, Rancho California Water District, Elsinore Valley Municipal Water District, San Bernardino Valley Municipal Water District, and others.

Selected Project Experience

San Bernardino Valley Municipal Water District and Partners: Determination of the Usable Capacity and Safe Yield for each Sub-basin within the Yucaipa Basin Area - Brian led efforts to reevaluate sub-basin boundaries in the Yucaipa Groundwater Basin to assess the "safe yield" and storage capacity of each sub-basin. He developed a watershed model of the Yucaipa Valley to determine water balance terms previously not calculated. The "safe yield' was calculated using three separate methods to validate values and compared to historical calculations performed by other parties.

Olivenhain Municipal Water District: Groundwater Supply and Brine Management Program - To reduce independence on imported water, Brian is leading our team's efforts to determine the safe yield and increment water available in the San Dieguito basin; and determine locations for well fields, treatment facilities, pipelines, and brine discharge facilities. Currently our team is collection data, completing a hydrological investigation and updating the current groundwater model. We are also developing preliminary well designs, recommending brine management activities, supporting community outreach, and completing desk-top environmental reviews.

City of Banning: 2010 Urban Water Management Plan - Brian prepared the City of Banning 2010 Urban Water Management Plan (UWMP) to comply with the Urban Water Management Planning Act requiring urban water suppliers to assess the reliability of its water sources over a 20-year planning horizon considering normal, dry, and multiple-dry years. Amendments to the UWMP since the 2005 UWMP include the Water Conservation Act of 2009 or 20x2020 Plan, to reduce per capita water use by 20% by December 31, 2020.

City of Moreno Valley: Ground Water Basin Assessment for the Box Springs Mutual Water Company Service Area Rezoning - Brian helped evaluate available long-term water supplies from the San Jacinto Ground Water Basin to support future City development plans.

Castaic Lake Water Agency: Santa Clara River Valley Salt and Nutrient Management Plan - Brian led efforts to determine ambient water quality conditions and develop a plan to confirm that water management practices were consistent with the agency's water quality objectives. The completed plan provided a framework to protect groundwater and improve groundwater resource sustainability. Brian led our team to develop a monitoring plan, and evaluate the effect that proposed projects would have on groundwater quality.

Yucaipa Valley Water District: Recycled Water Use Evaluation using the Gateway Sub-basin Focused Groundwater Model - Brian managed efforts to develop a geologic and hydrologic conceptual model and a groundwater flow and solute transport model for a 10 square mile area of the Gateway sub-basin and portions of five additional sub-basins. The model is being used to evaluate potential movement of recycled water from the Wilson Creek Spreading Basin.

San Bernardino County: Active Recharge Project from Tributaries of the Santa Ana River - Brian led our team to develop a watershed model to estimate potential stormwater capture from 13 tributary Creeks to the Santa Ana River in the San Bernardino Valley. The project included preparing conceptual designs for stormwater capture facilities and estimating potential new conservation water added to the ground water system from urban run-off capture.

Riverside County: Hydrogeologic Evaluation of the Riverside Aquifer Storage and Recovery Project - Brian identified available Santa Ana River surface flows to use in On-Channel and Off-Channel recharge basins and evaluated recharge impacts on the ground water surface.

Riverside County: Evaluation of Potential Locations for Ground Water Recharge at the East and West Dam Sites, Diamond Valley Lake - Brian assessed water quality and water level trends and other considerations to evaluate impacts from proposed recharge scenarios.

City of Oceanside/RMS: Mission Basin Model Update and Evaluation of Indirect Potable Reuse - Brian developed a geologic and hydrologic conceptual model and a groundwater flow and solute transport model for a 22 square mile area covering the entire Mission Groundwater Basin near Oceanside California. The model is being used to site and evaluate potential movement of recycled water from proposed injection sites.

San Bernardino Valley Municipal Water District: Recharge Investigation of the Yucaipa Groundwater Basin - Brian led efforts to complete a hydrogeologic investigation at eleven potential sites within the Yucaipa Groundwater Basin for potential artificial recharge. Recommendations for subsequent phases of investigation were provided for each site.

Johnson Yeh, PhD, PG, CHG

Years of Experience: 28
Years with GEOSCIENCE: 28
Education:
BS, Geology, National Taiwan University
MS, Geology, National Taiwan University
PhD, Sedimentology, University of Southern California
Professional Registrations:
California Professional Geologist (No. 6371)
Certified California Hydrogeologist (No. 422)

What Johnson Brings to the Project:

- Extensive water modeling experience—can work with GSA member staff to develop accurate models with sufficient detail to inform future groundwater sustainability strategies
- Understands how to combine multiple models and data sources—provide a clear picture of the current groundwater conditions and allow for accurate predictions and estimates
- Collaborates with the USGS to develop and update groundwater models using MODFLOW and helped USGS develop GSFLOW

For more than 28 years, Johnson has managed ground water modeling efforts, hydrogeologic investigations, ground water basin and water quality studies, and artificial recharge projects. He provides project management and technical direction for hydrogeologic investigations, groundwater models, and artificial recharge projects. Johnson performs detailed statistical analysis of various types of data and has been the lead modeler on many high profile projects—in fact, he was instrumental in helping to resolve one of the larges groundwater rights cases in California, and developed models that helped a water district client to successfully avoid costly litigation. Johnson has taught graduate level ground water modeling courses at the University of Southern California and routinely collaborates with the USGS to develop models in the Yucaipa and San Bernardino areas. His experience and knowledge will enable him to run scenarios and develop an accurate sustainable yield calculation.

Selected Project Experience

San Bernardino Valley Municipal Water District: Santa Ana River Integrated Model - Johnson is leading our team in an effort to use existing groundwater and surface water models to develop an integrated groundwater model for the upper Santa Ana River. The resulting Upper SAR Integrated Model (or Integrated SAR Model), will be used to determine what factors may contribute to declines SAR flows, and assess cumulative effects on SAR surface flows and groundwater levels.

Yucaipa Valley Water District: Recycled Water Use Evaluation using the Gateway Sub-basin Focused Groundwater Model - Johnson was the senior modeler overseeing the construction of a groundwater model used to predict the impacts of recycled water spreading on groundwater quality and to downstream municipal wells.

City of Pismo Beach/WSC Inc.: Central Coast Blue - Central Coast Blue is a regional recycled water project that will help reduce the risk of seawater intrusion and help improve sustainability for the region's water supply. Johnson is leading efforts to evaluate existing characterization studies, groundwater models, and water quality data. He is also constructing and calibrating an expanded groundwater model to evaluate injection and extracting scenarios, and conduct an anti-degradation analysis.

California American Water, Monterey Peninsula Water Supply Project (MPWSP) - Johnson led efforts to update a three-dimensional variable density flow and solute transport model for the North Marina Area in 2008 and constructed a focused groundwater model near the CEMEX gravel plant in Marina, CA. Johnson helped revise and update the Salinas Valley Integrated Surface Water and Ground Water Model (SVIGSM) which are currently being used to evaluate local and regional impacts on groundwater levels and quality from MPSWP operations.

Western Municipal Water District: Impact of Recharge on Contaminant Plumes and Modeling - Johnson was the project manager and lead ground water modeler to assess and model the area around the Riverside-Corona Feeder, to show the potential future impact of an initial operation scenario on the ground water levels and ground water quality in the San Bernardino Basin Area.

Jurupa Community Services District: Chino Basin Artificial Recharge Evaluation - Johnson led modeling efforts to modify a previously established groundwater flow model of the Chino Basin to incorporate solute transport and assess the impact of artificial recharge operations planned by the Chino Basin Watermaster on Nitrate and TDS concentrations in the southern Chino Basin.

Rancho California Water District: Surface and Ground Water Model of the Murrieta-Temecula Ground Water Basin - Johnson was the lead modeler to create an Integrated Ground Water and Streamflow Model of RCWD. Johnson worked with a technical panel that included, RCWD, USGS, U.S. Marines, Camp Pendleton, Stetson Engineers, Santa Margarita Watermaster, and GEOSCIENCE. The technical was formed to avoid litigation between RCWD and the Camp Pendleton Marine Base. Johnson is responsible for preparation of the model and analysis of the results.

Santa Ana Watershed Project Authority: Chino Desalter System Projects - Johnson developed a detailed analysis of the Chino Ground Water Basin that included a three-dimensional numerical ground water flow model (MODFLOW). A separate analysis was also conducted to assess potential water quality changes in project and existing wells as a result of the project.

San Bernardino Valley Municipal Water District: Remediation Strategies for Ground Water Contamination - Johnson was the project manager and lead ground water modeler to refine previous USGS models to better understand, analyze, and evaluate remediation alternatives related to ground water contamination problems.

Laine E. Carlson, PE

Education
BS, Civil Engineering, California State Polytechnic University, Pomona, CA

Professional Registrations
Professional Engineer - Civil, California, No. C72424

Certifications
SWRCB Registered T2 Water Operator #34907

SWRCB Registered D2 Water Operator #41981

Professional Affiliations
American Water Works Association, Member

California Water Environment Association, Member

Professional Experience

Mrs. Carlson has over 13 years of experience working for a public utility and as a consulting engineer, focusing on water and recycled water systems. Her experience includes project management, construction administration, capital improvement planning, hydraulic analysis, water and wastewater master planning, pipeline design, pump station design and analysis, and water standard development. She has developed an intimate understanding of how a water and sewer utility operates and the challenges they face. Her experience has enabled her to identify and analyze initial project concepts, prepare construction documents, and monitor construction of the project through completion.

Representative Projects

Santa Ana River Conservation & Conjunctive Use Program Decision Support Model, Santa Ana Watershed Protection Agencies. Project Manager. Served as a co-lead with another consulting agency for agency coordination and data collection for a tool to support optimization of a proposed watershed-scale conjunctive use program. Leveraged existing knowledge of local and regional water supply and distribution facilities and natural systems to support the development of a watershed-scale schematic model for use in developing the DSM. Developed a database to collect data critical to model development, co-managed the data collection process, compiled information from prior work to streamline data collection efforts for the agencies, and organized data into a comprehensive data set.

San Bernardino Valley Municipal Water District, Regional Recycled Water Concept Study & Grant Application, San Bernardino, CA. Project Manager. The RRWCS was a collaboration with nine local agencies to identify potential regional recycled water projects to improve local water supply reliability and sustainability. A total of 11 conceptual projects were analyzed. This project was completed in collaboration with a large stakeholder group with complex relationships. The 2015 Regional UWMP was developed with the participation of 10 local agencies. For the 2015 Regional UWMP, WSC collaborated and collected data from all agencies to update water supply and demand projections through 2035 based on changes since the 2010 UWMP, and compliance with SB7. Additionally, new requirements were addressed, such as distribution system losses reporting as part of demand and digital submittal through DWR's new templates and online submittal database.

San Bernardino Valley Municipal Water Distrct, 2015 Regional Urban Water Management Plan, San Bernardino, CA . Regional Liaison and Technical Advisor. Collaborated and collected data from 10 agencies to update water supply and demand projections through 2035 based on changes since the 2010 UWMP and compliance with SB-7. New requirements will be addressed, such as distribution system losses reporting as part of demand and digital submittal through DWR's new templates and online submittal database. Voluntary analysis of energy intensity in water deliveries and climate change impacts will also be completed during the update.

West Valley Water District, Cost Analysis for New Bunker Hill Groundwater Supply Alternatives, Rialto, CA. Project Manager. Providing project management and coordination to help the District assess the cost of leasing two unequipped wells from Inland Valley Development Agency on the site of the former Norton Air Force Base. The wells, known as IVDA Well 2A and IVDA Well 3, will require a capital investment by the District to develop as a new water supply. Tasked with developing a comparative cost analysis to lease the IVDA wells, or drill and equip a new well in the Bunker Hill Basin.

Big Bear Area Regional Wastewater Agency, Bear Valley Water Sustainability Project, Big Bear, CA. Project Manager. Evaluated conceptual recycled water use alternatives to retain treated water within Bear Valley and create a sustainable water resource to augment the region's potable water supply. Conceptual alternatives were analyzed based on treatment and regulatory requirements of use types, water supply yield, social and environmental benefits, and life cycle cost of the alternatives. WSC coordinated with several agencies in the region. WSC provided grant writing support and secured a $75,000 State Water Resources Control Board Water Recycling Facilities Planning Grant.

Flair Spectrum Water Supply Assessment, El Monte, CA. Project Manager. Project Manager of the Water Supply Assessment (WSA) for the proposed Flair Spectrum project located in the City of El Monte within California American Water's (CAW) water service area. The proposed project includes a 220-room hotel, 500,000 sq. ft. of retail outlet, 50,000 sq. ft. of restaurant and 600 condominium units with a total estimated water demand of 202 acre-feet per year. In accordance with California Water Code Section 10910-10915 (SB 610), the size of the development requires a WSA to determine whether the projected water supplies are sufficient to satisfy the demands of the project, in addition to existing and planned future uses. The WSA requires evaluating and documenting potential supplemental water supplies since CAW's 2010 Urban Water Management Plan did not account for the increased water demand associated with this project.

City of Hope Water Supply Assessment, Duarte, CA. Project Manager. Managed the Water Supply Assessment (WSA) for the proposed City of Hope Specific Plan project located in Duarte within CAW's water service area. The project includes over 1,428,000 square feet of additions to the existing outpatient, inpatient, research, office, industrial, warehouse and hospitality uses. The size of the development requires a WSA to determine whether the projected water supplies are sufficient to satisfy the demands of the project, in addition to existing and planned future uses. The WSA requires evaluating and documenting potential supplemental water supplies since CAW's 2010 Urban Water Management Plan did not account for the increased water demand associated with this project.

City of Victorville, 2018 Water Master Plan, Victorville, CA. Project Manager. Preparing a master plan that will address both hydraulic capacity deficiencies and rehabilitation and replacement needs driven by aging infrastructure. The project includes hydraulic modeling using InfoWater to evaluate capacity limitations, planning-level estimates of required capital spending each year based on system inventory and expected remaining useful life values, and a comprehensive 10-year Capital Improvement Plan.

City of Pismo Beach, 2015 Water Master Plan & UWMP Update, Pismo Beach, CA. Deputy Project Manager. Performing an update of the City of Pismo Beach 2004 Water Master Plan. Creating and calibrating an all-pipes, spatially allocated demand hydraulic model of the City's water distribution system using Bentley's WaterGEMS software. Utilizing the hydraulic model to evaluate capacity limitations for current and future buildout scenarios and opportunities to optimize operations. Developing condition based-replacement plans for aging infrastructure and an updated CIP project list to prepare for budget planning.

City of Victorville, On-Call Water Modeling, Victorville, CA. Project Manager. Providing staff support services for hydraulic water modeling and development planning. Converted the City's existing hydraulic model to GIS based InfoWater and updated the model to include projects completed since it was developed in 2009. Performing general model review and calibrating a previously un-calibrated portion of the model. Providing on-call modeling analysis of the existing system to help the City make informed decisions regarding potential changes to the system. Preparing Feasibility Studies and Water Supply Assessments as needed to support the City's review and conditioning of proposed development projects.

Kapo Coulibaly, PhD, PG

Years of Experience: 15
Years with GEOSCIENCE: 2
Education:
BS, Geology, National University of the Ivor Coast, Abidjan, Ivory Coast
MS, Environmental Science, National University of the Ivory Coast, Abidjan, Ivory Coast
PhD, Hydrogeology, North Carolina State University, Raleigh, NC
Professional Registrations:
Florida Professional Geologist (No. 2766)

What Kapo Brings to the Project:

- Experience with modeling salt and nutrient transport—help the GSA members effectively assess and manage nitrates and other water quality issues present in the basin
- Well design, construction, and development experience—accurately identify the effect of pumping on the aquifer and salt and nutrient transport
- Former Petrel employee (the 3D Lithologic model software developer)—accurately develop 3D models to identify geologic features that impact water quality issues, subsidence, and other undesirable results

Dr. Kapo Coulibaly has 15 years of focused experience with geologic and hydrogeologic investigations and groundwater modeling. He has in-depth experience investigating salt and nutrients and completing solute transport studies. Kapo's background also includes in-depth experience with 3D modeling software and developing accurate and complete lithologic models.

Selected Project Experience

Yucaipa Valley Water District: Basin Groundwater Model Update and Study to Calculate Annual Water Budgets/ Change in Water Storage - Kapo constructed a groundwater model to assess water budget and change in storage needs.

Olivenhain Municipal Water District: San Dieguito Valley Brackish Groundwater Desalination Study - Kapo supported modeling efforts to study brackish groundwater desalination feasibility and location. He helped collect data, complete a hydrogeologic investigation, and performed well field and raw water collection.

San Bernardino Valley Municipal Water District: Santa Ana River Integrated Model - Kapo is supporting to use existing groundwater and surface water models to develop an integrated watershed model for the upper Santa Ana River. The resulting Upper SAR Integrated Model (or Integrated SAR Model), will be used to determine what factors may contribute to declines SAR flows, and assess cumulative effects on SAR surface flows and groundwater levels.

Riverside Public Utilities: Flume 2 Replacement Well - Kapo supported modeling efforts to update and refine the focused model for the Flume 2 Replacement Well.

Santa Ana Watershed Project Authority: Santa Ana River Waste Load Allocation Model Update - Kapo helped our team update the Santa Ana River Waste Load Allocation Model. He updated the historical precipitation data for the region and then updated and recalibrated the model. Kapo updated surface water runoff and stream flow estimates in major stream segments, and then update the estimated TIM concentrations.

Mojave Water Agency: Salt and Nutrient Loading Model - Kapo developed a salt and nutrient balance model using a system dynamic approach to support the Salt and Nutrient Management Plan (SNMP) for the agency.

Imperial Irrigation District: Imperial Valley Seepage Recovery Investigation - Kapo developed a groundwater model to estimate groundwater seepage into the All-American Canal.

Mojave Water Agency: Upper Mojave River Groundwater Basin Integrated Surface Water and Groundwater Model - Kapo developed an integrated surface water – Groundwater model of the upper Mojave River basin to assess the regional recharge and recovery.

Daniel Eric Heimel, MS, PE

Education
MS, Civil and Environmental Engineering, Cal Poly San Luis Obispo

BS, Environmental Science, California State University Chico

Professional Registrations
Professional Engineer – Civil, California, No. C80762

Operator Certifications
SWRCB Registered D4 Operator #28472

SWRCB Registered T2 Operator #26014

Professional Affiliations
American Water Works Association, Member

Air & Waste Management Association, Member

Professional Experience

Mr. Heimel has 15 years of engineering and operations experience in the water and wastewater industry. He has worked for two public water utilities in an operations capacity, making him knowledgeable of the day-to-day operations that keep water supply, water treatment, and water distribution facilities functioning. His experience includes project and program management, hydraulic modeling, GIS implementation, water quality and drinking water utility regulatory compliance, sampling plan development and implementation, recycled water implementation, pilot studies, water quality and water supply watershed monitoring, groundwater recharge facility operations, and water quality data analysis.

Representative Projects

Multiple Agencies, Central Coast Blue, Pismo Beach, CA. Program Manager. Providing Program Management, Preliminary Design, Funding, and Environmental Document Support services for a Indirect Potable Reuse project that will recover secondary effluent from the Pismo Beach and the South San Luis Obispo County Sanitation District's wastewater treatment plants, a resource currently discharged to the Pacific Ocean. The advanced treatment facility will use microfiltration or ultrafiltration, reverse osmosis, and ultraviolet radiation and advanced oxidation process before injection into the Santa Maria Groundwater Basin to supplement groundwater supplies and protect the basin from seawater intrusion.

San Luis Obispo County Flood Control and Water Conservation District, Paso Basin Supply Options Study, Project Engineer. Identified potential supply options for the Paso Robles Groundwater Basin that could be delivered using existing State Water Project (SWP) infrastructure. Developed updated buy-in cost estimates for purchasing additional capacity within the Coastal Branch pipeline. Identified capacity limitations for each section of the Coastal Branch pipeline and quantified unutilized capacity, based on analysis of historical delivery data. Completed a fatal flaw analysis to identify SWP supply options for further evaluation (i.e. rough screening). Further developed the identified SWP supply options and compared them against potential recycled water and Nacimiento supply options to identify preferred supplemental water supply options for the Paso Basin.

Northern Cities Management Area, Groundwater Management Services, Central Coast, CA. Project Manager. Prepared a water supply, production and delivery plan for Northern Cities Management Area agencies, which is comprised of the City of Arroyo Grande, City of Grover Beach, City of Pismo Beach and Oceano Community Services District. Developed spreadsheet model to identify the most reliable scenario for potable water supply and delivery while considering implications of contractual surface water allocations and declining groundwater basin yields. Evaluated intertie pipeline capacity between two separate potable water distribution systems using a merged hydraulic model of the two systems. Developed shared cost structure for implementation, operation and maintenance of the intertie pipeline.

Alameda County Water District, Groundwater Recharge Facilities Operations and Maintenance Management. Project Engineer. Developed groundwater recharge monitoring database to track all operations of the Alameda Creek diversion facilities and groundwater recharge ponds. Directed maintenance of meters and valves at the groundwater recharge facilities. Compiled data and created regulatory reports related to the groundwater recharge operations. Oversaw watershed water quality monitoring and used GIS to spatially analyze water quality data.

Santa Barbara County Water Agency, Long Term Supplemental Water Supply Alternatives Report. Project Engineer. Identified and evaluated potential supplemental surface water supply alternatives for the Santa Barbara County Water Agency (SBCWA). Analyzed historical State Water Project (SWP) deliveries through the Coastal Branch pipeline to identify estimates of available capacity and underutilized SWP supplies. Investigated potential opportunities to increase surface water storage through expansion of existing dams or construction of new reservoirs. Evaluated sediment removal alternatives for existing reservoirs to increase capacity and yield. Developed planning level cost estimates for proposed supplemental water supply alternatives. Participated in inter-regional, regional, and intra-regional stakeholder meetings to identify, discuss, review, and receive feedback on potential supplemental water supply alternatives.

South San Luis Obispo County Sanitation District, Satellite Water Resource Recovery Facility & Groundwater Recharge Planning Study. Project Manager. Evaluated the development of a Satellite Wastewater Resource Recovery Facility to allow the District to recover a water resource and put it to beneficial use in a groundwater basin threatened by seawater intrusion. This study provided recycled water to offset potable demands. It provided new upstream treatment capacity and increased redundancy. Prepared a grant application to the SWRCB to cover 50% of the cost of the study, which focused on economic feasibility compared to other supplemental water supply alternatives. The alternatives evaluated included: 1) landscape irrigation; 2) agricultural irrigation; and/or 3) groundwater recharge through surface recharge and/or irrigation wells.

City of Redwood City Recycled Water Implementation Planning. Project Engineer. Oversaw the water quality monitoring for Redwood City's recycled water system. Performed bench scale testing to predict distribution system disinfection residual concentrations. Developed a recycled water demand schedule using existing water usage data and used it to analyze distribution system residence times based on water quality. Created a budget for all recycled water quality monitoring and for the operation of the recycled water storage facilities and pumping station.

Alameda County Water District, GIS Upgrade of Water Quality Mapping Tools. Project Engineer. Performed a complete upgrade of Alameda County Water District's GIS water quality mapping tools. Converted all program files from MapInfo 6.5 to ArcGIS 8.2 to improve efficiency and quality of the visual data presentation.

City of Redwood City, Water Quality Sampling and Management Program. Project Engineer. Managed all water quality operations for the City of Redwood City's drinking water system. Developed and implemented sampling plans, ensured regulatory compliance, created and submitted all California Department of Public Health (CDPH) and Environmental Protection Agency (EPA) regulatory reports. Developed a water quality database to create a more efficient system for data tracking and analysis.

City of Redwood City, Bacteriological Sample Siting Plan Update. Project Engineer. Prepared, submitted, and obtained California Department of Public Health (CDPH) approval for Redwood City's 2008 Bacteriological Sample Siting Plan. Updated all bacteriological sampling locations, including upstream and downstream locations. Compiled a comprehensive coliform monitoring document for use in ensuring compliance with all of CDPH's bacteriological water quality regulations.

Bay Area Water Supply and Conservation Agency (BAWSCA), Chair of the Water Quality Committee. Project Engineer. Member of and held the position of chair of the BAWSCA Water Quality Committee from July 2005 through December 2008. Coordinated all Water Quality Committee meetings for the 26 water utilities that receive water from the San Francisco Public Utilities Commission.

Nathan Reynolds, PG

Years of Experience: 13
Years with GEOSCIENCE: 13
Education:
BS, Geology, University of California, Riverside
Professional Registrations:
California Professional Geologist (No. 9384)

What Nathan Brings to the Project:

- Experience with groundwater monitoring, studies, and data management—help collect, store, and verify data to develop groundwater models and studies that accurately reflect basin conditions

Nathan has 13 years of experience completing hydrogeologic investigations, ground water quality studies, artificial recharge projects, water well test drilling programs, and inspection for a variety of drilling projects. He also develops and maintains project data and data management systems for large well, and groundwater study projects. His experience will provide the GSA with a thorough and accurate data management system to track basin conditions and complete the GSP.

Selected Project Experience:

San Bernardino Valley Municipal Water District: Bunker Hill Basin Conjunctive Use Project - Nathan help evaluate extraction well and spreading ground locations for the Bunker Hill conjunctive use project. He helped determine locations, potential well capacities, and updated modeling assumptions for baseline conditions.

Elsinore Valley Municipal Water District: Hydrogeologic Study of the Warm Springs Groundwater Basin - Nathan helped develop a HSPF model based upon the available precipitation data, land use, and soil types. Our team then calibrated the HSPF model with adjacent or nearby streamflow gages and quantify the Warm Springs Basin groundwater storage capacity and safe yield.

Mojave Water Agency: Salt and Nutrient Loading Model - Nathan helped develop a salt and nutrient balance model using a system dynamic approach to support the Salt and Nutrient Management Plan (SNMP) for the agency.

California American Water: Monterey Peninsula Water Supply Project - The Monterey Peninsula Water Supply Project (MPWSP) is a multifaceted project to improve water supply and reliability to the Monterey Peninsula. Nathan is providing weekly and quarterly monitoring and water quality testing for the slant wells that feed into the desalination plant. Drilled at an angle, the well pull ocean water from beneath the ocean floor, protecting ocean wildlife and improving feed water quality.

Olivenhain Municipal Water District: San Dieguito Valley Brackish Groundwater Desalination Study - Nathan supported modeling efforts to study brackish groundwater desalination feasibility and location. He helped collect data, complete a hydrogeologic investigation, and performed well field and raw water collection.

City of Huntington Beach: Well 1 Replacement - Nathan performed well destruction and replacement for the City of Huntington Beach. He supported design efforts for well casing, screen, filter pack, and annular seal. During construction, he attended field meetings and worked with the contractor to inspect conductor bore hole drilling, casing installation, and the sanitary seal. He also sampled and logged soil cuttings, inspected aquifer zone testing for yield and water quality, and performed mechanical grading analyses. Once constructed, Nathan inspected final development by pumping and surging and aquifer pumping tests.

Lauren Wicks, PG

Years of Experience: 7
Years with GEOSCIENCE: 6
Education:
BS, Geology, Cal Poly Pomona
BS, Integrated Earth Studies, Cal Poly Pomona
MS, Hydrology, University of Idaho
Professional Registrations:
California Professional Geologist (No. 9531)

What Lauren Brings to the Project:

- Experience supporting groundwater models, sustainable yield studies, and calculating water budgets—help provide more accurate and thorough models and studies to inform options to improve basin sustainability
- Detail oriented—help receive accurate data and high-quality deliverables

Lauren has experience with groundwater and environmental investigations performed for numerous municipalities, state agencies, and private clients throughout California. She performs groundwater flow and transport modeling, hydrogeologic investigations, groundwater basin and water quality studies, artificial recharge projects, and has experience in GIS mapping, watershed management, database development and management. Lauren can support your team by developing accurate and complete written reports and documents, and by performing quality reviews on data.

Selected Project Experience:

San Bernardino Valley Municipal Water District: Santa Ana River Integrated Model - Lauren is working with our team to use existing groundwater and surface water models to develop an integrated watershed model for the upper Santa Ana River. The resulting Upper SAR Integrated Model (or Integrated SAR Model), will be used to determine what factors may contribute to declines SAR flows, and assess cumulative effects on SAR surface flows and groundwater levels.

San Bernardino Municipal Water District: Joint Groundwater Model for the Rialto-Colton Groundwater Basin - Lauren prepared a technical memorandum comparing previous groundwater models of the Rialto-Colton area and identifying the strengths and weaknesses of each and helped with subsequent reports regarding model construction and calibration. She helped compile a well database with locations, construction information, lithologic information and water level/water quality data availability. Support for modeling and reporting activities, and assisted with the preparation of technical memoranda summarizing model construction, calibration, and predictive scenarios.

Rancho California Water District: Surface and Ground Water Model of the Murrieta-Temecula Ground Water Basin - Lauren helped evaluate and report on a systematic model update and refinement process.

Riverside Public Utilities: North Orange Well Field Evaluation, Well Siting, and Non-Potable Water Supply Assessment - Lauren helped interpret model results and prepared a technical memorandum summarizing the impacts of new potable and non-potable wells on the current North Orange well field wells.

Chino Basin Desalter Authority: Chino Basin Ground Water Model Update - Lauren helped refine the Chino Basin Ground Water Model to evaluate impacts from proposed CDA wells. She also compiled data, updated model files, created model datasets, and calibrated the groundwater model.

Western Municipal Water District: TDS and Nitrate Lumped-Parameter Model for the Riverside and Arlington Groundwater Basins - Lauren helped create a lumped-parameter model to meet monitoring and reporting requirements of the groundwater basins and assess compliance under various scenarios. She also helped prepare various technical memorandums throughout the modeling process.

East Valley Water District: Wastewater Reclamation Plant Engineering Report - Lauren helped produce technical memorandums summarizing the predicted impacts of recharging recycled water at various recharge sites as part of the proposed Sterling Natural Resource Center. The analysis included determining the amount of underflow available as diluent water, and calculating travel times for recycled water recharge and recycled water contribution at nearby production wells.

Rancho California Water District: Santa margarita River Watershed Groundwater Model Runs & Evaluation - Lauren helped conduct GSFLOW, soluble transport, and sustainable yield model runs to prepare a groundwater model plan.

Holly Tichenor

Education
BA, Journalism, University of Texas at Austin

Training
Duarte Visual Story, Power and Structure of Story that Leads to Change and Alignment

Duarte Slide:ology, Transforming Presentations

Miller Heiman, Strategic Selling and Conceptual Selling

Dag Knudsen Presentation Development and Delivery

PSMJ, Project Management Bootcamp

Professional Experience

Ms. Tichenor is a communications leader in the A/E/C industry with more than 20 years of writing, presentation, facilitation, training and education / outreach experience. Prior to working in the water and wastewater field, she worked as a reporter for both daily and weekly papers. Ms. Tichenor leads development of written and visual communications that convey complex ideas and promote timely decision making. She is trained in large group, stakeholder alignment and workshop facilitation that brings efforts to a common vision / direction and strategic action. Ms. Tichenor is an accomplished presenter and trainer in communications, leadership and relationship development. She coaches teams on effective presentation messaging and delivery. She is an active member of leading industry associations, and leader in outreach that promotes needed water/wastewater investments.

Representative Projects

Bear Valley Water Sustainability Project, Big Bear Area Regional Wastewater Agency, Big Bear Lake, CA, Communications & Outreach Lead. Leading communications and outreach efforts for four agencies within the Big Bear Valley to implement and gain funding for a regional One Water solution. Facilitated stakeholder interviews, assessed audiences and impacted communities, and led the messaging and development of an infographic that was used to lobby for funding on a state and national level, including the US House of Representatives Committee on Appropriations.

Central Coast Blue, Multiple Agencies, Pismo Beach, CA. Communications Project Manager. Facilitated a full-scale rebranding effort for a $30 million program that included the participation of five separate agencies. Rebranding efforts included: website messaging, content development, design and implementation; renaming the program; developing and implementing a new logo and brand package; development of City Council presentations; messaging support for press releases; and provide support for the implementation, design, and layout for the program's demonstration facility.

On-Call Strategic Communications, San Elijo Joint Powers Authority, Cardiff by the Sea, CA. Project Manager. Providing on-call communications and outreach support to San SEJPA, a progressive wastewater and recycled water provider that serves multiple coastal communities. With a vision for renewed outreach, education, and an improved brand message and design, SEJPA began working with WSC to support a website redesign and refresh of brand guidelines. Additional tasks include an update of messaging and design of annual reports, content and design for construction and facility signage, and press releases announcing partnerships and milestones.

City of San Luis Obispo, Utilities Department Strategic Plan, San Luis Obispo, CA. Strategic Planning Facilitator. The City of San Luis Obispo's Utilities Department is currently updating the its Strategic Plan to achieve future goals, supporting its mission for stewardship and service to the community. The effort includes assessing the needs of the nine sections within the Department, including water, wastewater, water resources, and business operations, to define future needs, goals and initiatives for the future. Support has included: staff interviews, research and assessment of other leading Strategic Plans by recognized Utilities of the Future, communications and a strategic planning workshop with the Department's managers. As a result of the efforts, the Department will have a clear vision, and working framework to achieve performance goals and measure results.

California Water and Environment Association, One Water Workshop at CWEA's 2017 Conference. Palm Springs, CA. Facilitator. Led and organized a Panel discussion followed by an interactive table discussion to expand understanding of One Water as part of the 2017 annual conference program. Provided direction on the event, coordinated content of all supporting material, helped to facilitate workshop, and provided hands-on training for all lead participants.

Integrated Water Management Brief, Kitsap County, Washington. Technical Writer / Outreach Coach. Guided concepts around communication to elected officials and public stakeholders on a new integrated water management approach in Kitsap County. The brief uses creative graphics and messaging that covers new ways the County is approaching water management to promote resilient and reliable water supplies, how a new reclaimed water facility is contributing to water supply goals, and how other near-term investments are providing an array of integrated water management options in the future.

Integrated Process Management for Drinking Water and Wastewater Treatment Operations Research Roadmap, Water Resource Federation. Technical Writer. Developed succinct summary to inform and educate on possibilities for integrated water/wastewater management, one water solutions, for utilities across the U.S. The summary highlighted in-depth research and survey results that included numerous utilities and nearly 40 experts representing key water stakeholders. The information presents challenges and opportunities to effectively implement integrated water management solutions, providing a roadmap sustainable water supply and water quality for the future.

Texas Legislative Water Outreach Workshop. Lead Developer. Led the creation of an annual legislative workshop for Texas representatives and staff. The workshop supported education on critical statewide water related issues, including reuse, funding, and water quality. Organized presentations by local as well as national experts to address critical topics. Worked in collaboration with Executive Director of WEAT to create outreach, invites, brand, and interest in the event. The full-day workshop that drew more than 100 attendees in the first year.

Membership Outreach & Communications Taskforce – Website Update, Association of Clean Water Agencies, Taskforce Leader. Leading the evaluation and direction of a new website which addresses improved membership data management and communications technology. Leveraging volunteer committee member time, limited funds and Board Member interaction to achieve ACWA's goals in building a user-friendly website.

Chambers Creek Regional Wastewater Treatment Plant Public Outreach Brief. Technical Writer / Outreach Coach. Conducted independent research, developed original content, and brainstormed conceptual graphics for a 40-page brief summarizing the benefits of a notable wastewater treatment plant upgrade. Four chapters of concise copy and visuals summarize how the project balances environmental, economic, and regulatory goals to benefit the community for decades. The plant is located adjacent to the new Chambers Bay Golf Course—host of the 2015 USGA U.S. Open—and the brief is designed to educate the thousands of expected visitors about how the project maximizes a public works investment by reclaiming prized recreational land, supporting local economic growth, and cost-effectively complying with regulations through 2040.

West Linn Water Treatment Plant and Pipelines Conditional Use Permit Applications Benefits Summary. Technical Writer / Outreach Support. Supported efforts to communicate the benefits of investing in the Bolton Reservoir upgrade. Developed presentation material and briefing for West Linn City Council.

Erik Cadaret, GIT, MS

Education
MS, Hydrogeology, University of Nevada, Reno, NV

BS, Geology, California State University, Fullerton, CA

Registrations / Certifications
Geologist-in-Training, No. 941

OSHA 40-hour HAZWOPER

MSHA 24-hour Part 48 New Miner

OSHA 10-hour

Professional Experience

Mr. Cadaret is a Geologist-in-Training with extensive field and rigorous scientific research experience. He has technical expertise in experimental design, data analysis and interpretation, and conducting field data collection activities. His technical experience includes managing field operations, training staff, well logging, piezometric data collection and interpretation, aquifer testing and analysis, geographical information systems (GIS) applications, and data management and visualization. His graduate studies focused on novel research to assist the Bureau of Land Management and the Bureau of Reclamation develop land management strategies to mitigate sediment and salinity contributions to the Colorado River. His research was published in the journal *Catena*, an Elsevier journal.

Representative Projects

SR-520 Design Build, Shannon & Wilson Inc./Washington State Department of Transportation, Montlake, WA. Hydrogeologist. Compiled and analyzed water level and geologic data, conducted geologic interpretation and identified hydrostratigraphic units, and developed piezometeric contour maps. This project involved data synthesis to support the design build proposal.

COBB Ground Water Model Update, Consumers Energy Corporation, Muskegon, MI. Hydrogeologist. Compiled and analyzed water level and geologic data, conducted geologic interpretations and identified hydrostratigraphic units, developed piezometeric contour maps, and assisted in updating an existing ground water model. This project involved developing and updating an existing ground water model to evaluate proposed dewatering activities.

Quarterly Water Quality Sampling, Reserve Silica Corporation, Ravensdale, WA. Hydrogeologist. Conducted quarterly water quality sampling. This project involved field data collection to assist the client meet regulatory requirements.

Ground Water Pumping Impact Evaluation, Reserve Silica Corporation, Ravensdale, WA. Hydrogeologist. Evaluated ground water flow paths and identified private and municipal wells that may be affected by on-site ground water pumping within a 1 mile radius. This project involved an initial assessment to satisfy a regulatory requirement.

Monthly Water Quality Sampling, Crown Resources Corporation, Chesaw, WA. Hydrogeologist. Conducted extensive field data collection activities at over 75 sites around the mountain and installed/maintained data loggers. Revised and updated health and safety plans for expected work. This project involved field data collection to assist the mine meet regulatory and permit requirements.

Lone Pine Production Well Pumping Evaluation, City of The Dalles, The Dalles, OR. Hydrogeologist. Conducted field data collection, oversaw aquifer test operations, and assisted with data analysis and report writing. Created health and safety plan for expected work.This project involved conducting an aquifer test at the Lone Pine production well to determine if the well pumping rate could be increased by installing a higher capacity pump.

Water Quality Annual Report, Crown Resources Corporation, Republic, WA. Hydrogeologist. Assisted in the preparation of the water quality annual report required by regulatory agencies.

City Wastewater System Evaluation, City of Malibu, Malibu, CA. Field Technician. Conducted well monitoring, water sampling, sonic core logging, and oversaw drilling operations. This project involved field data collection activities to be used in the evaluation of wastewater discharge and sea water intrusion.

Well Installation Support, Crown Resources Corporation, Chesaw, WA. Geologist. Sited well locations, logged borehole lithology, oversaw well construction and development of a piezometer and a mine dewatering well, and wrote technical memorandum of drilling activities. Created health and safety plans for expected work. This project involved the installation of a piezometer to monitor ground water along a fault zone. It also involved installation of a injection well that will be used to pump treated mine water from the on-site water treatment plant back into the mine water system.

Settlement Evaluation, Confidential Client, Seattle, WA. Hydrogeologist. Compiled and analyzed water level, pumping, geologic, and geophysical data to evaluate settlement damage claims. This project involved our professional assessment of the claims to assist the client in an ongoing litigation.

I-5 Expansion Support, Parametrix Inc./Washington State Department of Transportation, Lakewood, WA. Hydrogeologist. Conducted large-scale pit infiltration testing, assisted with on-site water treatment plant operations, and assisted in data analysis and report writing. This project involved field data collection to support the design of the I-5 widening project near the Berkeley Avenue interchange.

Settlement Evaluation, Confidential Client, Redmond, WA. Hydrogeologist. Analyzed seasonal water level data and construction blue prints to evaluate settlement damage claims.

Pioneer Park, HDR Engineering Inc., Tumwater, WA. Hydrogeologist. Conducted slug test analysis of multiple wells and generated a technical memorandum of results. This project involved further geotechnical and hydrologic evaluation of a proposed fish hatchery facility located adjacent to a river channel.

Interceptor Trench Extension, Reserve Silica Corporation, Ravensdale, WA. Hydrogeologist. Conducted rising head tests and performed initial analysis to estimate hydraulic properties. This project involved an estimation of aquifer properties that will assist in the future alignment and design of a trench with the purpose of diverting contaminated ground water toward the on-site water treatment plant that is located downgradient.

Superfund Site, Confidential Client, Burbank, CA. Hydrogeologist. Sited well locations, logged borehole lithology, and oversaw well construction and development of two monitoring wells. Conducted field data collection activities, managed on-site waste disposal operations, assisted with on-site treatment plant operations, and installed data loggers. This project involved evaluating contamination transport and ongoing clean-up of the aquifer to assist client to meet regulatory requirement and assist them in an ongoing litigation.

Superfund Site, Confidential Client, Soda Springs, ID. Hydrogeologist. Created report graphics and assisted with data analysis that was included in a remedial investigation report delivered to multiple regulatory agencies.

Superfund Site, Confidential Client, Soda Springs, ID. Geologist. Conducted soil and sediment collection activities. This project involved field data collection to assist the client meet regulatory requirements.

Cadman High Rock Quarry Expansion Support, Cadman Inc., Monroe, WA. Hydrogeologist. Sited well locations, logged borehole lithology, and oversaw well construction and development of ten monitoring wells of variable lengths. Conducted field data collection activities, installed data loggers, trained field staff, and interacted with stakeholders and the client. This project involved evaluating the ground water system to ensure the planned Quarry expansion doesn't affect the aquifer that stakeholders actively use as their drinking water source. It also involved data collection for use in the engineered design of the expansion area infiltration pond.

Spencer J. Waterman

Education
BS, City & Regional Planning, California Polytechnic State University, San Luis Obispo

Certifications
American Water Works Association, California-Nevada Section, Water Use Efficiency Practitioner Grade 1, Certificate # 1714

Professional Affiliations
American Water Works Association, Member

Professional Experience

Mr. Waterman is a planner with an emphasis on water resources planning and water use efficiency. His experience includes development of water master plans, wastewater master plans, recycled water master plans, grant funding applications, water use efficiency and conservation services, and state water law compliance documents including Urban Water Management Plans, AB 1420 Self-Certification Statement materials, and California Urban Water Conservation Council Best Management Practices reports. His planning related experience includes urban redevelopment plans, specific plans, general plans, the CEQA process, ordinance writing, and building permit review.

Professional Project Experience

San Bernardino Valley Municipal Water District, Regional Recycled Water Concept Study & Grant Application, San Bernardino, CA. Staff Planner. Collaborating with nine local water and wastewater agencies to identify potential regional recycled water projects to improve local water supply reliability and sustainability. Applying a triple bottom line scoring process to evaluate alternatives on the basis of economic, social and environmental criteria. The process is being integrated with the ongoing Upper Santa Ana River Habitat Conservation Plan, which is critical to achieving local habitat sustainability and permitting regional recycled water projects. The project is being completed under an aggressive schedule to advance the most beneficial regional projects into funding and implementation as soon as possible.

San Bernardino Valley Municipal Water Distrct, 2015 Regional Urban Water Management Plan, San Bernardino, CA . Technical Advisor. Being developed with the participation of the following agencies: SBVMWD, East Valley Water District, Riverside-Highland Water Company, West Valley Water District, Yucaipa Valley Water District, the City of San Bernardino Municipal Water District, and the Cities of Colton, Loma Linda, Redlands, and Rialto. Collaborating and collecting data from the agencies listed above to update water supply and demand projections through 2035 based on changes since the 2010 UWMP and compliance with SB-7. New requirements will be addressed, such as distribution system losses reporting as part of demand and digital submittal through DWR's new templates and online submittal database. Voluntary analysis of energy intensity in water deliveries and climate change impacts will also be completed during the update.

Northern Cities Management Area Technical Group, Regional Supply & Demand Planning, San Luis Obispo County, CA. Staff Planner. Provided as-needed research and analysis support for engineering services for the City of Arroyo Grande, City of Grover Beach, City of Pismo Beach, and the Oceano Community Services District. Research, development of materials, and coordination with Northern Cities agencies and funding agencies for SLO County IRWM funding applications. Research and analysis of water supply and demand data to inform water resources management actions.

City of Camarillo North Pleasant Valley (NPV) Desalter Facility Funding Pursuits, Camarillo, CA. Staff Planner. Supported state and federal grant opportunities to assist with design and construction of the City's proposed NPV Desalter Facility. Supported application efforts resulting in the award of a $10,000,000 grant through the Department of Water Resources Round 4 Water Desalination Grant Program. Supported development of the NPV Desalter Facility Feasibility Study which was successful in meeting U.S Bureau of Reclamation standards in order to pursue grant funding through the WaterSMART Title XVI Water Reclamation and Reuse Program.

Northern Cities Management Area, Local Groundwater Assistance Grant Program Application Package, San Luis Obispo County, CA. Staff Planner. Lead author for the grant application to develop a groundwater model for a portion of the Santa Maria Valley Groundwater Basin. Facilitated stakeholder workshops to enhance inter-agency collaboration to develop a competitive grant application meeting all stakeholders' goals and objectives.

San Luis Obispo County Flood Control & Water Conservation District, Paso Basin Supplemental Water Supply Options Study, San Luis Obispo County, CA. Staff Planner. Identified and analyzed existing and potential State Water Project supply options to allow the Paso Robles Basin to achieve a balanced groundwater elevation. Supported analysis of the supply options' operational, jurisdictional and contractual limitations, provided an overview of the options evaluation screening process, and identified the supply options selected for further evaluation.

City of Pismo Beach, Recycled Water Facilities Planning Study, Pismo Beach, CA. Staff Planner. Prepared a facilities planning study, funded in part by a planning grant from the SWRCB Water Recycling Funding Program. Investigated multiple alternatives to put the City's treated wastewater, which is currently discharged to the ocean, to beneficial use, including 1) landscape irrigation within the City to offset potable water use, 2) coastal injection wells to protect the basin from seawater intrusion, and 3) inland recharge using existing storm water basins or new inland injection wells to optimize seasonal groundwater recharge. Evaluated regulatory, water supply, and stakeholder considerations affecting the development of a recycled water program. Identified and evaluated treatment and conveyance alternatives, including repurposing abandoned facilities and maximizing the use of existing facilities to develop a cost-effective recycled water program.

West Valley Water District, Recycled Water Master Plan, Rialto, CA. Staff Planner. Lead author for the Recycled Water Master Plan. Facilitated stakeholder workshops to establish goals and objectives for the recycled water program. Facilitated outreach to potential stakeholders for jurisdictional analysis and cooperation, as well as to develop partnerships. Developed demand analysis of potential recycled water markets and customers in the Ditrict's current and future service areas. Analyzed jurisdictional and regulatory context for implementation of a recycled water program. Analyzed potential recycled water supply sources and facilitated outreach and workshops with potential recycled water source suppliers and partners. Analyzed conceptual alternatives to deliver recycled water in partnership with the County of San Bernardino Special Districts Department.

Avila Beach Community Services District, Water Resources Analysis, Avila Beach, CA. Project Manager. Prepare draft technical memorandum for the District. Evaluation and assembly of water resource reliability data, supply and demand characterization, and conditional dry and average supply and demand comparison information.

Big Bear Area Regional Water Agency, Bear Valley Water Sustainability Project, Big Bear, CA. Staff Planner. Evaluating conceptual recycled water use alternatives to retain treated water and create a sustainable water resource to augment the potable water supply. Alternatives will be analyzed based on treatment and regulatory requirements of use, water supply yield, social and environmental benefits, and life cycle cost. Project includes assisting in the procurement of state and federal funding.

Santa Barbara County Water Agency, Long Term Supplemental Water Supply Alternatives Report. Staff Planner. Identified and evaluated potential supplemental surface water supply alternatives for the Santa Barbara County Water Agency. Investigated potential opportunities to increase surface water storage through expansion of existing dams or construction of new reservoirs. Utilized GIS software to develop reservoir inundation mapping and estimate capacities of various potential reservoir expansion alternatives.

Si Si, EIT

Years of Experience: 5
Years with GEOSCIENCE: 3
Education:
BS, Environmental Science, Ocean University of China
MS, Environmental Engineering, University of Southern California
Professional Registrations:
Engineer-in-Training

What Si Brings to the Project:

- Experience supporting groundwater models, sustainable yield studies, and calculating water budgets—help provide more accurate and thorough models and studies to inform options to improve basin sustainability

Si Si has more than five years of experience in groundwater and environmental investigations performed for numerous municipalities, state agencies, and private clients throughout California. She regularly performs ground water flow and solute transport modeling, hydrogeologic investigations, ground water basin and water quality studies, watershed modeling and management, groundwater waste discharge permitting, GIS mapping, and database development and management.

Selected Project Experience:

Yucaipa Valley Water District: Recycled Water Use Evaluation - Gateway Subbasin of Yucaipa GW Basin - Si developed focused groundwater model for the unconsolidated sediments of the Gateway Subbasin and solute transport model MT3DMS, evaluated the effects, including travel times and percent contribution, of recharging recycled water at the Wilson Creek Spreading Basin under various recharge scenarios.

City of San Bernardino: US EPA Model - Si prepared the SBBA HSPF watershed model input data and run model; prepared recharge packages regarding stream bed percolation, mountain front runoff and areal recharge for Groundwater Flow Model based on water balance analysis from HSPF.

San Bernardino Valley Municipal Water District: Santa Ana River Integrated Model - Si is supporting our team in an effort to use existing groundwater and surface water models to develop an integrated watershed model for the upper Santa Ana River. The resulting Upper SAR Integrated Model (or Integrated SAR Model), will be used to determine what factors may contribute to declines SAR flows, and assess cumulative effects on SAR surface flows and groundwater levels.

City of Oceanside: Feasibility of Seawater Desalination in the Mission Narrows - Si incorporated two previous developed models, the Mission Basin Model and the Camp Pendleton Desalination Groundwater Model, the Oceanside Harbor Groundwater Flow Model was developed to assess desalination impacts on coastal and inland areas. Used SEAWAT solute transport model for predictive scenarios to evaluate percentage of ocean water pumped during the Project, in terms of the concentration of TDS, and salinity changes at various locations in the model area.

County of San Luis Obispo : Paso Robles Modeling - Si performed water balance analysis on HSPF watershed simulated outflow results and prepared input data package for a Groundwater Flow Model.

Elsinore Valley Municipal Water District: Hydrogeologic Study of the Warm Springs Groundwater Basin - Si developed HSPF model based upon the available data of precipitation, land use and soil types, calibrated HSPF model with adjacent or nearby streamflow gages, quantify the groundwater storage and safe yield of the Warm Springs Basin.

California American Water: Monterey Peninsula Water Supply Project - Si, prepared cross-sections based on well logs, revised NMGWM and CEMEX Model layers, calculated and summarized hydraulic conductivity form grading analysis in CEMEX and Moss Landing Sites, mapped soil size distribution in dune sand aquifer and 180-foot aquifer equivalent, prepared weekly/monthly monitoring reports for Test Slant Well and surrounding monitoring wells, analyzed groundwater elevation changes and calibrated CEMEX focused groundwater model, calculated slant well feed-water supply, impacts and mitigation approaches.

Leo Liu, EIT

Years of Experience: 5
Years with GEOSCIENCE: 4
Education:
BS, Environmental Engineering, Tianjin Institute of Urban Construction, China
MS, Environmental Engineering, University of Southern California
Professional Registrations:
Engineer-in-Training

What Leo Brings to the Project:

- Experience supporting groundwater models, sustainable yield studies, and calculating water budgets—help provide more accurate and thorough models and studies to inform options to improve basin sustainability

Leo has more than five years of experience with ground water and environmental investigations performed for numerous municipalities, state agencies, and private clients throughout California. He routinely performs ground water flow and solute transport modeling, hydrogeologic investigations, ground water basin and water quality studies, watershed modeling and management, artificial recharge projects, and has experience in GIS applications, database development and management, and well design.

Selected Project Experience:

San Bernardino Valley Municipal Water District: Santa Ana River Integrated Model - Leo is supporting efforts to use existing groundwater and surface water models to develop an integrated watershed model for the upper Santa Ana River. The resulting Upper SAR Integrated Model (or Integrated SAR Model), will be used to determine what factors may contribute to declines SAR flows, and assess cumulative effects on SAR surface flows and groundwater levels.

San Bernardino Valley Municipal Water District: Yucaipa Groundwater Basin Annual Storage Change Calculation - Leo measured ground water level and collected pumping, spreading data, and climatological data annually. He also digitized water level data from 2005 to 2013 for the Yucaipa area using GIS software. Leo then used groundwater elevation contours from each year to calculate groundwater storage capacity.

City of San Bernardino: US EPA Model - Leo prepared the SBBA HSPF watershed model input data including land use, channel type and evapotranspiration data and run model.

San Bernardino Valley Municipal Water District: Rialto Colton Model - Leo collected and digitized water data from 1945, and 2011 using GIS software. He calculated the water budget including underflow from Lytle Basin, underflow from Bunker Hill Basin, artificial recharge of imported water, ungaged runoff and subsurface inflow from the San Gabriel Mountains and Badlands, stream bed percolation from the Santa Ana River and Warm Creek, groundwater pumping, and evapotranspiration.

Los Angeles County: Raymond Basin Ground Water Flow Model - Leo performed a regression analysis on Arroyo Seco spreading based on annual and monthly flow data from City of Pasadena, Devils' Gate Dam, and precipitation.

Castaic Lake Water Agency: Santa Clara River Valley East Sub-basin Salt and Nutrient Management Plan - Leo developed and calibrated for the salt loading model for the period from 2001 to 2011. He provided assistant with determining surface water, groundwater and salt balance and incorporating proposed mitigation projects for the salt and nutrient management plant. Leo then ran predictive model runs for the period of 2012 through 2035, and analyzed modeling results under No Project, Single Project and, All Project conditions.

Western Municipal Water District: TDS and Nitrate Lumped-Parameter Model for the Riverside and Arlington Groundwater Basins - Leo updated Groundwater Flow Model input packages to incorporate recharge and discharge components (i.e., flux terms) measured during the period from January 1965 through December 2007. He developed a lumped-parameter model for the period from 1965 to 2007 and calibrated through varying the anthropogenic return flow mass loading and initial TDS and nitrate concentration. Leo then developed and ran predictive model runs for the period of 2015 through 2034 under four different scenarios.

Kendall Stahl, MS, EIT

Education
MS, Civil and Environmental Engineering, University of Adelaide

BS, Environmental Engineering, California Polytechnic State University, San Luis Obispo

AA, Mathematics – Physics, Allan Hancock College

Professional Registrations
Engineer in Training, No. 1560998

Professional Experience

Ms. Stahl is an Engineer-in-Training with environmental engineering specializing in hydrology and hydraulics analysis and water resources planning. She has experience in water quality assessment and groundwater contamination analysis, designing water treatment systems, water resources engineering, and flood modeling. Her graduate studies focused on water security analysis, water demand management optimization, with an emphasis on characterizing the drivers of household water demand.

Representative Projects

City of Arroyo Grande, GSA Formation, Arroyo Grande, CA. Staff Engineer. Support the City in preparing a Groundwater Sustainability Agency (GSA) formation notification for the California Department of Water Resources for the intent to undertake sustainable groundwater management in accordance with the Sustainable Groundwater Management Act. The GSA formation notification included the preparation of boundary maps, stakeholder lists, and support coordination with adjacent local agencies forming a GSA.

Avila Beach Community Services District, Water Resources Analysis Technical Memorandum, Avila Beach, CA. Staff Engineer. Prepare draft technical memorandum for the Avila Beach Community Services District. Evaluation and assembly of water resource reliability data, supply and demand characterization, and conditional dry and average supply and demand comparison information.

Multiple Agencies, Central Coast Blue, Pismo Beach, CA. Engineering Support. Providing Program Management, Preliminary Design, Funding, and Environmental Document Support services for the Indirect Potable Reuse project that will recover secondary effluent from the City of Pismo Beach and the South San Luis Obispo County Sanitation District's wastewater treatment plants, a resource currently discharged to the Pacific Ocean. The advanced treatment facility will use microfiltration or ultrafiltration, reverse osmosis, and ultraviolet radiation and advanced oxidation process before being injected into the Santa Maria Groundwater Basin to supplement groundwater supplies and protect the basin from seawater intrusion. Construction is expected to begin in 2019.

Northern Cities, Engineering Services. Project Engineer. Provided as-needed engineering services for the City of Arroyo Grande, City of Grover Beach, City of Pismo Beach, and the Oceano Community Services District. Coordinated monthly meetings of the Northern Cities Management Area Technical Group. Interfaced with local and statewide regulatory agencies as an authorized agent of the Northern Cities. Tasks include preparing monthly agendas, updating the monthly groundwater production report and database, reviewing their Annual Report, developing a comparison summary of Annual Reports from the NCMA and NMMA, drafting a Case Management Conference Statement, preparing GIS exhibits and excel graphics for the NCMA Case Management Conference.

City of Pismo Beach, 2015 Water Master Plan Update, Pismo Beach, CA. Staff Engineer. Performing an update of the City of Pismo Beach 2004 Water Master Plan. Utilized the calibrated hydraulic model of the City's water distribution system using Bentley's WaterGEMS software to produced fire flow visuals for future buildout scenarios and opportunities to optimize operations.

Kaylie N. Ashton, EIT

Education
BS, Civil Engineering, California State Polytechnic University, Pomona, CA

Professional Registrations
Engineer-In-Training, #153695

Professional Experience

Ms. Ashton is an Engineer-In-Training. Her experience includes water pipeline design, hydrology and hydraulic analysis, water and recycled water master planning, hydraulic modeling of water distribution systems and construction administration. Through her experience, she has developed a practical understanding of how to apply engineering practices to deliver insightful and operator-friendly projects.

Representative Projects

Santa Ana River Conservation & Conjunctive Use Program Decision Support Model, Santa Ana Watershed Protection Agencies. Engineering Support. Served as a co-lead with another consulting agency for agency coordination and data collection for a tool to support optimization of a proposed watershed-scale conjunctive use program. Leveraged existing knowledge of local and regional water supply and distribution facilities and natural systems to support the development of a watershed-scale schematic model for use in developing the DSM. Developed a database to collect data critical to model development, co-managed the data collection process, compiled information from prior work to streamline data collection efforts for the agencies, and organized data into a comprehensive data set.

San Bernardino Valley Municipal Water District, Regional Recycled Water Concept Study, San Bernardino, CA. Staff Engineer. Project included developing a Regional Recycled Water System to enhance water supply reliability in the San Bernardino region working with San Bernardino Valley Municipal Water District and several other agencies that collect and treat wastewater in the region. Held several stakeholder workshops, identified potential recycled water project that held regional benefits, and performed alternative analysis to develop a recycled water portfolio. Prepared Regional Recycled Water Concept Study.

West Valley Water District, Recycled Water Master Plan – Chapter 8, Rialto, CA. Staff Engineer. Performing an alternatives analysis for the development of a regional recycled water program in cooperation with the County of San Bernardino Special Districts Department. Tasks include analysis alternatives; cost/benefit analysis; development of capital & operating costs and funding mechanisms; and selection of conceptual alternative.

City of Victorville, 2018 Water Master Plan, Victorville, CA. Project Engineer. Preparing a master plan that will address both hydraulic capacity deficiencies and rehabilitation and replacement needs driven by aging infrastructure. The project includes hydraulic modeling using InfoWater to evaluate capacity limitations, planning-level estimates of required capital spending each year based on system inventory and expected remaining useful life values, and a comprehensive 10-year Capital Improvement Plan.

Big Bear Area Regional Wastewater Agency, Bear Valley Water Sustainability Project, Big Bear, CA. Staff Engineer. Evaluated conceptual recycled water use alternatives to retain treated water within Bear Valley and create a sustainable water resource to augment the region's potable water supply. Conceptual alternatives were analyzed based on treatment and regulatory requirements of use types, water supply yield, social and environmental benefits, and life cycle cost of the alternatives. Assisted in alternatives analysis and prepared the Recycled Water Facilities Planning Study.

South San Luis Obispo County Sanitation District, Complete Recycled Water Facilities Planning Study for a Satellite Water Resource Recovery Facility, Grover Beach, CA. Staff Engineer. South San Luis Obispo County Sanitation District's (SSLOCSD) current wastewater treatment plant does not meet redundancy requirements, therefore SSLOCSD is looking into the opportunity in adding an additional treatment plant and using the effluent as reuse. Prepared potential alternatives and cost estimates for an investment analysis which will be included in the Recycled Water Facilities Planning Study.

City of Pismo Beach, Recycled Water Facilities Planning Study, Pismo Beach, CA. Staff Engineer. Prepared a facilities planning study, funded in part by a planning grant from the California State Water Resources Control Board Water Recycling Funding Program. Investigated multiple alternatives to put the City's treated wastewater, which is currently discharged to the ocean, to beneficial use, including 1) landscape irrigation within the City to offset potable water use, 2) coastal injection wells to protect the basin from seawater intrusion and 3) inland recharge using existing storm water basins or new inland injection wells to optimize seasonal groundwater recharge. Evaluated regulatory, water supply and stakeholder considerations affecting the development of a recycled water program. Identified and evaluated treatment and conveyance alternatives, including repurposing abandoned facilities and maximizing the use of existing facilities to develop a cost-effective recycled water program.

Otay Water District, As-Needed Hydraulic Modeling, Otay, CA. Project Engineer. Providing as-needed hydraulic modeling services for the District's potable water modeled using InfoWater. Performing fire flow analysis for potential new developments, the fire flow results were maintained in a database to provide more consistent results and save time.

City of Victorville, On-Call Water Modeling, Victorville, CA. Staff Engineer. Updated the City's GIS based InfoWater water model to include new projects since 2009 and current operations. Calibrating the Southern California Logistics Airport portion of the model and performing a high level review of the model. Provide on-call modeling analysis to help the City make informed decisions regarding potential changes to the system. Preparing Feasibility Studies and Water Supply Assessments as needed to support the City's review and conditioning of proposed development projects.

Big Bear Lake Department of Water and Power, Sawmill Well Pumping Plant, Big Bear Lake, CA. Engineering Support. Provided design services for a 350 gpm well pumping plant, which includes site improvements and a CMU building. Project included the design of over 600-ft of 6-inch PVC pipeline to connect the new well to the existing distribution system. Following the design phase, WSC provided construction management services during well construction.

California American Water Company, Carmel River Reroute and San Clemente Dam Removal Project, Carmel Valley, CA. Staff Engineer. Project includes rerouting the Carmel River and removing the San Clemente Dam, which when completed will be the largest dam removal project completed in California. Provides document control and coordinates internal and external responses to Submittals and RFI's.

City of Camarillo, Project Management Support, Camarillo, CA. Staff Engineer. Providing project management support for implementation of recycled water projects. Preparing drawings for recycled water connections to irrigate City landscape, a recreational sports park and an elementary school. Developed recycled water pipeline and valve configurations to potable water backup connections for the recycled water system.

CONTACT

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Phone: (909) 483-3200
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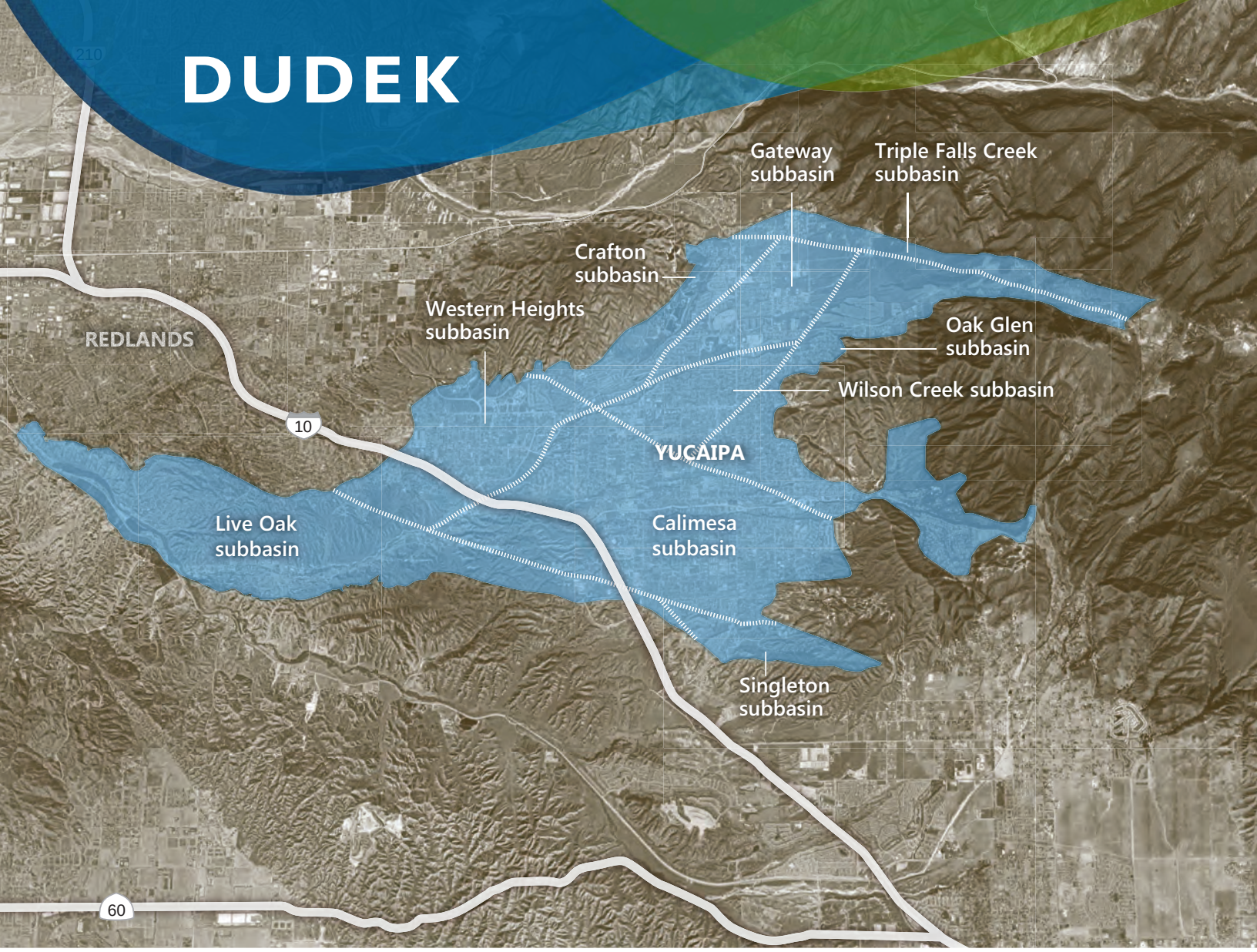
ONLINE

Expectwsc.com

WSC
WATER SYSTEMS CONSULTING, INC.

DUDEK



PROPOSAL

Develop Groundwater Sustainability Plan for the Yucaipa Valley Basin Area

PREPARED FOR

San Bernardino Valley Municipal Water District

June 20, 2018

605 Third Street . Encinitas, CA 92024 . 760.942.5147 . dudek.com

Cover Letter

June 20, 2018

Aaron Jones
Assistant Engineer
San Bernardino Valley Municipal Water District
380 East Vanderbilt Way
San Bernardino, California 92408

Subject: Develop Groundwater Sustainability Plan for the Yucaipa Basin Area

Dear Mr. Jones,

Dudek is pleased to submit a proposal to the San Bernardino Valley Municipal Water District (Valley District) for the preparation of a Groundwater Sustainability Plan (GSP) for the Yucaipa Basin (Basin). Dudek is an established firm with extensive groundwater planning experience, including preparation of the first three preliminary draft GSPs to have been released for public review in California. Dudek understands the importance and complexity of this planning effort for the Yucaipa Groundwater Sustainability Agency (GSA), stakeholders, and community within the Basin.

Dudek's experience with developing GSPs for the Fox Canyon Groundwater Management Agency (FCGMA) and the Borrego Valley GSA has provided us with a unique perspective and knowledge that we will apply in preparing the Basin GSP. Fundamentally, the GSP must adopt an adaptive management strategy that identifies uncertainty, while striving to reduce it over the 20-year plan implementation period. Our team will work collaboratively with the member agencies of the GSA and the Basin stakeholders to produce a GSP that provides operational flexibility, meets the regulatory requirements of the Department of Water Resources (DWR), and optimizes the use of the Basin for public benefit.

Extensive GSP Experience. Dudek is actively working on multiple GSPs for the Oxnard, Pleasant Valley, Las Posas, and Borrego Valley groundwater basins. As part of these efforts, we have:

- Facilitated stakeholder outreach efforts, board of directors workshops, and monthly meetings of the technical advisory group for the FCGMA;
- Provided technical analyses for GSP development based on the regulatory language from the Sustainable Groundwater Management Act (SGMA) and DWR guidance documents;
- Utilized an existing U.S. Geological Survey (USGS) numerical model to quantify uncertainty in the estimate of sustainable yield for the Borrego Valley groundwater basin;
- Developed a data management system to support GSP development; and
- Conducted an analysis of water credits and potential modifications to activities to achieve groundwater sustainability.

Dedicated Project Management. Dudek's proposed project manager, Steven Stuart, has managed multiple groundwater development and groundwater supply projects in Southern California, and offers a project management style that promotes collaboration, progress, and creative problem solving. Recently, Mr. Stuart assisted with the development of GSPs in both Ventura and San Diego Counties. Our principal in charge, Peter Quinlan, has 36 years of groundwater resources development and management experience. Mr. Quinlan is the principal in charge for both the Borrego Valley GSP and the GSPs for the basins of the FCGMA. Our project managers understand that this project must meet the GSA's and DWR's requirements while also withstanding a high level of public scrutiny.

Experience Working in the Basin. Dudek has worked with Yucaipa Valley Water District (YVWD) and other agencies in the Yucaipa, San Timoteo and Beaumont basins. This work has included collecting and compiling surface water and groundwater level and quality data per the Maximum Benefits Monitoring Program work plan drafted in response to the 2014 amendment (Resolution No. R8-2014-0005) to the Water Quality Control Plan for the Santa Ana River Basin. Our work is instrumental in evaluating the use of recycled water and imported water to augment local groundwater supplies, programs that are critical to the long-term sustainable management of the local groundwater basins.

Please find resumes for personnel committed to this project in **Appendix A**, a synopsis of projects similar to GSP development engaged by our personnel in **Appendix B**, and project assumptions that led to our cost estimate in **Appendix C**. We look forward to working with the GSA on this GSP effort. If you have any questions concerning this proposal, please contact Mr. Stuart at 760.479.4128 or sstuart@dudek.com.

Sincerely,

Peter Quinlan, RG
Vice President/Principal in Charge

Steven Stuart, PE
Project Manager

Peter Quinlan is authorized to sign on behalf of Dudek.

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FIGURES

APPENDICES

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1. Project Understanding

Groundwater from the Yucaipa Sub-basin, a part of the Upper Santa Ana Valley Groundwater Basin (DWR basin number 8-2.07), is utilized by the South Mesa Water Company, Western Heights Water Company, and the YVWD to meet most of the water demands of their respective customers. The DWR has designated the Basin a high-priority basin based on population size and growth, reliance on groundwater for public water supply, and long-term declines in groundwater levels (i.e., reduction in storage).

Valley District, Western Heights Water Company, and YVWD began discussions in 2011 to develop a groundwater management plan. The City of Redlands, San Gorgonio Pass Water Agency, South Mesa Water Company, and City of Yucaipa later joined the GMP group and initiated investigations to estimate the safe yield and available storage capacity of the basin and to evaluate potential sites for enhanced groundwater recharge.

In 2017, following the passage of SGMA in 2014, Valley District, YVWD, and the other entities formed the Yucaipa GSA. The GSA must submit a GSP for the sub-basin to DWR by January 31, 2022.

The goal of this project is to develop a comprehensive GSP using the best available data that is also adaptive and provides operational flexibility to sustainably manage the groundwater resources of the Basin. The GSP will incorporate the extensive work already conducted, including the recent Valley District investigation of the storage capacity and evaluation of potential sites for artificial recharge. Artificial recharge projects will be evaluated along with other potential projects in the GSP as part of determining the long-term future sustainable yield of the Basin.

Recent Relevant Experience with GSP Development

Dudek offers the full range of groundwater expertise to develop a GSP for the GSA. This expertise includes extensive water policy and planning, numerical modeling, hydrologic and geologic analysis, financial cost recovery, and local and stakeholder engagement. Additionally, as the only team to have produced preliminary draft GSPs for public review, we bring a perspective that has been shaped by lessons learned in other basins.

Lessons Learned

Communication is Critical

The single most important factor in determining the success of a GSP is communication. This includes communication between the consultant and the GSA, the GSA and stakeholders, and the member agencies of the GSA. When open lines of communication are maintained, the project remains on schedule and stakeholder feedback is incorporated into the development of the sustainable management criteria, which is vital to obtaining approval from DWR.

Uncertainty is Expected

In order to be successful, a GSP must acknowledge and embrace uncertainty. Initially, this takes the form of a data gap assessment, which will guide the understanding of the context for the numerical groundwater model results, and eventually quantify the confidence intervals that will be assigned to the sustainable yield. By acknowledging uncertainty, the GSA will be able to adopt an adaptive management strategy for the Basin

that relies not on a single number for the sustainable yield, but rather on the measurable objectives and minimum thresholds defined in the GSP. The 5-year updates will be used to reduce uncertainty throughout the 20-year implementation period.

The Past Is Not the Key to the Present (Or the Future)

Although a determination of the historical safe yield is a required component of the GSP, this determination will not be used to manage the Basin moving forward. Rather, the Basin management strategies will derive from the determination of the sustainable management criteria and local definitions of significance and unreasonableness for each sustainability indicator.

Defining the Sustainable Management Criteria is an Iterative Process

Local determination of sustainability hinges on understanding the impacts of the GSP on beneficial uses and users of the Basin. These impacts and the amount of sustainable pumping will vary depending on the measureable objectives and minimum thresholds adopted, the projects implemented, and the management strategies employed. Initial results of the future model scenarios will be used to inform subsequent model runs to optimize the beneficial use of groundwater and minimize impacts to the sustainability indicators. This process is likely to take several iterations before the final minimum thresholds and measureable objectives are incorporated into the GSP.

Advisory Committees Require a Clearly Defined Role

The GSA will establish a technical advisory committee (TAC) to provide technical expertise and insight to the development of the GSP. The GSA should retain the final authority to approve decisions related to the GSP, and the role of the TAC should be clearly defined as solely advisory. In the absence of a clear delineation of authority and mandate, the TAC can become a roadblock to completing the project.

2. Project Approach

Dudek's approach to assisting the GSA in developing a SGMA-compliant GSP submittal by the January 22, 2019 deadline is outlined following in accordance with the Scope Tasks identified in the RFP. Dudek recommends, however, that the GSA use the "DWR Guidance Document for the Groundwater Sustainability Plan (GSP) Annotated Outline" to structure the Yucaipa GSP. Therefore, the following descriptions include the chapter name in the RFP and subsection name that corresponds to the DWR guidance.

Task 1. USGS Groundwater Model

The USGS is currently developing a hydrogeological numerical model of the Basin using the USGS code GSFLOW. GSFLOW includes two integrated model components to simulate (1) watershed contributions to recharge using the Precipitation Runoff Modeling System and (2) groundwater flow using MODFLOW-2005. USGS is in the process of integrating the watershed model to simulate recharge to the groundwater basin. The next tasks for USGS are to calibrate the full hydrogeological model and conduct water availability analyses.

Dudek will work collaboratively with USGS to use the model to identify data gaps, assess the uncertainty in estimates of storage, and evaluate sustainability indicators required under SGMA. The model will also be used to evaluate future impacts resulting from potential projects in the Basin and climate change. The USGS will prepare a report providing supporting documentation for the modeling, and this report will be included as an appendix to the GSP. Dudek anticipates receiving the model input files and supporting documentation from USGS. It will be more efficient for Dudek to work directly with the model in developing the GSP while seeking input and support from USGS.

Task 2. Current and Historical Groundwater Conditions

Dudek will work with the GSA member agencies and USGS to collect all available historical and current data derived from previous hydrogeological investigations and the development of the USGS numerical model. Dudek, after consulting with the GSA member agencies, will compile a list identifying all data resources and make one request to obtain the data. The goal is to collect all data up front so we can effectively evaluate current and historical conditions in the early stages of GSP development. The data will be used to prepare the "Current and Historical Groundwater Conditions section of the "Plan Area and Basin Setting" chapter of the GSP.

The data will be compiled, sorted, and catalogued with a reference summary and table of contents. The catalogue will be structured such that additional data can be easily added to it for ease of future data management and use.

Dudek will review the existing data to assess conformance with the pertinent sections of the California Water Code and DWR's Emergency Regulations. The data will be evaluated to identify data gaps, both spatially and temporally, that will need to be addressed to enhance our understanding of Basin conditions and comply with the requirements of the GSP. The data will be assessed for applicability toward the six SGMA sustainability indicators, including the data evaluation considerations described in detail following.

Following review, confirmation, and rectification of preliminary data gaps, the list of data gaps and a technical memorandum summarizing the assessment of the existing data will be provided to the GSA. This is a critical step to inform development of the Monitoring Program and Sustainability Criteria and will yield the most defensible assessment in accordance with DWR requirements. The data assessment will include three components.

Data Conformance: As many assessments have been performed in the Basin by various entities, it is expected that inconsistencies exist. Inconsistencies may include variable specifications for the same well or other features, differing units (metric/imperial, acre-feet/gallons, etc.). The data conformance screening will consider the data and reporting standards specified in the GSP Emergency Regulations (§ 352.4), which specifies the use of water volumes in acre-feet, elevations using NAVD88, GPS locations using NAD83, and well identification nomenclature.

Data Relevance: Data will be assessed with regard to relevance to the applicable SGMA sustainability indicators. Data that are not relevant would be flagged as such.

Data Gaps: Geographic areas within the Basin will be categorized into subsets according to the ability to address each of the sustainability indicators. An area will be assigned "no data", "insufficient data", or "sufficient data" for each of the sustainability indicators. For areas designated as "no data" or "insufficient data", an overview of the specific data needed will be provided. For areas designated as "sufficient data", an overview of why the available data are sufficient will be provided. The sufficiency of data could be based on time history, parameter type, or data quality.

Task 3. Plan Area Including Land Use

Valley District submitted a request in 2016 to modify the DWR Bulletin 118 basin boundary defined for the Basin to reflect the physical watershed boundary and to close gaps between adjacent basins. Dudek will draft the "Plan Area" section of the "Plan Area and Basin Setting" chapter for the GSP based on the location of the modified basin boundaries that resulted from previous mapping and surveying efforts to characterize the physical attributes of the Basin watershed. Additionally, the plan area section will include a summary of the jurisdictional areas, water resources monitoring and management programs, and land use and general plans. Critical to the success of any GSP is stakeholder engagement. The description of the beneficial uses and users of the basin, as well as the description of public engagement notification and participation will also be included in this chapter.

Task 4. Water Budget and Sustainable Yield

The numerical model will be constructed to simulate the water budget for the Basin from 1980 to 2016. This historical water budget may serve as the baseline water budget from which future projects and climate change effects may be evaluated. However, if future conditions will differ significantly from historical conditions, the baseline water budget will be distinct from the historical water budget. If no such changes are identified, then the historical water budget will be incorporated into the numerical model and will serve as the baseline water budget.

The baseline water budget will be prepared using the results of the numerical groundwater model. Inputs to the model will be developed in coordination with the GSA, TAC, and USGS. The model will provide a coherent estimate of the input and outputs to the system, including estimates of subsurface flow between the seven sub-basins (i.e., potential management areas) in the Basin.

Dudek will work with the GSA to prepare the input criteria that will be used to model the long-term sustainability of the Basin. These input criteria will be based on the historical/baseline water budget, as well as on the future climate scenarios provided by DWR.

The DWR guidance on incorporating climate change into the assessment of sustainability is currently limited and the data sets to be used for these analyses were not developed specifically to address the 50-year planning horizon analyzed in the GSP. The DWR data sets cover a longer time horizon than will be simulated for the Basin sustainability analysis, leaving the GSA to consider which 50-year period(s) to simulate as part of the plan. One way to address uncertainty in future climate conditions is to simulate the future conditions using a dry, average, and wet 50-year period from the data provided by DWR.

Another way to assess uncertainty is to produce a range of synthetic future climate data, based on the historical distribution of precipitation and the gridded change factors provided by DWR. Dudek will work collaboratively with the GSA to establish technically sound and locally specific future conditions to simulate in the Basin.

Results of the numerical model in simulating the baseline water budget and future budgets influenced by planned projects and climate change will be documented in the "Water Budget and Sustainable Yield" section of the "Basin Setting" chapter. This chapter will be developed with input from Valley District, USGS, and the TAC.

Task 5. Define Management Areas

Dudek will work with the GSA, TAC, and USGS to identify and define management areas within the Basin. The management areas will be based on hydrogeologic data (e.g., faulting that created hydraulic barriers to groundwater flow) and/or jurisdictional boundaries to facilitate more effective management of water resources. Dudek will prepare the "Management Areas" section of the "Basin Setting" chapter of the GSP. This section will provide the justification for each management area selected and explain how the management of separate areas within the Basin will not cause undesirable results in other areas of the Basin.

Task 6. Define Undesirable Results, Minimum Thresholds, Measureable Objectives

Development of the sustainable management criteria lies at the heart of the GSP. These criteria are what provide the GSA with the operational flexibility to maximize the use of groundwater in the Basin while simultaneously avoiding undesirable results.

Undesirable Results

The GSA must define undesirable results in the Basin by determining what condition(s) in the Basin would be significant and unreasonable for each sustainability indicator. This determination is based on an analysis of how the minimum thresholds may affect the interests of beneficial uses and users of groundwater, or land use and property interests. Because both beneficial uses and users of groundwater are considered when defining undesirable results, the determination of undesirable results must incorporate stakeholder feedback. Dudek, with input from the TAC, will provide the analysis of the technical information to support the decision-making process, and will work collaboratively with the GSA and stakeholders to facilitate the development of undesirable results.

Minimum Thresholds

The minimum thresholds are the quantitative measure of undesirable results and are set at individual monitoring sites. These thresholds will be established, based on an analysis of how they would impact beneficial uses and users of groundwater in the Basin and the determination of undesirable results for each sustainability indicator. This process will be iterative, as minimum thresholds and undesirable results are linked together under SGMA. As with the definition of the undesirable results, Dudek will conduct the technical analysis to support setting the minimum thresholds. This is anticipated to be an iterative process, with the results of the predictive simulations informing

the minimum threshold determination. In addition, Dudek will work collaboratively with the GSA member agencies and stakeholders to incorporate both agency needs and stakeholder feedback into the final minimum thresholds.

Measurable Objectives

Just as the minimum thresholds are the quantitative measure of undesirable results, measurable objectives are the quantitative measure of the sustainability goal. They are set at individual representative monitoring sites that are, preferably, the same as those selected for the minimum thresholds. If conditions at the monitoring sites meet or exceed the measurable objectives, the Basin is at the desired groundwater condition.

The background technical studies, documentation of the current and historical conditions in the Basin, and results of the hydrogeologic numerical flow model will be used to establish the measureable objectives for the Basin. Additionally, the same data and analyses will be used to determine the interim milestones for any sustainability indicator that does not currently meet the measurable objective. These interim milestones, which will be established at 5-year increments, will be used to evaluate whether progress is being made toward sustainability during the 20-year implementation period.

Sustainability Goal

The GSA must adopt a non-quantitative sustainability goal, or goals, that set the framework for determining what is significant and unreasonable for each sustainability indicator. Because these goals are primarily policy statements that communicate the GSA's vision for sustainable management of the Basin to Basin stakeholders and DWR, they will be developed toward the end of the GSP development process, after the undesirable results and minimum thresholds have been defined. In order to draft the goal description, Dudek will use both the technical information gathered to define the quantitative sustainability criteria and the information gathered from stakeholders to craft a mission statement that summarizes the purpose for sustainably managing groundwater resources and reflects the local economic, social and environmental values in the Basin.

Once the GSA member agencies have reached consensus on the Basin's goals and objectives, Dudek will draft the "Undesirable Results, Minimum Thresholds, and Measureable Objectives" sections of the "Sustainable Management Criteria" chapter of the GSP.

Task 7. Identify Projects and Management Actions to Achieve Sustainability Goal

Potential projects and management actions previously evaluated or undertaken by stakeholders in the Basin include, but are not limited to, stormwater capture and infiltration, recycled water use, and increasing artificial recharge with additional spreading basins. These prospective projects and additional potential projects selected by the GSA will be evaluated to assess the relationship between costs and benefits for each proposed project/management action to determine its feasibility and impact on sustainability indicators. Additionally, each project or management action will also be screened for potential to contribute to undesirable results.

The initial step in the process is to compile a list of projects or management actions that are in process, historically considered, or new projects yet to be considered. The preliminary list will be presented to the GSA for consideration, and additional projects may be added, as appropriate. Several prospective projects may be known to be infeasible or ineffective; however, the projects will be carried through the study to present a complete administrative record for what projects were considered.

The initial list will be screened to identify key prospective projects and management actions that have been determined to warrant further evaluation. Performance criteria considerations

will include estimated costs, anticipated impact to sustainability indicators, and overall implementability. The distilled list of projects and management actions will be further evaluated and ranked from most to least feasible. The USGS numerical model will be used to evaluate these projects and/or actions in achieving sustainability. The findings of the evaluation will be incorporated into the GSP as the basis for the "Projects and Management Actions to Achieve Sustainability Goal" chapter.

Task 8. Infiltration Testing

Dudek understands that an Infiltration Test Work Plan was developed in 2017 based on the findings from 10 borings drilled by Geoscience in 2014 and historical performance at the existing Wilson Creek, Oak Glen Creek, and Wildwood Creek basins. Short-term infiltration tests are planned for 2018 to evaluate and rank potential sites to augment artificial recharge. Dudek will incorporate the findings from the infiltration tests with the evaluations of proposed projects and management actions addressed in Task 7.

Task 9. Define Plan Implementation Actions

Dudek, working collaboratively with the GSA, will develop a schedule for implementing the GSP and develop a monitoring and reporting program to assess and document progress in achieving sustainability. A cost estimate for implementing the program, along with annual budgets, will be developed and presented to the GSA.

Task 10. Describe Existing and Planned Monitoring Network

Fundamental groundwater monitoring data are necessary to understand how pumping affects groundwater elevations and quality, and ultimately are required to support development of a GSP that addresses the applicable SGMA sustainability indicators. Analysis of historical groundwater quality trends, combined with an understanding of concurrent production rates, will provide insight into the interaction between groundwater quality, groundwater production, and recharge.

The existing monitoring network will be evaluated in its ability to monitor each of the applicable SGMA sustainability indicators. The existing data and groundwater monitoring programs will be evaluated, and SGMA-compliant monitoring will be developed to fill in data gaps identified during existing data assessment and conform to DWR's Best Management Practices (BMPs). Dudek will develop the "Existing and Planned Monitoring" section of the "Sustainable Management Criteria" chapter of the GSP, which will describe the existing monitoring network and protocols and identify any modifications that may be implemented to enhance the assessment of achieving the sustainability goals.

Task 11. Develop Framework for Data Management System

The Basin GSA requires an enhanced system for managing existing data, future pumping, groundwater level and water quality records, and supporting SGMA-related analyses and outreach activities. A data management system is critical to the preparation of SGMA-compliant annual reports for DWR. Dudek has extensive experience with various levels of data management and can provide a robust Web-based data management platform and interactive mapping application for the GSA to use during the SGMA process and in the future. Dudek is currently developing a data management system for YVWD that will compile all information and data related to their water resources and infrastructure.

Task 12. Draft and Final GSP

Working closely with the GSA and TAC, Dudek will prepare one (1) administrative draft of the GSP for review and comment by the GSA and stakeholders. The GSP components will be based on the findings of the tasks previously described and as required by the DWR Emergency Regulations, DWR Preparation Checklist for GSP Submittal – GSP Annotated Outline, SGMA statutes, and elements developed and tested in other GSPs being developed by Dudek.

The evaluation criteria specified in the GSP Emergency Regulations will be considered throughout the GSP preparation process, rather than only at completion. Another key factor for efficient review and approval of the draft GSP is clear and meaningful communication between Dudek and DWR. Dudek will work closely with DWR during the interim review process and increase communication frequency, as needed, by leveraging existing relationships with DWR that have been developed during development of the other GSPs.

Dudek anticipates receiving all comments from the GSA and stakeholders prior to finalizing a draft GSP. Dudek will participate in one public hearing on the draft GSP. Dudek is accustomed to receiving and responding to public comments, and will bring the GSA an effective balance of technical expertise and public relations experience. Comments will be compiled and an initial draft of responses to comments will be prepared for discussion with the GSA. Upon approval of the responses by the GSA, the comments will be addressed in a final GSP.

Task 13. GSP Submittal to DWR for Review and Approval

Dudek, in coordination with the GSA, will submit the final GSP to DWR for review and approval. Dudek will document when copies of DWR's letter confirming receipt of the GSP and approval letter are received.

Task 14. Grant Administration

Administration of the DWR Grant includes completion of the following specific tasks and deliverables:

Quarterly Progress Reports. Quarterly progress reports provide the GSA and DWR with an opportunity to document success, identify potential problems, find solutions, and benchmark progress to project goals. Quarterly reports will be substantive, yet concise, and may be used as metrics for the overall grant. Dudek will communicate with Valley District to establish a system for invoice submittal so that timely and complete quarterly invoices are submitted to DWR. All progress reports will be clearly linked to the invoices and will verify that the work that is being billed has been accomplished during the identified time period.

Cost Information. DWR is specific in the intent and requirements associated with the presentation of grant-related cost information. Dudek will conform to all the grant agreement requirements. All costs associated with the grant and each individual task will be recorded, compiled, and collated by Dudek to conform to the DWR template and invoicing materials provided. Dudek will conduct quality assurance/quality control for each individual invoice to verify that all cost reimbursement requests are defensible and eligible. Once the draft invoices have been completed and vetted for eligibility. Dudek will submit the package to Valley District for their final review, approval, and signature and, ultimately, to DWR for reimbursement.

Schedule Information. The schedule is of critical importance to both the project proponents and DWR. Maintaining and adhering to an agreed-upon schedule is important for budget tracking purposes and as a metric of progress achieved. Dudek will communicate with Valley District to verify that the project is adhering to the schedule, and if it is not, Dudek will discuss options to communicate with DWR. As appropriate, the progress reporting will reflect

schedule change requests and approved schedule changes and/or official amendments.

Project Completion Report. The project completion report will be prepared in accordance with DWR specifications, which stipulate that the Grantee shall prepare and submit to DWR a separate project completion report for each project. The project completion report is to be submitted within 90 calendar days of project completion.

Task 15. Establish Governance of GSA

Dudek will prepare the "Governance" chapter of the GSP by documenting the formation of the GSA in May 2017, the responsibilities of each member agency with management and voting protocols defined, the establishment of the GSA by-laws, and a description of the process of sharing information with the San Bernardino Area.

Task 16. Develop and Implement Coordinated Outreach Plan

The spirit of SGMA is to develop local solutions for local groundwater problems. As such, stakeholder engagement is a critical factor for the successful development and implementation of the GSP. During Dudek's implementation of the SGMA process in other basins, we have observed a variety of stakeholders, each with differing levels of concern for differing components of the GSP. We have found that the most effective approach to addressing stakeholders' concerns is to be prepared to present clear, tactful presentations that balance technical data with conclusions delivered in relatable lay-person terms. Additionally, having the pertinent technical lead for each respective topic present the information results in better informed stakeholders and more meaningful discussion. Throughout the process, Dudek is mindful of the significance of the administrative record.

Dudek will work with the GSA to update the interested parties list that was developed during the initial efforts of forming the GSA. Dudek will also develop an Outreach Plan that identifies the processes of communicating with and engaging all stakeholders, including disadvantaged community groups. Dudek will develop a website portal providing access to the GSP development process to the general public.

Task 17. Technical Advisory Committee

Dudek will coordinate the TAC formation with the GSA and facilitate thirteen (13) meetings throughout the GSP development process from the project kickoff meeting to the draft GSP. Dudek personnel will participate in each meeting and provide meeting minutes identifying the participants and summarizing topics discussed.

Dudek also anticipates participating in weekly one-hour conference calls with the GSA member agencies and TAC regarding progress in completing the various tasks and other issues related to developing the GSP. Dudek also anticipates participating in eight (8) Valley District Board meetings to apprise the Board of the status of the GSP.

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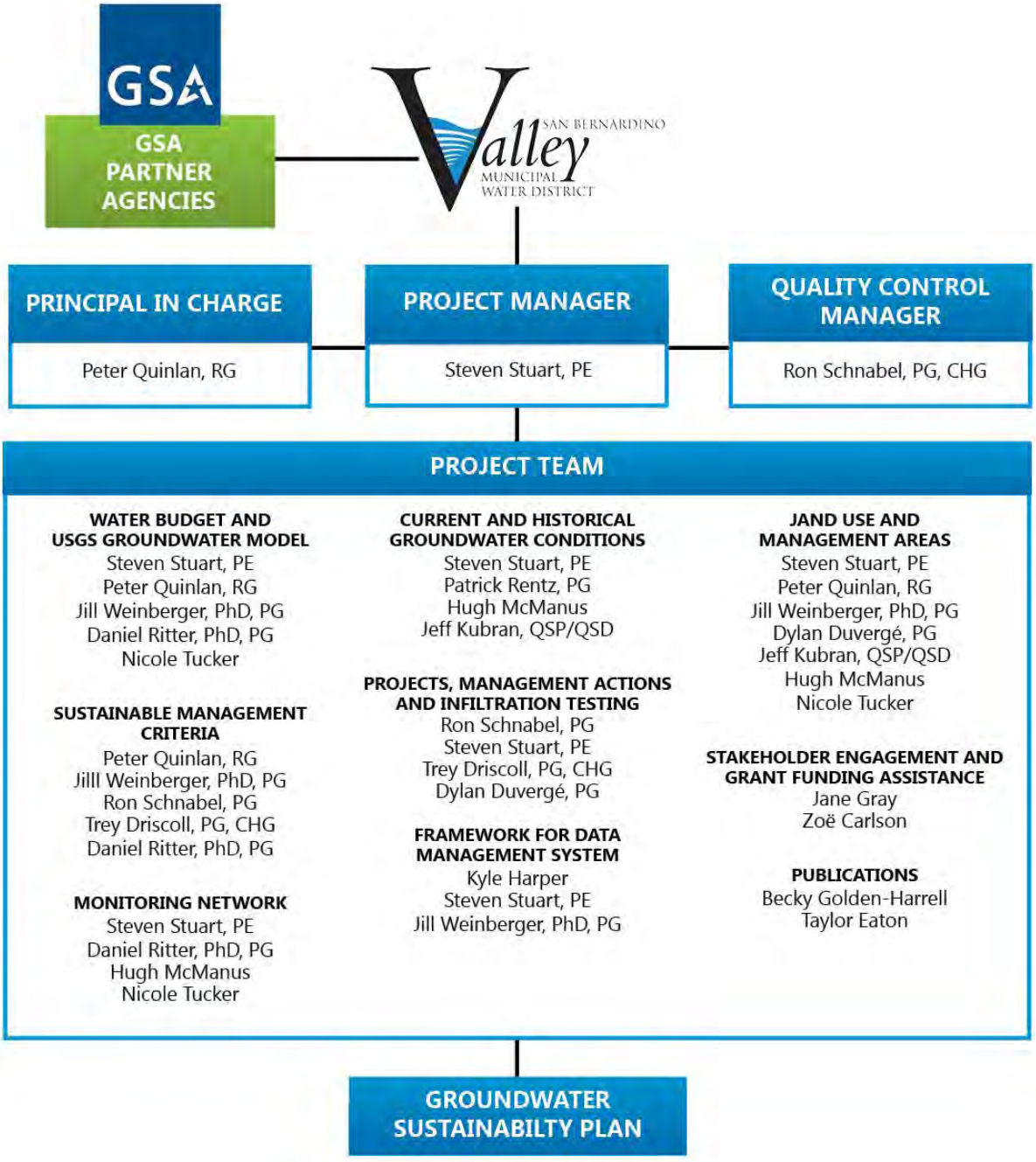
3. Team Organization

Figure 1 depicts the Dudek team that will work on the project, including the chain of responsibility and lines of communication that will be used to assist the Valley District. Resumes for key personnel are provided in **Appendix A**.

Figure 1. Team Organization



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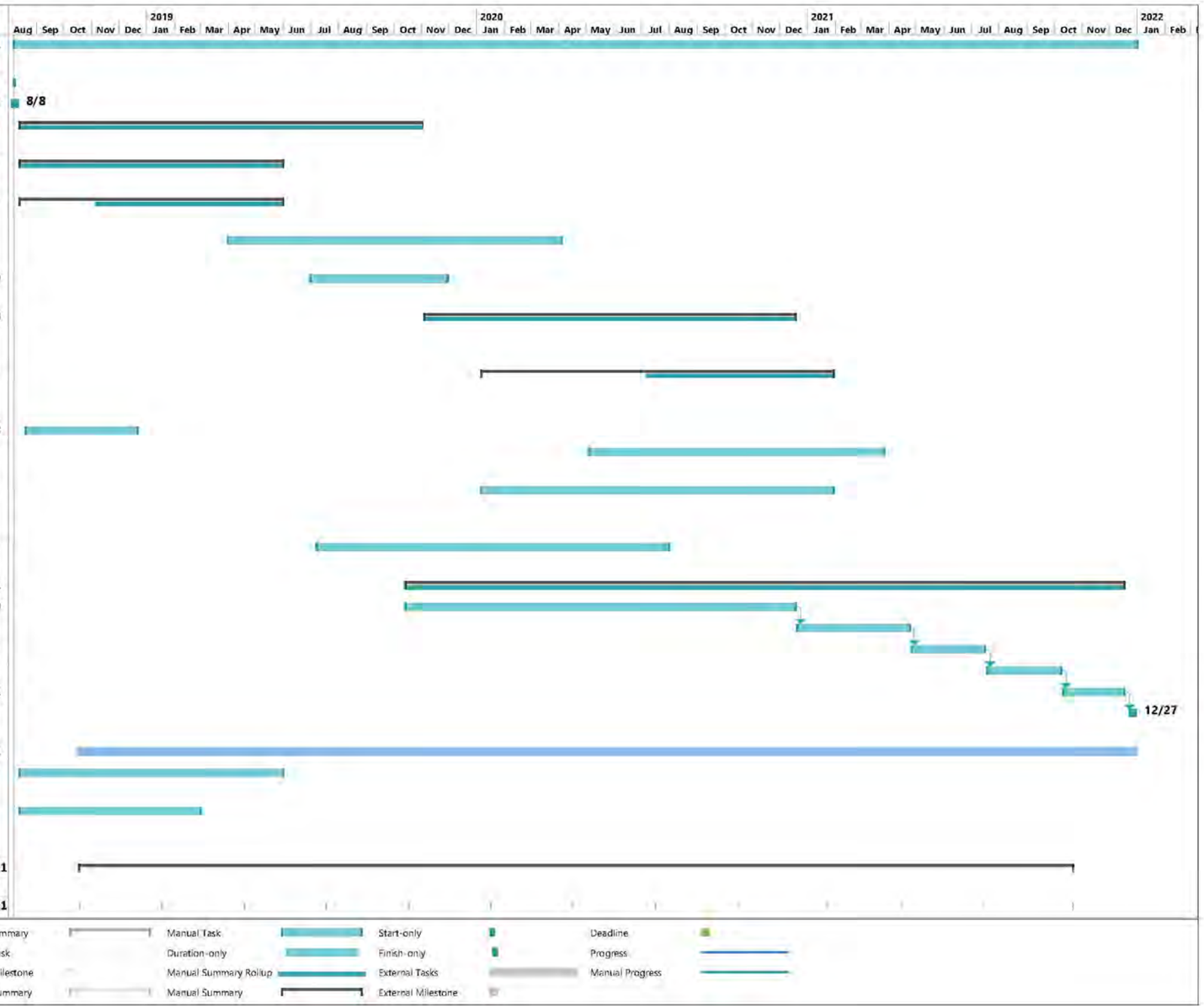
4. Project Schedule

Figure 2 depicts the anticipated schedule to complete the project.

Figure 2. Project Schedule

ID	Task Name	Duration	Start	Finish
1	Development of GSP for Yucaipa Basin	889 days	Tue 8/7/18	Fri 12/31/21
2	Notice to Proceed	1 day	Tue 8/7/18	Tue 8/7/18
3	Kick-Off Meeting	0 days	Wed 8/8/18	Wed 8/8/18
4	Task 1. USGS Groundwater Model	320 days	Mon 8/13/18	Fri 11/1/19
8	Task 2. Current and Historical Groundwater Conditions	210 days	Mon 8/13/18	Fri 5/31/19
12	Task 3. Plan Area Including Land Use	210 days	Mon 8/13/18	Fri 5/31/19
14	Task 4. Water Budget and Sustainable Yield	265 days	Mon 4/1/19	Fri 4/3/20
15	Task 5. Define Management Areas	110 days	Mon 7/1/19	Fri 11/29/19
16	Task 6. Define Undesirable Results, Minimum Thresholds, Measureable Objectives	295 days	Mon 11/4/19	Fri 12/18/20
19	Task 7. Identify Projects and Management Actions to Achieve Sustainability Goals	280 days	Mon 1/6/20	Fri 1/29/21
21	Task 8. Infiltration Testing	90 days	Mon 8/20/18	Fri 12/21/18
22	Task 9. Define Plan Implementation Actions	235 days	Mon 5/4/20	Fri 3/26/21
23	Task 10. Describe Existing and Planned Monitoring Network	280 days	Mon 1/6/20	Fri 1/29/21
24	Task 11. Develop Framework for Data Management System	280 days	Mon 7/8/19	Fri 7/31/20
25	Task 12. Draft and Final GSP	570 days	Mon 10/14/1	Fri 12/17/21
26	Administrative Draft GSP	310 days	Mon 10/14/1	Fri 12/18/20
27	Administrative Review	90 days	Mon 12/21/2	Fri 4/23/21
28	Draft GSP	60 days	Mon 4/26/21	Fri 7/16/21
29	Public Hearing of Draft GSP	60 days	Mon 7/19/21	Fri 10/8/21
30	Final GSP	50 days	Mon 10/11/2	Fri 12/17/21
31	Task 13. GSP Submittal to DWR for Review and Approval	0 days	Mon 12/27/21	Mon 12/27/21
32	Task 14. Grant Administration	840 days	Mon 10/15/1	Fri 12/31/21
33	Task 15. Establish Governance of GSA	210 days	Mon 8/13/18	Fri 5/31/19
34	Task 16. Develop and Implement Coordinated Outreach Plan	145 days	Mon 8/13/18	Fri 3/1/19
35	Task 17. Technical Advisory Committee	786 days	Thu 10/18/18	Thu 10/21/21
36	TAC Meetings	786 days	Thu 10/18/18	Thu 10/21/21



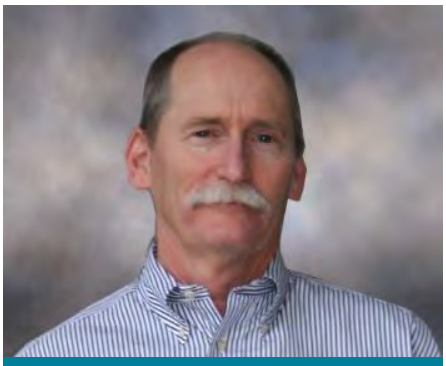
Detailed project cost information has been removed for evaluation purposes.

Appendix A

Qualifications

Peter Quinlan, RG

Peter Quinlan has 36 years' experience as a professional hydrogeologist. Mr. Quinlan worked in groundwater exploration and water resources evaluation for Tetra Tech International and the government of Oman before returning to the United States and working for Hargis + Associates, and eventually, Dudek. His current professional responsibilities include water resource evaluation, expert witness testimony, groundwater modeling, and groundwater management planning.



Peter Quinlan

Education

University of Arizona
MS, Hydrology

Certifications

Registered Geologist (RG), AZ No. 26772

Professional Affiliations

Industry Advisory Committee, Department of Aerospace, Mechanical, and Environmental Engineering, University of California (UC), San Diego

Advisory Board, Department of Hydrology and Atmospheric Sciences, University of Arizona

Project Experience

Groundwater Management

- Prepared GSP for the Oxnard Sub-Basin for FCGMA pursuant to the SGMA of 2014. Groundwater sustainability indicators with potentially undesirable results included seawater intrusion, chronic lowering of water levels, decrease in storage, and groundwater surface water interaction. Work is ongoing.
- Prepared GSP for the Pleasant Valley Sub-Basin for FCGMA pursuant to the SGMA of 2014. Groundwater sustainability indicators with potentially undesirable results included chronic lowering of water levels, decrease in storage, and groundwater surface water interaction. Work is ongoing
- Prepared GSP for the Las Posas Sub-Basin for FCGMA pursuant to the SGMA of 2014. Groundwater sustainability indicators with potentially undesirable results included chronic lowering of water levels, decrease in storage, and groundwater surface water interaction. Work is ongoing.
- Prepared GSP for the Borrego Basin for San Diego County and the Borrego Water District (BWD) pursuant to the SGMA of 2014. Groundwater sustainability indicators with undesirable results included chronic lowering of water levels, decrease in storage, and water quality Work is ongoing.
- Prepared AB 3030 Groundwater Management Plan for Rainbow Basin for the Rainbow Municipal Water District.
- Prepared AB 3030 Groundwater Management Plan for the Tijuana River Valley for the Tia Juana Valley County Water District.

Groundwater Supply and Development

- Evaluated water quality and quantity and regulatory and water rights issues as part of the due diligence for the acquisition of the Primm casinos and golf courses in Nevada and California.

- Prepared a groundwater supply assessment for the Joshua Basin Water District, including simulations of water level and storage declines in response to various demand growth scenarios. Evaluated recharge estimates, estimated storage, and historical production and declines in groundwater levels, and estimated both recharge from septic system discharges and water quality impacts associated with septic discharge. Identified potential sites for artificial recharge through the capture of storm runoff and imported water.
- Designed and prepared well specification for a new production well for the Joshua Basin Water District. Evaluated potential spreading basin locations for aquifer recharge with imported water.
- Evaluated potential impact of a new production well on water levels and pump submergence in existing wells, on seawater intrusion, and on colored water migration in the Orange County Groundwater Basin for the Laguna Beach County Water District.
- Investigated the groundwater resources and sustainable yield of a 23,000-acre ranch in San Diego County, California. Work included exploration drilling; production well construction; and measuring rainfall, surface water runoff, changes in soil moisture, and changes in groundwater storage. Estimated infiltration and losses to evapotranspiration to calculate recharge and sustainable yield through water balance analysis. Performed an ecohydrology study to evaluate water demands of native plant populations in upland and riparian areas. Project is ongoing.
- Investigated the groundwater resources and sustainable yield of a 25,000-acre ranch in Santa Barbara County, California. Measured rainfall, changes in soil moisture, and changes in groundwater storage. Estimated infiltration and evapotranspiration losses to calculate recharge and sustainable yield through water balance analysis. Performed an ecohydrology study to evaluate water demands of native plant populations in upland and riparian areas. Project is ongoing.
- Conducted resource evaluations and prepared a groundwater management plan in accordance with Assembly Bill 3030 to develop groundwater resources in Tijuana Valley, California. Designed a groundwater exploration program for the San Diego Formation, which included the installation of two 1,400-foot-deep observatory wells and a 1,200-foot-deep production well.
- Evaluated impacts of increased production from the Dyer Road well field for the Irvine Ranch Water District.
- Consulted with Suburban Water Systems to site and design two 1,200-foot exploratory boreholes and two 1,200-foot production wells. Prepared draft well specifications for driller bid packages; interpreted geophysical logs; and designed well screen intervals, slot size and filter pack. Evaluated water quality analyses from zone testing to determine screen intervals.
- Prepared a groundwater management plan for the Rainbow Municipal Water District. The plan addresses water quality impacts from agricultural and horticultural runoff and septic discharges, as well as developing groundwater supply.
- Evaluated the potential impact of seepage of reclaimed water from the San Joaquin Reservoir for Irvine Ranch Water District. This evaluation included review of hydraulic properties of the reservoir liner and underlying formations and water quality impacts on the Newport Beach Back Bay.
- Evaluated the impact of future wastewater plant effluent discharges on the salinity of groundwater for the Ramona Municipal Water District (RMWD). Prepared numerical models of the basin and a report to support a basin plan amendment request from the Regional Water Quality Control Board.
- Prepared a numerical groundwater model to evaluate the impacts of increased discharge rates of wastewater effluent from the Rancho Santa Fe Water Pollution Control Facility in the San Dieguito Valley.

- Investigated groundwater resources in the Ibri-Dhank area of Oman. Investigated quantity and quality of groundwater available in alluvial formations and Eocene/Paleocene limestone and dolomites beneath the foothills of the Jabal Akhdar and plains between the mountains and sand dunes of the Empty Quarter in Oman. Reviewed existing hydrogeologic information, sited exploration wells, logged boreholes, designed wells, conducted aquifer tests, and related data to existing hydrogeologic information. Constructed 12 wells to depths of 700 feet

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Steven Stuart, PE

Steven Stuart has been a professional hydrogeologist at Dudek since 1997. Mr. Stuart has 20 years' experience in California managing groundwater supply projects and hydrogeological investigations. His responsibilities include the oversight of hazardous waste remediation projects, groundwater resource assessments and investigations, and regulatory compliance. His experience includes designing, building, calibrating, and implementing 2-D and 3-D finite difference numerical models to simulate groundwater flow and contaminant fate and transport in the unsaturated and saturated zones. Mr. Stuart has used the windows-based pre/post-processor Groundwater Vistas, and conducted simulations with the finite-difference codes MODFLOW, MODFLOW-SURFACT, and MODFLOW-OWHM. Additionally, he has designed 3-D finite difference numerical models to simulate multiphase flow of contaminants using the T2VOC and TOUGH2 modeling codes developed at Lawrence Berkeley Laboratory.

Steven Stuart

Education

San Diego State University
MS, Geology with an emphasis toward Hydrogeology

UC San Diego
BS, Physics with specialization in Earth Sciences

Certification

Professional Engineer, CA No. 79764

Project Experience

Groundwater Supply and Management

- Project manager for implementing a habitat monitoring program for the YVWD to monitor the diurnal and seasonal fluctuations of shallow groundwater in riparian habitat adjacent to San Timoteo Creek. Data collected from the monitoring program was used to establish baseline groundwater level conditions and evaluate the potential impacts on established riparian habitat by planned reductions in treated effluent discharge to the creek.
- Data Project Manager for the Yucaipa, Beaumont and San Timoteo Groundwater Management Zones. Responsibilities include collecting, compiling and analyzing groundwater and surface water data to evaluate how each water agency and public entity is operating to maintain the "maximum benefit" of the natural water resource in the upper northeastern section of the Chino Basin that includes San Timoteo Creek.
- Conducted a water budget analysis for an alluvial sub-basin in Pauma Valley, California. The analysis included an estimate of groundwater in storage and an evaluation of potential impacts to storage by anticipated increases in groundwater production from the basin.
- Project manager for designing and implementing a monitoring program to establish baseline groundwater level conditions in shallow alluvium underlying riparian habitat downstream of El Capitan Reservoir and San Vicente Reservoir for the City of San Diego. Soil moisture sensors were installed, in addition to piezometers, to characterize the soil moisture profile from land surface to the water table.

- Initiated a shallow groundwater investigation of an upland wetland habitat area previously devastated by fire near the Sweetwater Reservoir in San Diego, California. Changes in groundwater elevations in response to precipitation and surface water flows, coupled with soil characteristics, were used to create a numerical model to simulate the height of the capillary fringe above the water table. The findings from the investigation were used to help design a habitat restoration program for the area.
- Project manager for investigating the performance and water quality of two municipal water supply wells for the City of San Clemente, one of which experienced increasing chloride and TDS concentrations. The investigation led to recommendations to modify the well to improve water quality and production.
- Project manager for evaluating previous hydrogeological investigations conducted by others that studied the potential impacts of groundwater production from fractured rock on the water levels at adjacent private wells and riparian habitat for the City of Poway.

Numerical Modeling Experience

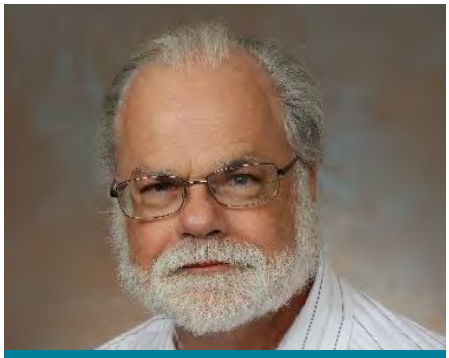
- Modified an existing 3-D MODFLOW-OWHM numerical model to incorporate recent groundwater level and pumping data for the Borrego Groundwater Basin. The updated model was used to validate calibration of the numerical model and define uncertainty in estimates of aquifer storage.
- Modified an existing 2-D MODLFOW numerical model by expanding the model domain with additional layers to better represent the geology of the groundwater basin and incorporating site-specific aquifer characteristics derived from local aquifer testing. The numerical model was used to simulate the potential change in water table elevation resulting from additional recharge from the discharge of imported water to recharge spreading basins.
- Modified an existing 3-D finite-difference numerical model to evaluate the potential impacts to groundwater levels at a downstream ecological reserve when diverting stream flow and pumping groundwater at a multipurpose basin upstream of the reserve. The modified numerical incorporated monthly stress periods to simulate monthly variations in rainfall, stream flow and evapotranspiration, which was defined using transpiration rates for riparian vegetation mapped in the reserve. The numerical model results were used to develop an operational plan for the basin to minimize the impacts to downstream habitat.
- Developed a variably saturated flow model to simulate the potential effects to shallow groundwater levels and soil moisture when modifying a floodplain for a riparian habitat restoration project. The numerical model was used to estimate the depth to the water table and the height of the capillary fringe above the water table. Results from the numerical model were used to design a habitat mitigation plan to sustain new riparian habitat.
- Manipulated the existing USGS MODFLOW groundwater numerical model of the Joshua Basin using Groundwater Vistas to predict changes in aquifer storage as a result of projected growth in the basin.
- Prepared a 3-D MODFLOW groundwater numerical model to simulate the transport of dissolved chromium in an aquifer beneath the former Marley Cooling Tower Company facility in Stockton, California. The numerical model is used to evaluate the hydraulic capture and plume containment by the remedial well field. Proposed modifications in the pumping scheme of the remedial well field are evaluated by using the numerical model to predict the effect of such changes.

Groundwater Remediation

- Project manager for the ongoing treatment of hexavalent chromium-contaminated groundwater at a former cooling tower facility in Stockton, California. This work includes the evaluation of hydraulic capture by the remedial well field and the effects of a full-scale in situ remediation program in chemically reducing hexavalent chromium to trivalent chromium.
- Project manager for the design, installation and implementation of an aggressive shallow subsurface soil vapor extraction system at a former chemical manufacturing facility in Los Angeles, California. The project reduced residual concentrations of chlorinated solvents to levels where the State of California issued a No Further Action letter.

Ronald Schnabel, PG, CHG

Ronald Schnabel is a senior hydrogeologist with 39 years' experience in geology and hydrogeology. Mr. Schnabel has used his thorough understanding of geology and hydrogeology to help clients requiring planning, permitting, design, and operational expertise with water banking and artificial groundwater recharge. He has served as project manager and key team member on more than twenty groundwater banking and recharge projects in California and for numerous other types of projects. Mr. Schnabel's regulatory experience includes environmental permitting, plans of operation, California Environmental Quality Act, environmental impact reports (EIRs), and National Environmental Policy Act compliance and permitting. He aims to use his experience to further help clients needing surface water- and groundwater-related investigations, artificial recharge projects for aquifer storage and recovery, well design, construction and testing. Mr. Schnabel's experience includes groundwater modeling, Geographic Information Systems, statistics, surface water-measurement methods, and geophysics.



Ronald Schnabel

Education

California State University, Sacramento
BS, Geology

Certifications

Professional Geologist (PG), AZ No. 39745; CA No. 7836

Certified Hydrogeologist (CHG) CA No. 867; OR No. 2020; WA No. 463

Project Experience

Centennial Hydrogeologic Investigation, Centennial Founders LLC, Los Angeles, California. Conducted a hydrogeologic study to assess the quantity and quality of groundwater. Performed preliminary design and cost estimating for groundwater recharge and recovery facilities consisting of approximately 100 acres of spreading grounds and seven recovery wells. Conducted an extensive hydrogeologic study that included drilling and installing eight monitoring wells, designing and constructing a groundwater recharge test basin, and estimating the safe groundwater yield for local groundwater supply. This investigation was a portion of the water resource assessment study for a major planned community.

Develop and Prepare GSPs for Multiple Basins, Fox Canyon Groundwater Agency, Ventura County, California. Project manager and senior hydrogeologist developing GSPs for the FCGMA. The GSPs include the high prioritized basins of Pleasant Valley, and Las Posas, and the Oxnard Subbasin, and the medium prioritized basin of Arroyo Santa Rosa. Duties include collaboration with the Agency, the Technical Advisory Group, Charter Water Allocation Groups, stakeholders, and the public in order to produce technically proficient and adaptive GSPs. The GSP development addresses developing equitable methods for controlling groundwater extractions and reaching agreement on how these controls are accomplished and implemented.

Percolation Basin Testing and Design Recommendations, Coachella Canal Lining Coordination Committee Technical Memorandum, San Bernardino County, California. Conducted percolation basin testing at Coachella Valley Water District's Unlined Canal and at the Dos Palmas Aqua Farms percolation basins to estimates infiltration rates. Used falling-head and constant-head percolation tests to estimate percolation rates. Results were then used to plan new percolation ponds on the Coachella Valley Water District's Unlined Canal and at the Dos Palmas Aqua Farms.

Evaluation of the Proposed Fremont Valley Preservation Project Groundwater Bank, AquaHelio Resources LLC, Kern County, California. Conducted an evaluation of the Fremont Valley Groundwater Basin to determine the effects of groundwater banking on the basin. Conducted 23 test borings and 12 hydraulic conductivity tests to evaluate surface recharge potentials. Constructed three percolation test basins to estimate infiltration rates. Conducted five aquifer pumping tests to estimate aquifer parameters to construct a conceptual geologic groundwater model to evaluate the groundwater banking operations. Estimated the safe yield of the Basin by precipitation and change in storage methods.

Evaluation of Groundwater Banking Project Impacts, Environmental Science Associates, Kern County, California. Evaluated the effects of the proposed West Kern Water District Groundwater Banking Project to groundwater levels and to water quality for an EIR. Used the WinFlow modeling software to estimate the drawdown and mounding impacts for different well configurations, pumping and recharge amounts and for different locations. Examined historic groundwater level and water quality data to estimate project impacts to baseline conditions. Characterized the groundwater basin. Reviewed pumping tests to obtain aquifer parameters for modeling.

Santa Ana River Groundwater Recharge Optimization Study, San Bernardino Valley Water Conservation District and Valley District, San Bernardino, California. Conducted recharge infiltration rate studies as part of a team to evaluate potential recharge and optimization for the upper Santa Ana River. Conducted falling-head and constant-rate recharge tests on existing recharge basins and worked with team to plan new facility locations.

White River Recharge Site Investigation, Kern-Tulare Water District, Kern County, California. Conducted groundwater recharge basin tests to estimate percolation rates for a proposed groundwater banking operation. Drilled an exploratory borehole to determine the viability of conducting a groundwater storage and recovery program.

Groundwater Resource and Quality Investigation, Blackwell Land LLC, Bakersfield, California. Evaluated the quality and availability of groundwater for approximately 45 square miles of the Berrenda Mesa Water District in western Kern County. Examined historic groundwater levels and water quality, characterized the groundwater basin and provided estimates of current groundwater quantities and quality. Performed pumping tests to obtain aquifer parameters and for water quality testing.

Groundwater Storage and Recovery Pilot Project in White Wolf Basin, Wheeler Ridge-Maricopa Water Storage District, Kern County, California. Conducted a detailed hydrogeologic investigation on recharging State Water Project water in the White Wolf Basin for groundwater banking. The investigation included field work and reviewing reports, well construction information, groundwater quality and level data, oil and gas well information, and geophysical investigations. The investigation included surface recharge pond tests, design and construction of monitoring wells, water quality sampling, and conducting three aquifer pumping tests to estimate storage aquifer parameters.

Ocotillo-Coyote Wells Hydrology and Groundwater Modeling Study, US Gypsum, Ocotillo, California. Reviewed available reports, well information, groundwater level and quality data, and conducted field work to generate a conceptual geologic model used for a groundwater model. The work was the major part of an EIR/environmental impact statement (EIS) to estimate future groundwater conditions with increased production from the basin. Work included environmental documentation and responses to comments on the project's hydrogeologic effects.

Jill Weinberger, PhD, PG

Jill Weinberger is a principal hydrogeologist with 18 years' experience working in the fields of groundwater supply and development, water resource management, and groundwater contamination. Dr. Weinberger has been the technical lead on projects assessing alternative intake locations for desalination projects along the California coastline, investigating the potential for on-shore pumping to induce seawater intrusion in coastal aquifers, evaluating the complex interactions between surface water and groundwater in fractured rock aquifers, and quantifying the transpiration demands of native vegetation in a changing climate. Dr. Weinberger's current professional responsibilities include assisting water districts, municipalities and agencies prepare for and implement the requirements of the SGMA, designing and implementing of water resource investigations, evaluating the interaction between surface water infiltration and aquifer recharge, and assessing sources and movement of groundwater contamination plumes. Prior to joining Dudek in 2008, Dr. Weinberger worked for the Ocean Drilling Program and the Integrated Ocean Drilling Program on projects incorporating marine hydrogeology, sediment physical properties, and borehole geophysics in the marine environment.

Jill Weinberger

Education

UC San Diego
Scripps Institution of Oceanography
PhD Earth Sciences

Rice University
BA Geology

Certification

PG, CA No. 8940

Project Experience

SGMA

- Prepared preliminary draft GSPs for the Oxnard subbasin of the Santa Clara River Valley Groundwater Basin, the Las Posas Valley Groundwater Basin, and the Pleasant Valley Groundwater Basin.
- Presented key technical concepts, proposed sustainability criteria, including measurable objectives and minimum thresholds, and data gap analysis at stakeholder meetings.
- Prepared hydrogeologic conceptual model for the Las Posas Valley, Pleasant Valley, and portions of the Arroyo Santa Rosa Groundwater Basins, as well as for the Oxnard subbasin of the Santa Clara River Valley Groundwater Basin in Ventura County.
- Conducting ongoing assessment of groundwater elevation data, production records and historical precipitation in order to link water levels and sustainability goals for the Las Posas Valley and Pleasant Valley Groundwater Basins, as well as for the Oxnard subbasin of the Santa Clara River Valley Groundwater Basin within the jurisdiction of the FCGMA.
- Participant in technical advisory group meetings, and stakeholder outreach planning for preparation of the GSPs for the FCGMA.
- Prepared subsurface geologic analysis of Borrego Valley Groundwater Basin hydrogeologic boundaries for submission of Basin Boundary Modification (BBM) Request to DWR, under the SGMA.

Groundwater Supply and Sustainable Yield

- Analyzed groundwater quality trends for naturally occurring constituents of concern in the Borrego basin.
- Conducted peer review and analysis of geologic and hydrologic evidence used to prepare submission of BBM Request for the Cuyama and San Antonio Groundwater Basins, under the SGMA.
- Assessed sustainable yield using network of groundwater wells, stream gauges, and soil moisture probes for a private ranch in eastern San Diego County.
- Prepared technical memorandum regarding comparing the County of San Diego methodology for assessing sustainable yield to site specific data on stream flow and runoff.
- Prepared recharge and sustainable groundwater production estimate for a 25,000 acre private ranch using the Santa Barbara County methodology for determining CEQA significance thresholds.
- Evaluated the impacts of naturally occurring hexavalent chromium [Cr(VI)] on water quality at production wells owned and operated by the Santa Ynez River Water Conservation District. Compiled and analyzed intraborehole flow data and depth discrete water quality sample results documenting vertical variation of Cr(VI) concentrations in aquifer.
- Prepared County Groundwater Investigation Report update to County of San Diego Pine Valley Cumulative Groundwater Study.
- Assisted with analysis of aquifer test data and water quality sample results for a groundwater resources assessment for a large concentrating photovoltaic solar projects encompassing 1,473 acres of land.
- Provided peer review for Groundwater Resources Investigation Report for a 765 acre solar energy system in eastern San Diego County.

Groundwater/Surface Water/Habitat Interaction – Ecohydrology

- Evaluated transpiration data collected as part of an assessment of the potential for groundwater development to impact native plant populations in the upland and riparian areas of a watershed in eastern San Diego County.
- Estimated habitat water requirements using changes in soil moisture in order to assess the water demands of native plant populations on a private ranch in Santa Barbara County.
- Conducted an ecohydrology study evaluating water demands of riparian plant population supported by wastewater effluent in Imperial County in order to assess the potential impact of a reduced water supply.

Litigation Support

- Prepared Draft Feasibility Study analyzing alternatives for both water supply and remediation in the Chino Basin necessitated by trichloroethylene contamination in a groundwater aquifer with municipal supply wells. Identified potentially responsible parties and potential groundwater pathways from upgradient sources.
- Assisted with the geochemical analysis evaluating the potential contribution of Bradley Landfill to groundwater contamination in the North Hollywood Operable Unit of the San Fernando Valley Superfund Site.
- Evaluated the subsurface geologic constraints, generated geochemical history, and created an operational ranking matrix, to assist with cost allocation for perchlorate contamination at the Bermite site in Saugus, California.

- Evaluated the geologic setting and structural controls on the potential hydraulic connection between the San Diego River and the San Diego Formation. Assisted with the assessment of the potential for seawater intrusion to result from the expansion of well fields in the San Diego Formation.

Trey Driscoll, PG, CHG, QSP/QSD

Trey Driscoll is a senior hydrogeologist with 17 years' experience in the environmental field. Mr. Driscoll specializes in water resource studies, watershed evaluations, environmental investigations, well locating and drilling, and well design. Mr. Driscoll brings diverse experience to the project team and has supported numerous projects encompassing a wide range of areas. Mr. Driscoll's project experience includes negotiation of water supply contracts, water rights testimony, preparation of groundwater monitoring and mitigation plans, water quality and hydrology technical reports, and exploratory groundwater investigations.

Trey Driscoll

Education

Hobart and William Smith Colleges, Geneva, New York
BS, Geoscience and Environmental Studies

Certifications

Professional Geologist, CA No. 8511

CHG, CA No. 936

QSP/QSD, No. 20167

Professional Affiliations

National Groundwater Association

Groundwater Resource Association of California

San Diego Association of Geologists

Project Experience

Borrego Valley GSP, County of San Diego. Serving as consultant project manager for preparation of a GSP for the critically overdrafted Borrego Valley Basin. Coordinate multiagency GSA to prepare technical analysis, educational materials, project deliverables, management and scheduling for development of GSP. Dudek also provided grant application preparation services and support for various projects through numerous chapters of Proposition 1 to the GSA.

Water Supply, Aquifer Characterization and SGMA Support Services, BWD, Borrego Springs, California. Dudek was retained by the BWD in 2013 to evaluate water supply options for the Rams Hill Golf Course. Dudek completed a series of technical memoranda to evaluate water supply options and provided the BWD technical support to develop the Agreement for the Delivery of Water to the Rams Hill Golf Course. Subsequently, Mr. Driscoll led a drilling program to explore the aquifer underlying Rams Hill. This included drilling and logging five test holes, completing four of the five test holes as production water wells, performing aquifer tests and analysis, water quality sampling, and oversaw installation of wireless system for remote groundwater level and production monitoring. Dudek used the integrated hydrologic numerical model, USGS code, MODFLOW-OWHM, to assist in completing analysis of the sustainable yield of the Southern Management Area of the Borrego Springs Subbasin. Mr. Driscoll prepared technical analysis of the existing BWD and County Demand Offset Water Credit Policy, water cost analysis, economic analysis, and evaluated water quality and water supply options for District customers. Mr. Driscoll is the project manager for SGMA support services Dudek provided to the BWD. Dudek prepared the Bulletin 118 basin boundary modification request, which was approved by the DWR.

Groundwater Resources Technical Report Belden Barns Farmstead and Winery, County of Sonoma. Prepared groundwater resources investigation for the Sonoma County Permit and Resource Management Department to evaluate whether proposed uses on the site would have adverse impacts regarding depletion of groundwater in storage, interference with neighboring wells, adjacent surface water depletion, and/or groundwater quality. Researched site's geology and groundwater conditions, performed inventory of water wells on site and adjacent parcels, conducted 24-hour pump test and groundwater level monitoring, evaluated water balance, well-interference, and impacts of pumping on surface water sources.

Hexavalent Chromium Study and Municipal Water Wells Installation Project, Santa Ynez River Water Conservation District, Santa Ynez, California. Project manager for design and implementation of a well profiling study to evaluate the potential for naturally occurring hexavalent chromium [Cr(VI)] to impact the water quality at Upland Basin production wells owned and operated by the Santa Ynez River Water Conservation District. The Santa Ynez River Water Conservation District operates 12 groundwater wells in the Upland Basin located north of Santa Ynez in the Alamo Pintado Creek Watershed. Cr(VI) concentrations exceeded the California maximum contaminant level for Cr(VI) of 10 micrograms per liter (µg/L) in half of the Upland Basin wells. The Santa Ynez River Water Conservation District sought to identify potential discrete zones of naturally occurring Cr(VI) concentrations that exceed the maximum contaminant level. Preliminary flow data and depth discrete water quality samples indicated vertical variation of Cr(VI) concentrations in aquifer. Dudek used the results of the well profiling study to develop a plan to improve the quality of water supplied by the wells. Dudek designed an inflatable packer with Baski Inc., to selectively pump from aquifer zones with lower Cr(VI) concentrations to reduce the wellhead concentration of Cr(VI) without wellhead treatment. For wells that will require wellhead treatment, Dudek is working with a multi-consultant team to evaluate potential treatment alternatives. As site geologist, supervised installation of four municipal production wells and one monitoring well in the Upland Basin. Conducted aquifer pump tests, logged lithology of boreholes and assisted with well design. Currently assisting the Santa Ynez River Water Conservation District with locating and design of replacement water wells.

Hydrogeology, Engineering and Project Management Services, Jacumba Community Services District, Jacumba Hot Springs, California. Worked in collaboration with Jacumba Community Services District and Jacumba Solar LLC to develop Water Supply Agreement for the Jacumba Solar Farm. Project manager for subsurface geophysical survey, well locating, design and drilling oversight of the new Highland Center Well completed in October 2016. Implemented a groundwater level monitoring and water quality testing program for the Jacumba Valley Groundwater Basin to evaluate pumping and localized historical groundwater contamination from a gas station. Prepared Preliminary Engineering Report and assisted with U.S. Department of Agriculture Rural Development grant application for Manganese Treatment System Water Supply Wells No. 7 and 8, Photovoltaic Solar Array and Pipeline Replacement. Successfully assisted the Jacumba Community Services District obtain a grant totaling $1.671 million from U.S. Department of Agriculture Rural Development.

Well Screen Liner Design, Well Rehabilitation Master Planning and Groundwater Supply Drought Planning, Goleta Water District, Goleta, California. Led team of engineers and hydrogeologists for design and installation of unique combination Muni-Pak pre-packed screen and traditional well screen with filter pack design to line well damaged due to casing embrittlement. Increased well yield and eliminated sanding issues. Well liner was featured in the August 2015 issue of Water Well Journal. Hydrogeology lead for well rehabilitation master planning of seven water wells. Conducing aquifer testing, mechanical and chemical redevelopment, water quality sampling, and analysis of historical water levels and production. Optimizing pump intake depth, and pump and motor sizing to allow for sustained production from basin during drought.

Daniel Ritter, PhD, PG

Daniel Ritter is a geochemist whose primary research focus was aqueous and isotope geochemistry. Research interests included using isotopes and geochemistry as tracers of natural and anthropogenic contaminants in groundwater and surface water, and the impact of interactions between water, rock, and microbes on groundwater chemistry. He is proficient in ArcGIS and has experience with MODFLOW and GMS.

Daniel Ritter

Education

University of Arizona
PhD, Hydrology and Water Resources

Brigham Young University
MS, Geology
BS, Geology

Certifications

Professional Geologist, CA No. 9618

Professional Affiliations

Geological Society of America.

Geochemical Society.

American Chemical Society

San Diego Association of Geologists

Project Experience

Research Assistant, University of Arizona. Collected, prepared, and analyzed water and gas samples for analysis of major ion chemistry and isotopes. Contacted natural gas companies to obtain permission to sample their wells. Planned and carried out sampling trips to collect samples from both natural gas producing wells and monitoring wells.

Physical Scientist, USGS GS-09, STEP Program. Assisted with USGS fieldwork and research on methanogenesis in oil fields in Louisiana. Collected and analyzed samples and helped prepare and edit final report.

Teaching Assistant, Brigham Young University. Graded assignments and set up labs for Hydrogeology and Hydrogeochemistry classes. Graded assignments and assisted students in Groundwater Modeling (GMS/MODFLOW) class.

Hydrogeochemistry Lab Assistant, Brigham Young University. Prepared and analyzed samples for solutes, tritium, and stable isotopes (oxygen, hydrogen, nitrogen, carbon). Supervised other students in carrying out these same tasks. When supervisor was gone, helped ensure the smooth running of day-to-day operations in the lab.

Dylan Duvergé, PG

Dylan Duvergé is an environmental analyst and hydrogeologist with 12 years' experience assessing program and project impacts to surface water and groundwater resources; geologic and hydrologic hazards; and soil, mineral, and paleontological resources. Mr. Duvergé assists large-scale planning efforts and individual project proposals through California Environmental Quality Act and National Environmental Policy Act compliance. He has prepared, contributed to, and/or peer reviewed groundwater resource investigations, hydrology and drainage studies, geotechnical reports, Phase I Environmental Site Assessments, and paleontological resource assessments for various projects throughout California, effectively communicating both the scientific and regulatory aspects of hydrologic and geologic issues.

Dylan Duvergé

Education

San Francisco State University
MS, Geosciences

UC Santa Cruz
BA, Environmental Studies

Licenses and Certifications

PG, CA No. 9244

Qualified SWPPP Developer, CA No. G09244

40-Hour HAZWOPER, as per 29 CFR 1910.120(e)

Professional Affiliations

Association of Environmental Professionals

Association of Environmental and Engineering Geology

Groundwater Resources Association of California

Project Experience

Borrego GSP, County of San Diego and BWD. Mr. Duvergé is currently authoring the Draft GSP for the critically overdrafted Borrego Valley Basin. Mr. Duvergé has assisted in the compilation of current and historical data related to groundwater levels, water quality, pumping, and has been working with team members in developing the basin's data management system. The Borrego Valley Basin must submit a GSP to DWR by 2020, and Dudek has been assisting the County of San Diego and the BWD for years on numerous aspects of groundwater management, including technical analysis of the existing BWD Demand Offset Water Credits Policy, scientific and jurisdictional analysis of the basin boundaries to obtain a Bulletin 118 basin boundary modification, water replacement cost analysis, and analysis on managing proportional groundwater production cutbacks through a water market approach. Dudek is also providing on-call grant application preparation services and support for various projects through numerous chapters of Proposition 1 for the BWD.

GSPs, FCGMA. Mr. Duvergé developed the sections of four Draft GSPs related to population growth, land use development patterns/trends, and relevant land use goals and policies directing growth within each basin. Dudek is working with a technical advisory group to prepare four comprehensive GSPs in accordance with state requirements. The plans consist of historic basin and water use conditions and determination of sustainable basin yield, undesirable results, and thresholds for monitoring. Future conditions are evaluated in terms of potential changes to land use and climate and a plan for proactive management, including data monitoring and implementation of projects and policies will be developed.

Cojo-Jalama Ranch Groundwater Sustainability, Bixby Management Inc., Santa Barbara, California. Mr. Duvergé completed a Safe Yield Report on a 25,000-acre ranch in Santa Barbara County using County approved soil moisture balance method to quantify recharge and sustainable groundwater production, and evaluate potential impacts on groundwater-dependent ecosystems. The study was completed to document that the water demand of the ranch's existing and future cattle operation would fall within the consolidated rock aquifer's sustainable yield, and to comply with County thresholds for determining impact significance under the California Environmental Quality Act. The evaluation summarized the hydrogeologic setting, groundwater well distribution and depths, and the results of water level monitoring on the ranch. Prior to the acquisition of the property by the California Nature Conservancy, Dudek had been assisting the client resource evaluation work on the ranch by installing and monitoring gauges to measure rainfall, soil moisture content, and transpiration.

Kunzler Terrace Mine Use Permit and Reclamation Plan EIR, Mendocino County, Ukiah, California. Conducted a subsurface investigation and prepared a technical memorandum addressing the potential presence of subsurface archeological resources based on soil age. Logged a series of on-site test pits for soil type and evidence of paleosols, drafted a memorandum based on the results that described the soil stratigraphy and the potential for buried archeological artifacts, and assisted in the preparation of the hydrology and water quality section for the EIR. The Kunzler Terrace Mine is an aggregate mining operation at the confluence of the Russian River and Ackerman Creek. The EIR analyzed the potential impacts of a quarry pit to be developed through three phases totaling approximately 30 acres with a maximum depth of 66 feet.

Belden Barns Winery Focused EIR, County of Sonoma, California. Dudek is preparing an EIR for the County of Sonoma for a proposed farmstead and winery project that involves winemaking, hospitality, and farmstead food production on a 55-acre parcel in unincorporated Sonoma County. Groundwater and geologic hazards were major issues for the project, as it is located on an old landslide and in an area where groundwater is the sole source of water for rural residences. Mr. Duvergé established a well monitoring network, conducted a well pump test to determine aquifer properties, and modeled the long-term cumulative effects on groundwater resources. In addition to authoring the groundwater resources technical report, Mr. Duvergé also authored the hydrology and water quality chapters and geology and soils of the EIR.

San Francisco Groundwater Supply Project EIR, San Francisco, California. The San Francisco Groundwater Supply Project is a project under the City's Water System Improvement Program, and will provide the city up to 4 million gallons of local, sustainable groundwater every day. The project proposes to utilize up to six deep water wells and associated treatment facilities in the city. Dylan prepared the analysis of aesthetics in the EIR and supported the groundwater analyses and investigations of the Westside Basin with maps, figures, and GIS data.

Steephollow Creek and Bear River EIR, Nevada Irrigation District, Grass Valley, California. Dudek prepared the EIR for the Bear River Sediment Removal at Rollins Reservoir Project for the Nevada Irrigation District. The project would restore and maintain reservoir capacity in Rollins Reservoir on an ongoing basis through re-establishment of gravel skimming operations on the Bear River below the confluence with Steephollow Creek. Mr. Duvergé completed a technical review of the hydrological and geomorphology studies completed for the project, and authored the geology and soils and the hydrology and water quality chapter of the EIR.

Kyle Harper

Kyle Harper is an application developer with 16 years' experience in information technology, database architecture, computer programming, and Web application development. Mr. Harper currently oversees Dudek's geospatial Web applications and ESRI ArcGIS Enterprise infrastructure. Mr. Harper has managed an agile software development team and built Web applications from the ground up using HTML5/CSS/JavaScript/PHP/Python. He places an emphasis on user experience/engagement and team collaboration as the keys to developing successful software products.

Kyle Harper

Education

UC, San Diego
BS, Environmental Systems (Ecology, Behavior, and Evolution)

In addition to his programming experience, Mr. Harper has 6 years' focused experience in the biological field, with emphases on botany, plant ecology, and wetland ecology. He has participated in projects requiring vegetation mapping, focused rare plant surveys, regulatory permitting, and habitat restoration. During this time, Mr. Harper designed and implemented several applications for the collection, quality assurance, analysis, and reporting of ecological findings. Many of his projects required rigorous statistical analyses in R, Python, Systat, and PC-ORD; several applications relied on spatial data and were built to interface with the ESRI ArcGIS suite of software, including Web-based maps using ArcGIS Server and ArcSDE.

Mr. Harper's dual experience in the natural sciences and technology sector aligns with his passion for developing better data collection and analysis tools, packaging complex data into meaningful, actionable information, and delivering an elegant user experience to allow data-driven decisions to shine in environmental stewardship.

Project Experience

Phase I Data Management System Development, YVWD, San Bernardino County, California.
Assesses current state of YVWD's data, processes, and workflows through collaborative meetings and on-site visits. Designs Data Management System to integrate disconnected systems and platforms, including Supervisory Control and Data Acquisition, Maintenance Connection Asset Management Software, Zerion/iFormBuilder mobile data collection, ESRI Enterprise Geodatabases, Microsoft SQL Server databases, and Web-based data sources. Develops Administrative Web Portal for managing users, alerts, reports, assets, and data readings from one central hub. Implements data warehouse connectors for appurtenant SGMA database, Laserfiche document storage, and general unstructured file store data.

GSP for Borrego Valley Groundwater Basin, County of San Diego, California. Architects an ESRI Enterprise Geodatabase and Web application for the Borrego Valley Groundwater Basin GSP. Implements Python scripts for database creation; data extraction, transformation, and loading operations; and recurring jobs to import and sync from external data sources (e.g., Microsoft Excel workbooks with water quality results, online HTTPS historical and real-time weather station data). Provides custom query and export functionality for enhanced data accessibility within the Web-based user interface.

Year 3 GIS Services, RMWD, San Diego County, California. Provides support and maintenance to the RMWD and Dudek joint GIS team, including a browser-based Web application for viewing and querying the RMWD infrastructure and locating as-built PDF plans. The implementation includes a mobile-friendly Web application for accessing the same data in the field from mobile smart devices. Develops integrations with RMWD's asset management system, and collaborates with the GIS team to provide creative reviews of data management workflows.

Regional General Permit, Metropolitan Water District of Southern California, Los Angeles, California. As database administrator, oversaw the creation of a database and associated user interface for tracking impacts, mitigation, and agency notification/reporting. As biologist, evaluated baseline data; participated in preliminary field visits with the client to lay groundwork for programmatic permitting; and prepared programmatic permits for operations and maintenance projects throughout the Metropolitan Water District of Southern California service area, focusing on Orange County infrastructure.

Online GIS Updates, Temescal Valley Water District, Corona, California. Implements custom Web GIS solutions for the Temescal Valley Water District operations team, including a map-based Web application for viewing the TVWD infrastructure, including custom querying, filtering, data export, custom map printing, and document linking to as-built PDF plan drawings. Links data to an ESRI Collector for ArcGIS map, enabling field crews to access as-built plans and locate infrastructure while in the field, whether connected to the internet or offline.

Vegetation, Exotic Weeds, and Tecate Cypress Mapping of Western San Diego County, San Diego Association of Governments (SANDAG), San Diego County, California. As biologist, participated in remote vegetation mapping and field ground-truthing of more than 500,000 acres of vegetation within western San Diego County. As software developer/database administrator, created an electronic field form for ground-truthing of vegetation mapping, exotic weed mapping, and Tecate cypress (*Hesperocyparis forbesii*) mapping.

Vegetation Classification System Development, SANDAG, San Diego County, California. As biologist, completed numerous vegetation samples and participated in post-field statistical analyses using statistical packages, such as Systat, R, and PC-ORD, and co-authored the multichotomous key for the *Vegetation Classification Manual for Western San Diego County*. As software developer, created an electronic data entry program integrating camera, GPS, and paperless field forms for use with ruggedized field computers. This software has built-in data validation and saved the project an estimated $30,000 in paper, printing, manual data entry, and error-checking costs, which earned this project the AECOM Green Ribbon Award for integration of sustainable practices. Created an updated vegetation classification system for San Diego County, based on the Sawyer Keeler-Wolf classification system, and integrated quantitative/statistical methods.

Vegetation Classification and Mapping Project, Nature Reserve of Orange County, Orange County, California. As biologist, completed vegetation samples and participated in post-field quality control/QA and statistical analyses using the statistical packages PC-ORD. As software developer, created an electronic data entry program with built-in data validation, integrating camera, GPS, and paperless field forms for use with ruggedized field computers. Created an updated vegetation classification system for Orange County, based on the Sawyer Keeler-Wolf Classification System, and integrated quantitative/statistical methods.

Jane Gray

Jane Gray is a regional planner, environmental specialist, and project manager with 23 years' project management and environmental planning experience, specializing in water/wastewater planning and permitting, agricultural resource and policy planning, policy analysis, land use planning, project development and entitlement services, and grant writing and management. Ms. Gray has a diverse and nuanced planning background, having worked as a project manager, analyst, and environmental planner for nongovernmental entities, public agencies, and private firms and corporations. She has been responsible for projects varying from small-scale development and infrastructure planning in developing economies to private residential and commercial developments throughout California.

Ms. Gray brings acumen, efficacy, and a customized approach to efficient service delivery. Her ability to skillfully negotiate the often-disparate interests involved in projects and bring about consensus is an asset in any situation. Ms. Gray has organizational expertise, technical aptitude, planning proficiency, and competency in facilitating projects through contentious issues and fractious communities. Her relevant grant writing.

Jane Gray

Education

Universität Dortmund, Germany
MS, Regional Planning and Management

State University of New York, Buffalo
BS, Social Work

Professional Affiliations

Third District Santa Barbara County Supervisorial Appointee to the Agricultural Advisory Committee

Gubernatorial Appointee to the Central Coast Regional Water Quality Control Board (Region 3)

Project Experience

Grant Writing and Administration, Sustainable Groundwater Planning Grant Program under Prop 1 (DWR) for Santa Barbara County, Santa Barbara, California. Wrote a successfully awarded grant application for the SBCWA for GSA formation for two priority basins in Santa Barbara County, and is also leading the administration and management of the grant and complying with all grant requirements. Leading the public and stakeholder outreach and engagement as well as facilitation of local agencies working toward formation of a GSA.

On-Call Grant Writing Services, San Mateo County, California. Providing ongoing grant writing services as well as grant and project scoping for San Mateo County and various divisions from Sustainability to Flood Protection to Climate Change among other projects. Applications have been prepared for state and federal grant programs.

Santa Barbara Countywide Integrated Regional Water Management (IRWM) Program Grant Applications, Proposition 84 and Proposition 1E, SBCWA, Santa Barbara, California. As extension of SBCWA staff, was part of a team that generated a Regional Acceptance Process application required for competition in the multiple rounds of funding associated with Proposition 84 and Proposition 1E under IRWM provisions. Participated in generation of the Proposition 84 Planning Grant Application submitted to the California

DWR and in the Proposition 84 Implementation Application submitted to DWR. The Implementation Grant Application was prepared on behalf of Santa Barbara County and six other jurisdictions/districts.

Santa Barbara Countywide IRWM Proposition 50, SBCWA, Santa Barbara, California. Provides project management assistance as extension of staff for the SBCWA in administration of grant funds received under Proposition 50. In addition to reviewing and coordinating the data-gathering and reporting requirements associated with the 14 projects under IRWM, serves as liaison with the State Water Resources Control Board on a variety of contentious issues related to select projects. Has provided key and effective support to the project proponents, county, and state to facilitate solutions and ease strained relations.

Grant Manager and Proposition 50 Grant Administration, City of Guadalupe, California. Manages and administers the grant funds received by the city for the Wastewater Treatment Plant Improvement project under Proposition 50. Complies with all reporting requirements and interfaces with the county, state, and Regional Water Quality Control Board on project-related issues and waste discharge requirements and compliance.

Public and Stakeholder Outreach, Planning and Development Department, Santa Barbara County, Santa Barbara, California. In conjunction with the rezoning of agricultural land from an antiquated ordinance, was involved in a countywide public outreach effort that included meetings and workshops designed to educate the public about changes, elicit comments and suggestions from affected landowners, and work with a dedicated group of stakeholders to craft sensible and required language for ordinance changes. Wrote the associated environmental document and assisted in drafting policy language.

Public and Stakeholder Outreach, Planning and Development Department, Santa Barbara County, Santa Barbara, California. To complete an update to the countywide Uniform Rules for Agricultural Preserves, public meetings and workshops were initiated with local agricultural organizations and advisory committees, the Cattlemen, and a broad group of growers, shippers, greenhouse operators, landowners, nongovernmental organizations, and others. These were designed to create a more rational and flexible program that provided for more supportive language, flexibility, and a greater variety of allowed uses countywide. Was involved in the stakeholder and public outreach portion in addition to the actual generation of policy and environmental documents associated with the program.

Santa Barbara Countywide Integrated Regional Water Management Program SBCWA, Santa Barbara, California. The position entails overall program management assistance and coordination of more than 30 agencies and nonprofits involved in regional benefit projects for competitive grant applications and over 120 stakeholders. Coordinates and manages the public stakeholder process and all public outreach efforts associated with the IRWM program.

Grant Manager, Cuyama Community Services District, New Cuyama, California. Manages and administers the grant funds received by the district for two projects funded under Proposition 50. Prepares project assessment evaluation plans, quality assurance project plans, and other requirements of the state contract. Prepares and submits all invoices and supporting documentation in fulfillment of the state contract requirements, and assists in determination of grant-eligible work tasks and project scoping. Interfaces with the county, state, and Regional Water Quality Control Board on project-related issues and National Pollutant Discharge Elimination Systems and waste discharge requirements and compliance. Interfaces with the California Department of Public Health on water system compliance and other grant opportunities for the district

Zoë Carlson

Zoë Carlson is an environmental specialist/planner with 12 years' experience specializing in watershed management, science, strategic planning, facilitation and grant management. In addition, Ms. Carlson has extensive experience with stakeholder engegement in watershed management, IRWM, and sustainable groundwater management.

Zoë Carlson

Education

UC, Santa Barbara
MA, Environmental Science and Management

California State University, Monterey Bay
BS, Earth Systems Science and Policy

Certifications

Management Practices, UC Santa Barbara

Project Experience

Strategic Planning Facilitation and Negotiations. Ten years of project and program level facilitation and negotiations. Represented the County of Ventura in negotiations of board representation and voting structure for the Upper Ventura River Basin GSA. Negotiated changes in grant management to overcome obstacles with granting agencies, local partners and limited resources. Researched methods of effective water resource management in California, design market based solutions and presented options to water management entities. Facilitated design, permitting, bidding, contracting, implementing, and monitoring of conservation projects. Negotiated permit conditions for a variety of complex and controversial projects with up to seven different regulatory agencies at a time.

Stakeholder Engagement Facilitation. Four years of facilitation and negotiation experience with large groups of diverse stakeholders. Identify regional issues and coordinate meetings to inform stakeholders. Facilitate solution-oriented discussions about water resources management challenges. Engage project planning teams in discussions regarding funding strategies and prioritization. Engage stakeholders in the Ventura County General Plan Update Water Element development.

Watershed Coordinator for the Ventura River Watershed. Overall program management assistance and coordination with Ventura County IRWM Program. Planning, coordinating and facilitating Ventura River Watershed Council Meetings. Representing the Watershed Council on the Matilija Funding Committee. Identifying and supporting funding opportunities for priority programs and projects in the Ventura River Watershed. Facilitating the development of and maintaining strategic partnerships to solve water resource management challenges.

Watershed Coordinator for the Santa Clara River Watershed. Overall program management assistance and coordination with the Ventura County and Upper Santa Clara River Watershed IRWM Programs. Coordinated, and facilitated meetings among a diverse groups of stakeholders in the upper and lower Santa Clara River Watershed. Identified and supported efforts to secure funding for priority programs and projects in the Santa Clara River Watershed. Facilitated the development of and maintained strategic partnerships to solve water resource management challenges.

SGMA. Represented the County of Ventura on the Upper Ventura River Basin GSA Formation Committee. Negotiated the County position within the GSA including Agency structure, decision-making, voting and funding details. Reviewed proposed basin boundary modifications including stakeholder engagement, coordination with local and state agency representatives, legal and technical review. Engaged stakeholders in the SGMA development and implementation through facilitating local stakeholder meetings, attending statewide meetings, and distributing information about state and local action to stakeholders. Facilitated meetings to discuss groundwater priorities and secures state grant funds for sustainable groundwater management in Ventura County.

Resource Conservation District of Santa Cruz County. Managed Integrated Watershed Restoration Program (IWRP) grant program implementation including project oversight, review of deliverables and invoices, negotiating funding allocations and matching funds contributions. Managed progress on 14 to 20 fish passage restoration projects and 17 to 20 Permit Coordination Program restoration projects at one time, all at different stages of implementation. Worked with agricultural operators to install vegetated treatment systems, bank stabilization structures, erosion control best management practices, and water quality improvement projects.

Natural Resource Conservation Service San Mateo and Santa Cruz Counties. As the soil conservationist for San Mateo and Santa Cruz Counties, coordinated project development, permitting and funding for projects with local stakeholders. Conducted site visits, developed conservation plans, coordinate project implementation on Agricultural lands.

Ventura County Watershed Protection District. Managed environmental compliance for 35 to 45 projects at a time including project planning, budgeting, CEQA/NEPA compliance, permitting review and negotiations, technical report and design review, stormwater plan review, construction inspection, conflict resolution, fiscal management, mitigation plan development and implementation, monitoring and reporting. Managed environmental compliance with the Ventura County Watershed Protection District's Operations and Maintenance Program permits.

Watersheds Coalition of Ventura County (WCVC). Facilitate grant funding workshops, project planning workshops and align strategic fiscal partnerships. Serve as one of two WCVC IRWM Disadvantaged Community Involvement Program Task Force members to coordinate the allocation of $9.8 Million in grant funding among community needs within Los Angeles and Ventura Counties. Facilitated project selection for IRWM grant funding in the Santa Clara River Watershed and Ventura River Watershed.

Ventura County Watershed Protection District. Managed a $1.6 million Agricultural Water Use Efficiency Grant. Negotiated partnership agreements and contracts with local agricultural organizations including the Farm Bureau of Ventura County and the Resource Conservation District. Reviewed grant invoices, reports and deliverables for multiple technical grant projects including the Santa Clara River Salt and Nutrient Management Plan and the Piru Burn Dump Stabilization Project.

Resource Conservation District of Santa Cruz County. Managed a $4 million Integrated Watershed Restoration Program (IWRP) grant including project oversight, review of deliverables and invoices, negotiating funding allocations and matching funds contributions. Negotiated project and funding allocation changes with state and local agencies, stakeholders and partners.

Patrick Rentz, PG

Patrick Rentz is a hydrogeologist with 10 years' experience in the hydrogeological and environmental fields. Mr. Rentz has performed a wide range of services in these fields and specializes in groundwater supply assessment, hydrogeological investigations, and groundwater production wells. His project experience includes geologic and geophysical logging, well construction design and oversight, and water quality sampling and reporting.

Patrick Rentz

Education

Scripps Institution of Oceanography
MS, Marine Geology

UC, San Diego
BS, Environmental Systems

Certifications

Professional Geologist, CA No. 9150

Certified Hydrogeologist (CHG) CA No. 867; OR No. 2020; WA No. 463

Professional Affiliations

Groundwater Resources Association

Project Experience

Groundwater Production Well Installation, BWD, Borrego Springs, California. Responsibilities included supervising production well drilling, geophysical borehole logging, well development, aquifer pump testing and designing well construction specifications for multiple groundwater supply wells. Coordinated with the BWD to obtain basin-wide lithology data and prepared regional geologic cross-sections. Prepared multiple water supply applications for BWD.

Groundwater Well Valuation, Borrego Springs, California. Performed an assessment of the existing condition of a network of groundwater irrigation supply wells for a potential real estate/property transaction. Evaluated the well construction, materials, production capacity and service life to estimate a value on the groundwater production infrastructure.

Groundwater Supply Assessment for Solar Project, Lucerne Valley, California. Performed an evaluation of the existing condition of 20 on-site groundwater wells to support the solar project construction and operational water demand. Evaluation included review of historical well logs, downhole well video logs and well locations relative to local aquifer type and thickness.

Aquifer Zone Testing for Multiple Pilot Boreholes, Oasis, California. Performed zoned aquifer pump and water quality testing for multiple pilot boreholes as part of a groundwater supply program at a 1,000 acre property in Oasis, California. The zone testing and sampling was performed to assess quantity and quality of potential irrigation water, suitable for citrus crop. In addition to the zone testing, duties included interpretation of drill cuttings and geophysical borehole logs.

Multi-Groundwater Production Well Rehabilitation, Joshua Basin Water District, Joshua Tree, California. Assisted in rehabilitation work on a municipal supply well. Project tasks included supervising mechanical pre-treatment work, turbine pump removal, removal of floating turbine oil, wire brushing, and dual-tube/dual-swab airlifting. Supervised the chemical treatment and associated agitation during contact time. Dudek oversaw and coordinated the re-installation of the turbine pump and disinfection.

Large-Scale Aquifer Recharge Suitability, San Jacinto, California. Evaluated a 40-acre site in San Jacinto, California for suitability as an aquifer recharge facility. Supervised drilling of 18 sonic borings and documented continuous cores to assess suitability of sediments to infiltrate water. Prepared technical report, including cross sections detailing potential aquitards and provided recommendations on final recharge basin configuration. Additionally, provided recommendations on location and screened intervals for multiple single and multiport piezometers, based on locations and depth of potential aquitards and regional water table.

Recharge Basin Well Installation, Inland Empire Utilities Agency (IEUA), Rancho Cucamonga, California. Supervised drilling and construction of paired monitoring well to assess water quality and water level prior to bringing an existing recharge basin into use. Monitoring well design and installation details were determined as the work progressed due to the nature of the subsurface conditions. Wells were drilled using flooded reverse circulation and construction details were finalized based on drill cuttings and interpretation of geophysical logs. Facilitated coordination between driller and IEUA to maintain project momentum.

Exploratory Borehole Drilling and Assessment for Groundwater Production Well Site, Eastern Municipal Water District, Moreno Valley, California. Supervised the drilling and evaluation of an exploratory borehole to evaluate the acquisition of the property and installing a groundwater production well. Groundwater quantity was evaluated via production rates measured during dual-tube reverse air rotary drilling, analysis of the aquifer material using drill cuttings, geophysical borehole logs, and nearby well performance. Groundwater quality was evaluated using zone-specific groundwater samples.

Groundwater Well Survey, San Diego and Riverside Counties, California. Analyzed current and historical aerial imagery, color infrared imagery, geologic maps, high resolution digital topographic data and well logs in addition to active investigation techniques (electromagnetic soundings, magnetometer surveys and terrestrial electrical resistivity surveys) to recommend new water well locations for multiple private land holdings in southern Riverside County and countywide in San Diego.

Artesian Groundwater Condition Investigation, Newhall, California. Collected and managed site water level data and performed slug tests and pump tests to determine aquifer properties. Coordinated, planned and performed geophysical survey to characterize the subsurface conditions of a spring complex. Obtained well permits and supervised well destruction.

Countywide Monitoring Well Network, San Diego County, California. Maintained and monitored a network of over 40 groundwater wells. As project geologist, devised and performed aquifer pump tests on several of the production wells within the network. Coordinated with the County of San Diego to provide data for the countywide groundwater monitoring program.

Groundwater Well Investigation, U.S. Forest Service (USFS), San Diego County, California. Planned and performed step test and constant rate aquifer testing at multiple groundwater supply wells for the USFS in eastern San Diego County. Performed temperature logging and depth-discrete water quality sampling in order to diagnose production zone contributing to high iron concentrations in the groundwater.

Seawater Intrusion Investigation, City of San Clemente, California. Evaluated existing conditions of the City of San Clemente's water supply wells. Supervised fluid conductivity, flow and temperature surveys in the wells and collected depth-discrete water samples for analysis. Proposed a well development schedule and well construction modification based on the results of the investigation.

Groundwater Well Evaluation and Assessment, Santa Catalina Island, California. Performed a field investigation and well assessment for over 30 supply and monitoring wells throughout the island. Further investigation of select wells included downhole video logging, well rehabilitation and historical production data review. Additional work included aquifer testing of the City of Avalon's groundwater supply wells and evaluation of pumping influence.

Hugh McManus

Hugh McManus is a hydrogeologist with 3 years' experience as a geologic field technician specializing in groundwater elevation monitoring, groundwater supply investigation review, surface mine enforcement, and compliance with groundwater programs mandated by the California DWR.

Hugh McManus

Education

San Diego State University
BS, Geology

Certifications

OSHA 40-Hour HAZWOPER Certification

Professional Affiliations

Geologic Society of America

Project Experience

Groundwater Supply Investigation Review, County of San Diego, California. Reviewed groundwater supply investigations for technical accuracy and compliance with the California Environmental Quality Act (CEQA), County Guidelines for Determining Significance, and the County of San Diego Groundwater Ordinance. Researched land use and zoning densities to determine maximum basin buildout and projected groundwater use. Manage and review Groundwater Monitoring and Mitigation Plans (GMMPs) for various groundwater-dependent projects, including golf courses and outdoor camping/recreation facilities that obtain a Municipal Use Permit through the County. Prepared correspondence, provided direction, and interfaced with clients regarding adequacy and changes needed to GMMPs.

Groundwater Monitoring Program, County of San Diego, California. Maintained, updated, and managed a groundwater monitoring network of more than 250 privately owned wells through the county. Prepared and created the County Groundwater Monitoring Procedures document and mapping application to streamline quarterly groundwater monitoring. Procured new equipment and repaired existing equipment. Effectively presented scientific information to internal staff and the general public. Maintained a positive relationship with members of the public as a representative of the County of San Diego and assisted in educating residents about groundwater information and conditions.

California Statewide Groundwater Elevation Monitoring (CASGEM), County of San Diego, California. Provided support to the County of San Diego Planning and Development Services to comply with state-mandated CASGEM requirements on four medium priority basins within San Diego County, including Borrego Valley, San Diego River Valley, San Pasqual Valley, and San Luis Rey River Valley. Duties included coordinating with consultants, the DWR, State Parks, the City of Oceanside, water districts, and individuals to incorporate new groundwater wells and acquire well completion and monitoring data for CASGEM monitoring reports. Additional task included ongoing monitoring and reporting to ensure County of San Diego compliance with CASGEM by performing semiannual groundwater monitoring and coordinating with various agencies.

SGMA, County of San Diego, California. Aided in the development of basin boundary and jurisdictional maps for the public and presentations to the County Board of Supervisors. Collaborated with internal staff to address positive outcomes for public relations regarding the implementation of SGMA within four communities in the county. Duties also included providing support and attending planning group meetings, planning commission hearings, and County Board of Supervisors hearings for SGMA-related items.

Surface Mine Enforcement – Surface Mining and Reclamation Act (SMARA), County of San Diego, California. Conduct site inspections and review reclamation plans for the County of San Diego Surface Mine Enforcement program to verify that mines meet SMARA requirements, which includes assessment of property boundaries, sloped-grading (Cut and fill slopes), erosion control, ponds, soil and stockpile management, and revegetation. Perform site evaluations during construction activities to ensure as-built geotechnical plans conform to approved reclamation plans. Conduct budget inquiries and annual report reviews for surface mines within the County to confirm adequacy of Financial Assurance Cost Estimate.

Jeff Kubran, QSP/QSD

Jeff Kubran is a hydrogeologist and geographic information system (GIS) specialist with 13 years' experience, specializing in groundwater planning, groundwater remediation, stormwater pollution prevention plan (SWPPP) monitoring and reporting, water supply evaluations, and GIS. Report preparation includes groundwater sustainbility plans, well completion reports, well master planning, water supply assessments, SWPPPs, and Clean Water State Revolving Funds applications. Field experience includes construction site stormwater BMP monitoring; water quality sampling and reporting; geologic and geophysical logging; groundwater temperature, velocity, and depth discrete sampling; and well construction and redevelopment oversight.

Jeff Kubran

Education

UC, Santa Barbara
MESM, Environmental Science and Management
BA, Geography

Certifications

Qualified SWPPP Practitioner/Developer (QSP/QSD), No. 25238

OSHA 40-Hour HAZWOPER

Professional Affiliations

Groundwater Resources Association

Engineers without Borders

Project Experience

California High-Speed Rail Construction Package 2–3, Dragados Flatiron Joint Venture, Sacramento, California. Approved, certified, and assisted in the writing of the SWPPP as the QSD for the High-Speed Rail Construction Package 2–3. The SWPPP was written to act as an overarching guide to BMP planning and was designed to be amended when detailed construction plans became available.

Cancer Center of Santa Barbara, Cancer Foundation, Santa Barbara, California. Performed SWPPP BMP monitoring and reporting. Prepared the construction general permit registration documents, wrote and certified the SWPPP document as the QSD, completed the annual reports, and conducted on-site staff training.

Coastal Vineyard Care Associates, Hydrogeological Services, Santa Barbara County, California. Assisted with water resources evaluations to assess potential water quantity and quality for vineyard properties. Coordinated with well driller's, cataloged drilling cuttings, and over saw drilling operations of an agriculture well project.

Cold Springs Rancheria, Source Water Assessment, Tollhouse, California. Prepared the Delineation of the Cold Springs Rancheria Source Water Protection Area utilizing the Environmental Protection Agency's Wellhead Analytic Element Model (WhAEM). Performed a site visit to collect GPS information and interviewed tribal environmental staff to prepare the Potential Contaminant Source Inventory Report. The final deliverable was the Source Water Assessment and Protection Plan outlining recommendations found in the WhAEM modeling effort and the Potential Contaminant Source Inventory report.

Confidential Client, SWPPP Services, Ventura, California. Performs SWPPP reporting and monitoring. Prepares SWPPP annual reports and updates BMP maps. Performs water and soil sampling and analysis as part of the remediation process.

County of San Diego, Borrego Valley Groundwater Basin SGMA, San Diego County, California. Coordinated the development of the data management system that was designed to house GIS and other GSP-required data and information for the basin. Assisted with the basin boundary modification and collection of a variety of GIS data for the data management system.

Andrew Brown, SWPPP Services, Goleta, California. Performed SWPPP BMP monitoring and reporting. Prepared the annual reports, Notice of Termination, collected water quality samples, and conducted on-site staff training for the Brown Residence Horse Arena construction project.

Former Kearney-KPF Facility, Hydrogeological Services, Stockton, California. Developed a mobile water level collection application for generating water level elevation contours in the field and a custom GIS tool for expedited report figure production. Assisted with quarterly water quality sampling and groundwater investigations.

Goleta Water District, Water Supply Projects, Goleta, California. Conducted field surveys and prepared Well Master Plans and Technical Memorandums for upgrades to improve the production and lifespan of ageing and damaged wells. Performed field oversight of mechanical and chemical well redevelopment. Oversaw pump tests of recently redeveloped wells and wrote recommendations for pump and motor designs.

Montecito Water District, SGMA Tasks, Montecito, California. Authored a report to DWR on the basin prioritization ranking of the Montecito Groundwater Basin requesting the basin be moved into a medium ranking. Conducted a water use analysis of the basin by calculating the irrigated acreage of landscaping and agriculture. Reviewed DWR well completion reports and geo-located the wells to develop a GIS well dataset of the basin. Conducted a delineation of a basin boundary modification and developed the associated GIS data.

Newhall Land and Farming Company, Middle Canyon Spring Project, Santa Clarita, California. Conducts quarterly sampling to monitor water quality/quantity conditions in a jurisdictional spring habitat. Tasks included water level measurements, water level data logging, surface water velocity and flow volume surveys, and water quality sampling.

Santa Barbara County Water Agency (SBCWA), SGMA Tasks, Santa Barbara County, California. Determined acreage of irrigated lands and crop types to estimate annual water use of two basins in Santa Barbara County. Developed map templates, produced maps for stakeholder meetings, and other public documents. Managed and organized GIS datasets.

Santa Ynez River Water Conservation District, Improvement District No. 1, Hydrogeological Services, Santa Ynez, California. Assisted with an aquifer study to assess vertical distribution of naturally occurring hexavalent chromium. Collected water temperature and water quality samples at various depths in order to help characterize the aquifer. Assisted in the location analysis, oversaw the drilling operation, oversaw the pump test, and wrote the well completion report for a new test well at the District office. Assisted with the Well 27 project test to improve water quality by placing an inflatable packer in the well to block off the upper production zone of the aquifer, which is known to produce elevated levels of hexavalent chromium. Tasks included development of the well re-engineering plan, acted as on-site hydrogeologist to perform field oversight during construction, and water quality sampling.

Rams Hill Golf Course, Hydrogeological Services, Borrego Springs, California. Served as on-site hydrogeologist for well drilling and large-scale production well development and construction. Tasks included logging drilling cuttings, well drilling, and well construction oversight of well drilling contractors.

Becky Golden-Harrell

Becky Golden-Harrell is a technical editor with 16 years' experience editing complex, multidisciplinary technical manuscripts. Ms. Golden-Harrell also has many years of experience managing and directing complex projects from manuscript preparation to publication at academic and commercial publishing houses.

Her areas of expertise lie in many areas, including coordinating large projects prepared by multiple authors and ensuring resulting work has a consistent style, tone, and terminology. Ms. Golden-Harrell has experience establishing and maintaining guidelines and standard practices for formatting, editing, and producing documents. She manages workflow for large, complex projects – defining and maintaining schedule and budget to ensure on-time, on-budget completion and provides excellent editorial support tailored to needs and schedules of individual projects. Other tasks include providing feedback and direction to authors in regards to writing and project style, as well as overall editorial quality check for documents.

Becky Golden-Harrell

Education

Boston University
MS, Marketing

California Polytechnic State University, San Luis Obispo
BA, English

Project Experience

Fox Canyon Groundwater Supply Plans, Fox Canyon Groundwater Management Agency, Ventura County, California. Served as lead technical editor responsible for reviewing three Groundwater Sustainability Plans (GSPs) for three groundwater basins (Las Posas, Oxnard, and Pleasant Valley) in Ventura County, California. The Fox Canyon Groundwater Management Agency (FCGMA) developed goals to maintain groundwater conditions at levels identified in 2015 but to allow enough operational flexibility that groundwater levels could still decline without undesirable results and then return to those levels. As the lead editor, Ms. Golden-Harrell developed custom templates for the three GSPs to meet requirements of the Department of Water Resources Bulletin 118 and Sustainable Groundwater Management Act. She also developed a style guide and reviewed the three GSPs for public review and comment. Ms. Golden-Harrell ensured all references cited in the GSPs were on hand and prepared the administrative record to supply to the FCGMA at the time of public review. Ms. Golden-Harrell also helped to organize and catalogue comments received from the public and advised on the response to comment process.

Mid-Coast Corridor Transit Project, San Diego Association of Governments (SANDAG) and California Department of Transportation (Caltrans), San Diego, California. Served as lead technical editor responsible for reviewing the Biological Resources Technical Report (BTR) and associated work products in support of this regional transit project. The project involved evaluation of light rail, bus rapid transit, and commuter rail alternatives. Became familiar with SANDAG style resources and style/formatting choices of the contract's prime, Parsons Brinckerhoff (PB, now WSP). Developed a formalized quality assurance and quality control (QA/QC) program that was reviewed and approved by PB and attended an all-day training on QA/QC procedures at PB San Diego.

East County Substation/Tule Wind/Energia Sierra Juarez Gen-Tie Projects EIR/Environmental Impact Statement (EIS), California Public Utilities Commission (CPUC) and Bureau of Land Management (BLM), San Diego County, California. Served as principal technical editor for the EIR/EIS. Also managed administrative record compilation and organized all comment letters during the scoping process and public review of the EIR/EIS. Deliverables were compliant with Section 508 of the Rehabilitation Act - Federal Electronic Media. The Draft EIR/EIS was prepared in December 2010.

Desert Renewable Energy Conservation Plan (DRECP), California Energy Commission, Southern California. Edited numerous wildlife and plant species profiles as well as reviewing sections and assisting with coordination of this multi-volume effort that spanned more than 12,000 pages. Dudek supported the Renewable Energy Actions Team agencies (California Energy Commission, BLM, U.S. Fish and Wildlife Service, and California Department of Fish and Wildlife) in developing the plan, which is a major component of California's renewable energy planning efforts that will help provide effective, coherent protection and conservation of desert ecosystems while allowing for appropriate development of renewable energy projects across 22.5 million acres in the seven counties of the California desert region.

Rancho Palos Verdes General Plan, City of Rancho Palos Verdes, California. Ms. Golden-Harrell was contacted directly by the City's planner and asked to submit a proposal to provide editorial and formatting services for the update to the City's General Plan. The City project manager was familiar with the quality of work completed by Dudek's publications department and reached out to us directly. The General Plan needed to be completely edited and the format underwent a complete overhaul to produce a well-written, accessible, and visually appealing document. The General Plan is currently in use and posted on the City's website.

Merriam Mountains Specific Plan EIR, Stonegate Development, San Diego County, California. Served as lead editorial liaison responsible for editorial review, drafting/coordination of responses to comments, coordination of production, and quality control for EIR. Project is a 2,300-acre, 2,700-unit planned community proposed by Stonegate Development. Dudek is providing environmental services for the proposed planned community and has guided Stonegate Development through the County of San Diego environmental planning process and helped them meet the requirements for implementing such a large-scale development project.

Tejon Mountain Village Multiple Species Habitat Conservation Plan (MSHCP) and Biological Technical Report (BTR), Tejon Mountain Village, LLC, Kern County, California. Served as technical editor and assisted in editorial reviews of environmental documentation for this large-scale, master-planned community. Dudek provided comprehensive environmental design and planning services for a 28,000-acre study area and assembled a comprehensive document detailing all sustainability efforts.

Newhall Ranch Resource Management and Development Plan (RMDP), Spineflower Conservation Plan (SCP), and EIS/EIR, Newhall Land and Farming Company, Los Angeles County, California. Served as technical editor and assisted in editorial reviews of RMDP, SCP, and biological resources section of the EIS/EIR, which analyzes the impacts of the RMDP and SCP with respect to numerous special-status species on the 13,650-acre site. Management plan addresses all special-status species and habitats affected by the project and establishes standards for management of biological resources on the site.

Chula Vista Bayfront Master Plan (CVBMP) Environmental Impact Report (EIR), San Diego Unified Port District, San Diego County, California. Served as lead editorial liaison responsible for editorial review, coordination of production, and quality control for EIR effort. Dudek provided environmental review services to the San Diego Unified Port District for the CVBMP's EIR to develop 550 acres of San Diego bayfront property, including both state tidelands and uplands under the Port's jurisdiction, and uplands under the City's jurisdiction.

Valencia Commerce Center Tentative Parcel Map (TPM), Newhall Land and Farming Company, Los Angeles County, California. Served as lead editorial liaison responsible for editorial review for TPM effort. Dudek provided environmental and CEQA documentation services to Newhall Land and Farming Company for the final phase of the 12.6-million-square-foot Valencia Commerce Center.

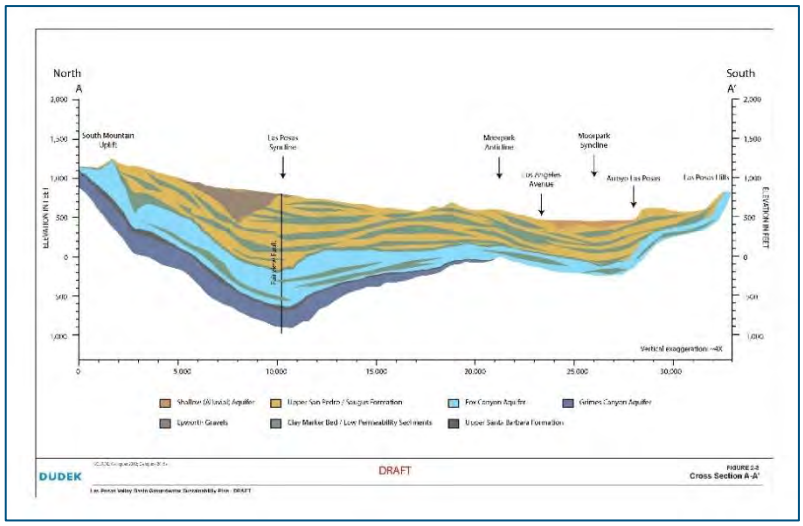
PG&E Pease–Marysville 60-kilovolt (kV) Transmission Line Mitigated Negative Declaration (MND), California State Lands Commission (CSLC), Sutter and Yuba Counties, California. Served as lead editorial liaison responsible for editorial review, drafting/coordination of responses to comments, coordination of production, and quality control for MND. Provided CEQA documentation for PG&E's proposed 60 kV transmission line extending 8 miles within Sutter and Yuba counties. Included preparation of a CSLC-specific style guide, templates for MND sections adhering to CSLC style guidelines, and web support.

Appendix B

Similar Project Experience

Fox Canyon Groundwater Sustainability Plans

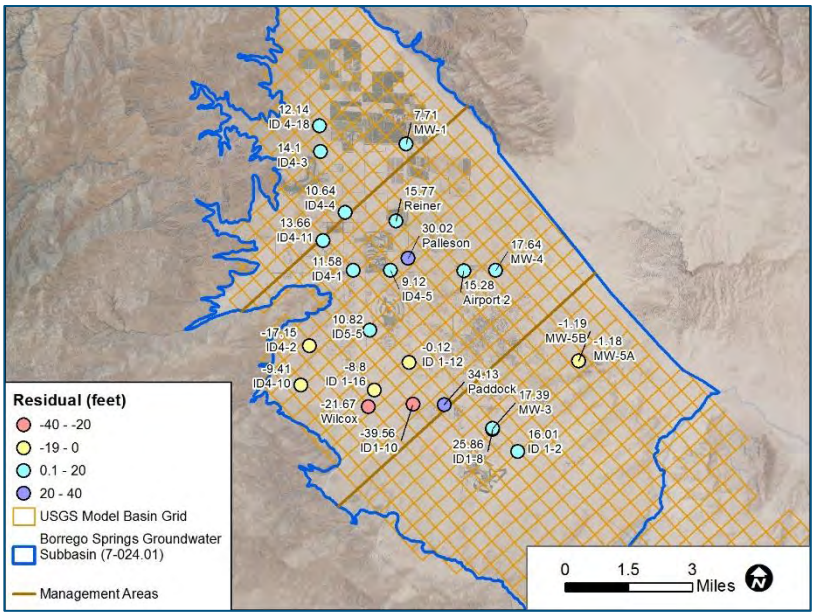
Client: FCGMA
Dates: 2016–Present
Key Dudek Staff: Peter Quinlan, Ron Schnabel (Project Manager), Jill Weinberger, Daniel Ritter, Hugh McManus, Dylan Duvergé, Jane Gray, Zoe Carlson, Becky Golden-Harrell
Reference: Jeff Pratt, Director of Watershed Protection District, 805.645.2014, Jeff.Pratt@ventura.org



The FCGMA retained Dudek in 2016 to prepare the GSPs for the Oxnard, Las Posas, and Pleasant Valley basins in Ventura County. These basins were designated high priority by DWR for overdraft and water quality. The plan requirements include historical basin and water use conditions, including an annual water budget for the 30-year period from 1985–2015; determination of sustainable basin yield and associated uncertainty; definition of undesirable results and minimum thresholds; and identification of water resource projects or management actions necessary to achieve sustainable management by 2040. After compiling and evaluating existing data from multiple agencies, Dudek completed preliminary drafts of the GSPs in November 2017, which were released for public review. Dudek has led stakeholder outreach efforts throughout the development of the GSPs including development of an outreach and engagement plan, ongoing communication with more than 400 interested parties through electronic newsletters, facilitating six stakeholder meetings and leading two workshops for the FCGMA Board of Directors. We are proceeding with incorporating the feedback received from stakeholders during the review process and revising the initial conditions for the numerical model simulations of future conditions. The plans are scheduled for completion by the fall of 2018.

SGMA Project Management and Development of a GSP

Client: BWD and County of San Diego
Dates: 2013–Present
Key Dudek Staff: Peter Quinlan, Trey Driscoll (Project Manager), Jill Weinberger, Steven Stuart, Daniel Ritter, Hugh McManus, Dylan Duvergé, Kyle Harper
Reference: Geoff Poole, BWD General Manager, 760.767.5806, geoff@borregowd.org



Dudek is managing the development of a GSP for the critically overdrafted Borrego Valley Groundwater Basin for the BWD and the County of San Diego. Dudek has prepared cost estimates for the GSP; technical analysis of the existing BWD and County Demand Offset Water Credit Policy; scientific and jurisdictional analysis of the basin boundaries to support application for a Bulletin 118 BBM; water replacement cost analysis; and analysis on managing proportional groundwater production cutbacks through a water market approach. Dudek is also currently building a custom data management platform to support the Borrego GSP and providing on-call grant application preparation services and support for various projects through numerous chapters of Proposition 1 for the district.

Dudek has worked collaboratively with USGS in modifying the Borrego Valley Hydrologic Model, a finite-difference groundwater flow numerical model developed by USGS using the MODFLOW-OWHM code, to extend the simulation period from 2010 to 2016. Dudek updated the numerical model by incorporating known and estimated pumping at wells in the basin up to the end of 2016. The model was validated by simulating conditions from 2010 to 2016 and comparing the simulated results to observed water level data collected from 2010 to 2016. Model validation is a measure of the uncertainty in model predictions. Improvements in model accuracy may be made after identifying the model parameters that result in the greatest uncertainty and implementing future investigations and data collection to reduce the uncertainty. Dudek identified three conditions, or parameters, that contributed most to uncertainty: estimated pumping in lieu of actual metered pumping, aquifer storage, and recharge from infiltrating stream flow. Additional information on pumping, storage and recharge will be collected over the next 5-year period to reduce uncertainty and generate more accurate simulations.

BBM and GSA Formation for Cuyama Valley and San Antonio Creek Groundwater Basins

Client: SBCWA
Dates: 2015–2016
Key Dudek Staff: Jill Weinberger, Jane Gray, Jeff Kubran
Reference: Fray Crease, Water Agency Manager, 805.568.3440, fcrease@cosbpw.net

Dudek assisted the SBCWA with the BBM and formation of GSAs in the two medium-priority groundwater basins in the county. To meet the March 2016 deadline for BBM applications, Dudek initiated stakeholder outreach in December 2015, and held two public meetings on January 12 (San Antonio) and 13 (Cuyama), 2016. After completing both BBM applications, Dudek facilitated GSA formation discussions and filed for GSA formation in both San Antonio and Cuyama.

Additionally, Dudek reached out to the DWR early in the BBM process to secure the well completion reports necessary to inform future decision-making and to open channels of communication regarding the rapidly evolving SGMA guidelines. Dudek hydrogeologists conducted a literature review of existing studies for both basin boundaries to fulfill the technical information requirements for a Scientific Boundary Modification and to identify data gaps and goals for the GSP development process. Dudek prepared a successful application for the County of Santa Barbara under DWR's Sustainable Groundwater Planning Grant program and will continue to monitor, track, and prepare applications on behalf of the county for SGMA compliance and groundwater basin benefit.

Dudek provided extensive engagement and facilitation services for the formation of GSAs for the Cuyama and San Antonio Groundwater Basins. The engagement entailed public outreach to communities, some of which had language, cultural and economic barriers to overcome. The GSA facilitation for both GSAs was an 18-month process working with all eligible local agencies, agricultural interests, and the public to form new governmental agencies for the judicious apportioning of groundwater in a collaborative and sustainable manner. The process culminated in the successful formation of the GSAs and an Advisory Group for one of the GSAs. The public aspects of the outreach were addressed differently in each of the basin areas and entailed coordination with NGOs, the University of Santa Barbara and the local Resource Conservation District.

Surface and Groundwater Monitoring, Data Management System Development

Client: YVWD
Dates: 2012–Present
Key Dudek Staff: Steven Stuart, Kyle Harper, Patrick Rentz
Reference: Joe Zoba, General Manager, 909.797.5119 ext. 2. jzoba@yvwd.us

Dudek was retained by YVWD to provide groundwater and surface water monitoring services per the 2014 amendment (R8-2014-0005) to the Water Quality Control Plan for the Santa Ana River Basin, and to act as data manager for information collected in the Yucaipa, Beaumont, and San Timoteo Groundwater Management Zones. The primary objective of the maximum benefit groundwater monitoring program is to collect the data needed for the triennial re-computation of ambient water quality in the Santa Ana Basin. Dudek conducts field monitoring services, including measuring surface water flow, collecting surface water quality samples, measuring field parameters (i.e., pH, temperature, and conductivity), measuring groundwater levels at selected wells, collecting groundwater quality samples, and compiling water level and water quality data in a database.

As-Needed Hydrogeological Support

Client: BWD
Dates: 2013–Present
Key Dudek Staff: Peter Quinlan, Trey Driscoll (Project Manager), Hugh McManus, Dylan Duvergé
Reference: Geoff Poole, BWD General Manager, 760.767.5806, geoff@borregowd.org

Well Development for the Rams Hill Water Supply Project

Dudek assisted the BWD in drafting a long-term cooperation agreement with the Rams Hill Golf Course to avoid litigation of water rights. As part of the agreement, Dudek is currently characterizing the hydrogeology of the southern portion of the Borrego Valley Groundwater Basin to determine safe yield. Dudek has performed multiple aquifer tests, drilled three test holes, installed a new production well, and completed water level monitoring and water quality sampling. Dudek is currently installing a telemetry system to monitor production and water levels for several wells. We are using the recently updated USGS groundwater numerical model to optimize pumping of the basin and project water level decline. By pumping non-potable poor-quality water from the southern Borrego Valley Groundwater Basin for use on the Rams Hill Golf Course and fallowing 800 acre-feet of agricultural production over the next 4 years, Rams Hill Golf Course will improve the long-term availability and sustainability of water in the Borrego Valley Groundwater Basin.

Appendix C

Project Assumptions

1 Cost Proposal

Dudek has prepared a cost estimate that is competitive, yet accurately reflects the level of effort required to complete the scope of services based on our understanding of the project and our experience having prepared draft GSPs. We will use as much information as applicable from recently prepared analyses in the area so as to recognize schedule and cost efficiencies. Dudek does not believe it is in the client's interest to submit an unrealistically low cost proposal, which is made possible by either reducing the scope of work or by assuming that budget augments will be made available at a later date. That said, we are flexible and willing to discuss ways to reduce our preliminary cost proposal. In an effort to keep costs at a minimum, there will be limited printing of draft documents and notices. If additional printed copies are requested by any member of the project team, Dudek will revise this budget accordingly. Factors that would increase the scope of work and estimated costs outlined in this proposal include, but are not necessarily limited to, any of the following:

- Attendance at additional meetings;
- Additional printing of copies of reports;
- Analysis of additional issues beyond those discussed in this proposal, or a more detailed level of analysis than described in this proposal;
- Changes in the project requiring re-analysis or rewriting of report sections; and/or
- Collection of additional data.

Table 5 presents Dudek's cost estimate for this project. The hourly rates include fringe benefits, indirect costs and profit. The Dudek team will bill on a time-and-materials basis. Each invoice will identify the hours expended by each staff member and the percentage of the budget, by task, that has been expended to date.

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2 Budget Estimate

The Dudek team proposes to perform the services described at a fixed-price total of $1,180,480. This budget is based on a fixed-price contract and costs will not be exceeded without prior written approval from Valley District. The budget includes an allocation for project management, meetings, and project coordination.

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3 Assumptions

Dudek provides the following cost assumptions used in development of the fixed-price items outlined in the budget estimate.

Assumptions for Development of GSP

GSP Development

Project Facilitation, Project Management, and Meetings

Kickoff Meeting

Dudek assumes that Valley District or the Yucaipa GSA will provide a single lead point of contact authorized to make decisions and provide project direction and project management upon Notice to Proceed. This person will assist with facilitating the kickoff meeting, which will be held at a location provided by Valley District. At this meeting it is assumed Valley District and the Yucaipa GSA member agencies will provide electronic copies, or links to electronic copies, of the sources with groundwater data listed in the RFP (e.g., USGS) and any additional sources that may have become available since the RFP was written.

Monthly Yucaipa GSA Meetings

We anticipate facilitating up to 36 monthly meetings, assuming 12 meetings per year, beginning in fall 2018 and ending in fall 2021. Each meeting is assumed to be three (3) hours long, and our cost estimate includes time for meeting preparation and travel. The meetings will be attended by the project manager or other major team member. Dudek assumes Valley District or Yucaipa GSA member agencies will reserve the meeting location.

Technical Advisory Committee and Stakeholder Meetings

We anticipate facilitating up to 13 TAC and stakeholder meetings, with four (4) occurring in 2019, four (4) occurring in 2020, and two (2) occurring in 2021. The cost estimate assumes the meetings will be three (3) hours long, and will be attended by the project manager and other team members pertinent to the meeting agenda, as well as our public outreach facilitator. Dudek assumes Valley District or Yucaipa GSA member agencies will reserve the meeting location and audiovisual equipment for the meetings.

Weekly Project Phone Calls

We have budgeted one (1) hour per week for the duration of the project for update phone calls. The phone calls will be conducted by either the project manager or other team members.

Progress Reports and Schedule Updates

Dudek will prepare monthly project reports and schedule updates that will identify the percentage of the budget by task that has been expended to date, the upcoming work and schedule, scope, or budget concerns identified during the billing period. Dudek anticipates preparing up to 36 monthly progress reports, beginning in fall 2018 and ending in fall 2021. The progress report assumption is based on an anticipated 3-year contract.

USGS Groundwater Model

The costs for this task are based on using a calibrated numerical model that integrates surface water and recharge with groundwater. Dudek understands that the USGS anticipates having a calibrated model by the end of summer 2018, at which point the model input files and draft documentation on model design and calibration will be provided to Valley District. USGS anticipates publishing a final report of the model in the summer of 2019.

Dudek anticipates obtaining the model input files and draft documentation in the summer of 2018 to begin evaluating the basin water budget, sustainable yield and developing predictive simulations. The predictive simulations include evaluation of up to three (3) future climate change scenarios using DWR guidance and five (5) project alternatives/assessments. If the Yucaipa GSA requests additional predictive simulations to evaluate other climate change scenarios or potential projects, than the scope of work and budget provided in this proposal will be amended and presented for approval by the GSA.

Current and Historical Data Compilation and Assessment of Existing Data

Data Compilation

Reports and data will be limited to PDF, Excel, and GIS file formats. The organizations to be contacted to request files will be allowed up to four (4) weeks to respond in order to meet proposed schedule requirements listed in the RFP. Copy or scanning fees will be limited to a cumulative total of up to $1,000. Redaction of confidential data will be the responsibility of the agencies providing the data.

Deliverables:

- Database with compiled data

Prepare Initial Data Gaps Technical Memo

Data gaps will be summarized in a list at the conclusion of the Current and Historical Groundwater Conditions task. Data conformance issues (i.e., inconsistent units, etc.) will be noted but not rectified as part of this task. Data provided by the various sources is assumed to be correct and representative, and does not require verification. However, related data and reports will be compared for consistency. Data gaps will be limited to those with potential significance to the development of the GSP. This task assumes two (2) conference calls and one (1) round of review by the Yucaipa GSA.

Deliverables:

- Data Gaps Technical Memo (which will constitute the majority of the "Current and Historical Groundwater Conditions" chapter of the GSP).

Prepare Historical Water Budget

The historical water budget will be based on the data identified by the local agencies and compiled during the first three months following the kickoff meeting. Additional data will be incorporated after one (1) round of review by Yucaipa GSA member agencies. Data made available after the first round of review will be held for incorporation in the 5-year updates.

Deliverables:

- Pre-draft historical water budget tables and figures for Yucaipa GSA review and comment

Technical Assessment of Monitoring Network

A memorandum will document the procedures used during the evaluation of the existing monitoring program, and conclude with a discussion of expanding the network to be sufficient to meet SGMA requirements and meet temporal and spatial monitoring objectives to support continued evaluation of the effectiveness of the GSP. Includes a preliminary study of available information and data evaluation of screened intervals with respect to aquifer zones based on existing logs. The memorandum will be subject to one (1) round of review by the Yucaipa GSA.

Deliverables:

- One (1) electronic copy of the Monitoring Network Technical Memo (which will constitute the majority of the "Existing and Planned Monitoring" chapter of the GSP).

Technical Assessment of Projects and Actions

Dudek assumes that project costs, costs associated with implementing management actions, and anticipated acre-feet of water supplied, will be provided by the project proponent, Yucaipa GSA member agencies, or stakeholders. Dudek will produce an initial memo documenting the technical assessment of projects and management actions after coordination with the Yucaipa GSA and stakeholders during the first projects and management actions discussion session. Up to one (1) additional memo will be prepared following the second discussion session to reflect updated analyses provided by project proponents, additional management actions contemplated by the Yucaipa GSA, and the results of the groundwater modeling efforts.

Deliverables:

- One (1) electronic copy of the Initial Projects and Management Actions Technical Memo
- One (1) electronic copy of the Second Projects and Management Actions Technical Memo

Prepare GSP

Administrative Draft GSP

Dudek anticipates completing the administrative draft of the GSP in December 2020. The administrative draft will be provided electronically and hard copy, if requested, to the Yucaipa GSA and stakeholders to review and provide comments. Dudek anticipates a 90-day review period for the administrative draft. Dudek assumes the member agencies will coordinate their comments and provide either a single comment document from the entire GSA or a single comment document from each GSA member agency.

Draft GSP

Dudek will incorporate the comments made on the administrative draft and submit (electronically only) a final administrative draft document to the Yucaipa GSA before preparing the draft GSP for public review. It is anticipated that the comments received on the final administrative draft GSP will be minimal and mostly editorial in nature. Substantive comments requiring a second round of substantial edits would require an amendment to the proposed budget. A print-ready copy of the Draft GSP, and in electronic format (Word and PDF), will be submitted to the Yucaipa GSA for final review before release to the public. Dudek assumes the Draft will be released to the public in July 2021, and that the comment period will close in October 2021.

Respond to Comments on Draft GSP

Responses to comments will be generated following closure of the first comment period. Dudek assumes that no more than 20 substantive discrete comments will be received on the Draft GSP; note that one comment letter can contain multiple substantive comments. Since the actual scope and extent of public comments (in either written or oral format) cannot be definitively determined at this time, if additional staff hours are needed to prepare responses to comments, the scope of work and budget provided in this proposal would be amended.

Prepare Final GSP

Dudek will produce a final GSP that incorporates comments on the administrative and draft GSPs. Dudek will provide the Yucaipa GSA with five (5) printed and bound copies of the final GSP, one (1) electronic copy of the Final GSP in Word format, and one (1) electronic copy of the final GSP in Web-ready PDF format.

Unanticipated Interaction with DWR or stakeholders

Since the actual scope and extent of unanticipated interactions cannot be definitively determined at this time Dudek has assumed hours for meeting time, planning, and graphics that will be used on an as-needed basis. Use of this time must be pre-approved by the Yucaipa GSA and additional time may be required if the unanticipated interactions exceed the amount budgeted. Any additional time will be requested in a change-order for approval by the Yucaipa GSA.

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Proposal to
San Bernardino Valley Municipal Water District

Groundwater Sustainabiity Plan for the Yucaipa Basin Area

June 20, 2018

TODD GROUNDWATER

June 19, 2018

Re: Proposal to Develop a Groundwater Sustainability Plan (GSP) for the Yucaipa Basin Area

Dear Mr. Jones:

San Bernardino Valley Municipal Water and its partner agencies have successfully managed Yucaipa Basin for decades. I personally was involved in a 1988 perennial study for Yucaipa Valley Water District and was impressed by the management that reversed 1960s overdraft with conjunctive use, active recharge, and comprehensive monitoring and investigations. These decades of management provide the technical and institutional basis for successful development of a GSP.

In recent years, we have appreciated the opportunity to work with you on expansion and optimization of your management efforts. To develop a GSP, we can combine that local experience and knowledge with our GSP expertise from elsewhere across California; as documented in the enclosed proposal, we have assisted ten agencies with the Sustainable Groundwater Management Act (SGMA) requirements and we currently are working on five GSPs, including several on the fast-track for critically-overdrafted basins. We can bring you lessons learned from that experience.

I am pleased to propose Mr. Edwin Lin as Project Manager. Edwin has deep understanding of the basin, broad knowledge of SGMA, recent experience in Yucaipa Basin, and a shared vision with you of sustainable management. He is an accomplished project manager. As such, he has organized a strong and cohesive team including staff from Todd Groundwater for hydrogeology, SGMA issues, monitoring, modeling, feasibility analysis, and plan implementation; CWE for evaluation and costing of projects; and MIG for public outreach. We look forward to working with them again.

Yucaipa Basin has been proactively managed and this has yielded solid working relationships, a good understanding of the basin, extensive data, and a near-complete modeling tool. Nonetheless, SGMA mandates a relatively intense process with considerable public outreach and with detailed, comprehensive, and rigorous technical requirements. Understanding this challenge, Edwin and his team have developed an approach that builds on past accomplishments while looking toward future optimization of management practices and maintenance of sustainability.

We look forward to the opportunity to work with you and your staff on this important work toward groundwater sustainability. Please do not hesitate to call or email Edwin or me.

Sincerely,

Iris Priestaf, PhD
President
ipriestaf@toddgroundwater.com

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Appendix

Project Understanding

In July 2017, the San Bernardino Valley Municipal Water District (Valley District) joined eight other local municipalities and water retailers in the Yucaipa Basin (Basin) to form the Yucaipa Groundwater Sustainability Agency (YGSA). This governance structure allows for the YGSA to maintain local control of ongoing management actions to better serve the interests of local groundwater users.

The Yucaipa Basin is a medium-priority basin that is not subject to conditions of critical overdraft. Accordingly, the YGSA is responsible for preparing a Groundwater Sustainability Plan for the Basin (Yucaipa GSP) by January 31, 2022. The core elements of the Yucaipa GSP include:

- Documentation of the Plan Area, including land use, basin setting, and groundwater conditions
- Establishment of a sustainability goal for the Basin and set of criteria by which sustainability indicators can be evaluated
- Identification of projects and management actions to achieve the sustainability goal by addressing projected gaps in water supply and demand culminating in the absence of undesirable results within 20 years of GSP implementation (i.e., 2042)
- Development of an implementation plan by which performance of the GSP and interim progress are assessed and plan elements can be re-evaluated to allow for future adaptive management.

Over the past several years, Valley District and its partner agencies have been proactive in building the technical foundation needed for a successful GSP. Recent studies and investigations have improved the understanding of local hydrogeologic conditions, including the depth to the basin bottom, location and hydraulic effect of geologic faults, long-term groundwater level trends, and groundwater quality distribution. Additionally, estimates of groundwater storage, usable storage, and safe yield have revealed the need to continue management of groundwater conjunctively with surface water supplies.

While the technical foundation built to date by the YGSA can be leveraged to support GSP development, additional data collection and analyses are needed to comply with all SGMA requirements. We understand that the USGS, in collaboration with the YGSA, is completing the calibration of its integrated surface water-groundwater flow model of the Basin (USGS model). The USGS model will serve as a critical tool for refining historical, current, and future water budgets under varying climatic conditions, quantifying the sustainable yield of the Basin, and evaluating future projects and management actions with regard to their ability to meet the sustainability goal. Accordingly, while final documentation of the USGS model is not anticipated until Summer 2019, we envision that YGSA will want to obtain the USGS model as soon as the USGS completes its historical calibration and future baseline simulations and will want to apply it to assess proposed projects and management actions.

SGMA intends the development of the GSP to be a local stakeholder-driven process, which considers and encourages participation of all beneficial users of groundwater in the Basin through the development of the GSP. This process is ensured through a coordinated public outreach plan, which YGSA envisions will encourage participation by all interested parties in the Basin.

Project Approach

Our approach to the YGSA is to construct a technically-credible plan that is guided by the SGMA regulations, reliant on existing data and analyses to the extent practical, and based on locally-appropriate best management practices (BMPs) for groundwater management. In our review of GSP

guidance and discussions with DWR, we note that GSPs will be evaluated by hydrogeologists such as ourselves and must provide the depth of knowledge necessary to stand up to a rigorous technical assessment.

The GSP is considered the foundation of SGMA compliance and demonstrates sustainable management for the Subbasin. Our approach for the Yucaipa GSP incorporates the following:

- complies with GSP regulations, incorporating BMPs
- makes best use of existing data
- establishes meaningful sustainability criteria for the YGSA
- coordinates with GSAs in adjacent basins, and
- provides transparency through public outreach/communication with local stakeholders.

The intent of this GSP is effective and adaptive local management, which is allowed by the GSP regulations to satisfy local values and needs. Accordingly, our approach will be to develop a GSP that meets GSA needs first, complies with GSP regulations, moves forward with a level of detail commensurate with available data and basin issues, and considers a long-term view of adaptive management. For such a GSP, our team combines local knowledge, working experience with SGMA, and strong technical expertise.

Assembling the technical information for the GSP is relatively straightforward, but obtaining stakeholder buy-in on the GSP can be a challenge. As noted above, we plan to work with stakeholders early and often to develop a common understanding of basin conditions, define sustainability criteria, and discuss options. We also recognize that common ground has already been established through your previous groundwater studies and planning efforts, and that there is a shared resolve to move forward with projects and management actions. Accordingly, identifying and implementing cost-effective projects and management actions that meet local sustainable criteria is a key part of the GSP. In compliance with the regulations, analyses must demonstrate how these projects achieve and maintain sustainability, requiring groundwater modeling tools. Based on our experience working in the Basin and elsewhere, we offer both the expertise and tools to evaluate specific potential projects and management actions (e.g., recharge of imported water and stormwater capture in in-channel and off-channel locations across the Basin) for consideration by the YGSA and stakeholders and incorporation into the GSP.

The proposed scope of work to develop the Yucaipa GSP has been divided into eleven (11) tasks, details of which are presented below. The proposed scope of work covers the tasks identified in the Scope of Services in the Request for Proposal. It is organized in the same sequence as shown in GSP Work Plan submitted as part of the GSP grant application with slight modifications to ensure adherence to GSP regulations. It is noted that at the completion of Tasks 2 through 5, the respective draft chapter of the GSP will be prepared and submitted to the YGSA for review to solicit comments and encourage early discussion of key findings and recommendations. Additionally, fact sheets and website postings will be prepared to support public outreach efforts.

Task 1 – Collect Data and Develop GSP Databases

This task includes the collection, review, and preparation of GSP hydrogeologic datasets and documents that will be used to develop required components of the hydrogeologic conceptual model (Task 2) and support preparation of the public outreach plan (Task 8).

Following receipt of a notice-to-proceed, we will work with YGSA staff to compile relevant data required to define sustainability, set sustainability criteria, and evaluate options for obtaining and maintaining groundwater basin sustainability.

Collection of hydrologic and hydrogeologic datasets through September 2018 (end of 2017-18 Water Year) will support characterization of current climatic, surface water, groundwater, and pumping conditions. We assume that data will be provided electronically in spreadsheet and GIS-compatible formats. Todd Groundwater can facilitate file transfer and sharing among YGSA and project team members by setting up a project folder on its file transfer protocol (ftp) site.

Spatial and numerical data received will be inventoried within the project Database Management System (DMS) (to be developed under Task 5). Technical references will be catalogued to streamline required documentation in the GSP, submittal to DWR of technical documents not generally available to the public, and transfer of digital files in formats acceptable to the YGSA at the completion of the project.

Master spatial and spreadsheet databases for production and monitoring wells, climatic and stream gaging stations, groundwater levels, water quality, and groundwater pumping will be prepared to allow for efficient creation of GSP-required maps, geologic cross sections, and charts. We will QA/QC all databases to identify discrepancies and remove erroneous or duplicative data. All spatial datasets will be saved in a geodatabase with consistent geographic coordinate system (e.g., NAD83 State Plane 0405 US Feet).

Task 2 – Develop Basin Conceptual Model

This task includes documentation and evaluation activities needed to and groundwater conditions (1) describe the GSP Plan Area, hydrogeologic conceptual model (HCM), and physical characteristics of the Basin, (2) characterize current and historical groundwater conditions in the Basin, (3) document current and historical water budgets for the Basin, and (4) identify management areas (if any) that can facilitate implementation of the GSP.

Document Plan Area, Land Use, Basin Physical Properties. We will document the Plan Area, which includes describing the boundaries of the Basin to be managed by the GSA in relation to GSA member service areas and jurisdictional boundaries of all federal and state lands and adjacent basins. We will prepare maps showing land use designations and describe the relationship and potential constraints of City and County General Plans and other land use plans to existing and proposed water resource monitoring and management programs, focusing on existing and future water demand sectors. Well permitting procedures and local well ordinances will be documented, recognizing their importance as a management tool. As required in the GSP, a map depicting the distribution of well densities by use type will be developed using the DWR-provided SGMA mapping tool supported by the project well database.

Leveraging the technical studies completed by Valley District, the USGS, and others (and datasets developed in Task 1), we will describe the geologic setting, depositional history, and key physical properties of the Basin. We will describe the occurrence and thickness of alluvial deposits (bottom of the basin), structural features (including mapped faults and inferred hydraulic flow barriers), and hydraulic properties of key aquifers and aquitards across the Basin. Using publicly available soil and hydrologic databases, we will map and describe soil characteristics and identify recharge areas in the Basin.

It is noted that the GSP requires the preparation of detailed geologic cross sections that depict the major stratigraphic and structural features across the Basin along with screen intervals and water levels. To

satisfy this requirement, we propose to re-scale and augment the five geologic sections generated in the 2016 USGS report, "Geologic Structure of the Yucaipa Area inferred from Gravity Survey Data" with well construction, lithologic, and water level information to the cross sections. The cross sections will provide basin-wide coverage both parallel and perpendicular to regional groundwater flow directions.

Evaluate Current and Historical Groundwater Conditions. We will evaluate current and historical groundwater level and water quality conditions. Historical changes in groundwater occurrence and flow direction will be illustrated through (1) Basin-wide groundwater elevation contour and groundwater level change maps under current conditions (Water Year 2017-18) and for selected historical high and low water level periods, and (2) groundwater level change maps for time periods between high and low water levels. Review of selected basin wells indicates historical high groundwater level conditions occurred in the 1980s and 1999, while historical low water levels occurred more recently between 2007 and 2009.

Additionally, we will develop a figure showing water level hydrographs for key wells across the Basin. Wells in close proximity with different screen interval depths may be grouped on one hydrograph to illustrate vertical gradients between aquifers. We will also develop a current depth to water map to illustrate the available vadose zone storage capacity across the Basin; this will support evaluations of future projects (Task 4) and help identify any areas where groundwater dependent ecosystems (GDEs) may exist, augmenting DWR-provided information on vegetation and wetlands.

Groundwater in the Basin is a calcium-bicarbonate type (similar to local surface water) and generally is very good quality with most constituents meeting drinking water standards. For this task, we will work with Valley District staff to identify and map current concentrations of target constituents of concern across the Basin. We will also identify and map any existing contaminant plumes in the Basin that may be affected by GSP management activities.

Evaluate Water Budget and Sustainable Yield. We will review previous evaluations of water budget components and the Basin's sustainable yield. We will document water budget estimates from completed studies and extract historical water budgets from the USGS Model. Differences in water budget components will be noted, including those that may be attributable to slight differences in delineated basin boundaries.

Define Management Areas. SGMA allows the YGSA to define one or more management areas to facilitate local management and implementation of the GSP. The Basin has been divided historically into eight subbasins to account for apparent barrier effects of geologic faults. We recommend starting with a conceptual 'clean slate' and anticipate discussing how the GSP will benefit from identifying more than one management area while minimizing the need to establish multiple sets of sustainability goals and criteria. This will be discussed through the public process between the YGSA and stakeholders, per GSP Regulation § 354.20. Working with YGSA, we will examine management strategies and impacts for treating the Basin under multiple management areas.

Task 3 – Establish Sustainability Goals and Management Criteria

The establishment of sustainable management criteria begins with the definition of a sustainability goal. In order to determine if groundwater conditions meet that goal, an evaluation of undesirable results is required. We will build on the hydrogeologic conceptual model, groundwater conditions, and water budgets developed in Task 2 to identify and evaluate Sustainable Management Criteria for the YGSA, as

per GSP Regulations Subarticle 3, § 354.22-§ 354.30. This evaluation allows identification of metrics under which the sustainability indicators become significant and unreasonable, thereby defining undesirable results. This metric is referred to as a minimum threshold and will be developed for each sustainability indicator applicable to the YGSA. Measurable objectives will be identified to demonstrate future performance and ability to achieve the sustainability goal.

Analysis of undesirable results will build on results of the previous tasks and be used to determine minimum thresholds and measurable objectives. It will involve focused discussion of groundwater conditions with respect to the six undesirable results (only four of which may be applicable or significant to YGSA), the related beneficial uses and users, and the potential effects (existing, projected, and cumulative) of groundwater conditions on beneficial uses/users.

Analysis of undesirable results will be accomplished through various analytical and numerical assessments. For chronic lowering of water levels, the analysis will focus on historical and current water level contour maps and well hydrographs, with comparison to potentially affected wells. Depletion of groundwater storage will be evaluated with the USGS model and supplemented by findings from previous evaluations to ensure availability of supply through drought and climate change. Potential groundwater quality degradation will involve analysis of water chemistry with depth, overall groundwater quality, and constituents of concern, but are likely to be readily managed. Subsidence is not expected to be a critical sustainability indicator but will be assessed using data provided by DWR and USGS California Water Science Center. Historical low water levels may provide a reasonable minimum threshold. Identification of interconnected surface water systems will be assessed with the USGS Model, and identification of GDEs will be based on review of GIS mapping and DWR-provided data. Preliminary review of depth to water indicates that sustainability indicators for interconnected surface water systems and GDEs are likely to be constrained to the northern and eastern margins of the Basin.

The GSP draft regulations outline how minimum thresholds are defined with regard to supporting information, their mutual inter-relationships, relation to existing regulations, consistency with the monitoring program, and effects on beneficial uses across the basin. Consistent with GSP regulations, minimum thresholds will be identified for each of the sustainability indicators in each management area, if more than one such area is defined for the YGSA.

Task 4 – Identify and Evaluate Management Actions

We will collaborate with YGSA to develop and analyze projects and management actions to achieve the identified sustainability goal (and interim goals) per GSP Regulations Subarticle 5, § 354.42– 354.44. Once groundwater sustainability has been defined, measurable objectives identified (including minimum thresholds), and the water budget established, sufficient information will exist to assess groundwater conditions relative to the sustainability goal. It is at this point that an implementation program is developed and presented in the Management Actions and Projects sections of the GSP.

The development of projects and management actions will be tied closely to sustainability criteria developed in Task 3. A range of possible management actions, programs, and projects will be identified (based on existing planning documents, ongoing investigations, and outreach) that can be implemented to help achieve (or maintain) sustainability. Projects will be screened for feasibility and ability to meet the GSP objectives. Individual projects will first be simulated using groundwater modeling to assess the ability to meet the sustainability goal; promising projects will be re-analyzed as scenarios for GSP development. Although projects and actions will be evaluated during a public process, some key

management activities (e.g., recharge opportunities using imported State Water Project water and captured local storm runoff) have been identified already and are being evaluated by the YGSA.

Based on this analysis, the management actions, projects, or programs will be analyzed for possible inclusion in the GSP. The USGS Model will be used to analyze these strategies individually and in combination to determine the ability of selected management actions to achieve or maintain sustainability goals for the future. We will analyze strategies to optimize benefits and compare those benefits against the baseline future scenario. As per GSP regulations, climate change scenarios will be considered in the analysis.

Task 5 – Prepare Implementation Plan and Management Actions

Prepare GSP Administrative, Operations, and Reporting Plan. For this, we will work with YGSA to prepare an implementation plan of the GSP. This task will include developing steps for implementation, a plan schedule (including annual reporting and periodic evaluations), and a fiscal strategy. As required by Regulations § 354.6, costs for implementing the project and management actions will included in the GSP, along with costs associated with any monitoring network improvements that may be recommended. The plan schedule will include milestones relative to required annual reporting of groundwater conditions and water resources, in addition to key meeting dates. The Plan Implementation will also consider the process for periodic evaluations, including re-examination of the GSP at five-year intervals, allowing for assessment of progress in meeting milestones and measurable objectives. Evaluations will be used to report the performance of the GSP and determine if revisions are required.

Describe Existing and Planned Monitoring Network. We will develop a GSP monitoring network and monitoring protocols with the collection of data of sufficient quality, distribution, and frequency to characterize groundwater and related surface water conditions and to track changes, including short-term, seasonal, and long-term trends. We assume that the existing monitoring networks and protocols used by the YGSA will provide a strong foundation for the GSP. Monitoring will likely need to be expanded beyond current programs to include the ability to monitor for each of the minimum thresholds or to address technical deficiencies and/or data gaps.

Groundwater and surface water monitoring has been conducted in the Basin for decades. Accordingly, historical and current monitoring programs provide many opportunities for designation of representative sites, including wells that have been long monitored and deemed suitable for the GSP monitoring program with appropriate well construction information. Consistent with GSP Regulations § 354.36, these will be evaluated and documented in terms of distribution (areal and vertical) and density, suitability to monitor sustainability indicators, and representation of general conditions in an area.

Develop Framework for Database Management System (DMS). Monitoring network details will be incorporated into the DMS. We envision that the YGSA DMS will consist of a combination of standardized datasets using typical formats for groundwater data including Excel spreadsheets, a project Access database, and a GIS geodatabase. The DMS will be tailored to meet the functional needs of the YGSA to store and report information for the development of the GSP, demonstration of progress toward sustainability goals, and ongoing monitoring of the Basin, as well as the specific activities noted above. We will coordinate with the YGSA to ensure the proposed GSP DMS formats meets the requirements of DWR and are compatible with YGSA members.

Task 6 – Prepare Draft and Final GSP

For Task 6, we will prepare the Draft and Final GSP document for DWR submittal per GSP Regulations. Considering that draft sections for the GSP will be developed under the previous tasks, this task includes time for review and comment by YGSA and editing of these sections into the GSP. For costing purposes, we assume that an initial document and three revisions will be required as described below. Electronic submittal of all draft documents is assumed. An Administrative Draft GSP will be prepared for YGSA staff to review and provide comments. These comments will be incorporated into a Draft GSP that will be subject to an additional internal review to ensure that comments were appropriately managed. Our costs assume minimal comments for this version of the GSP. A Final Draft GSP will be prepared to allow sharing with stakeholders and the public. For the Final Draft GSP, there may be a need for hard copies to be produced. We assume delivery of up to six (6) hard copies for the Final Draft GSP.

The Final Draft GSP will be a coordinated and unified report that clearly describes the data, methods, and analyses. With appropriate public and stakeholder notification, it will be uploaded to the GSA website and will be presented at one of the last technical workshops. Comments received at the workshop as well as written submitted comments by agencies and stakeholders will be incorporated into the Final GSP, which will be uploaded to the website with specific notification to and consultation with cities and counties per SGMA. Following this 90-day required process, the Final GSP will be printed for final consideration by GSA members, presentation at a public hearing (a Regular or Special Board Meeting), and formal adoption. Subsequently, the Final GSP will be submitted to DWR.

Task 7 – Document GSA Governance and Inter-Basin Agreement

Documentation of the YGSA governance structure is required in GSP per GSP Regulations § 354.6. For this task, we will document the identified local stakeholders and legal authority of the YGSA including its bylaws, duties, powers, and responsibilities. The inter-basin agreement between the Yucaipa Basin and San Bernardino Basin Area will also be documented.

Task 8 – Develop and Implement Public Outreach Plan

A truly sustainable Groundwater Sustainability Plan for the Yucaipa Basin will require stakeholder support from many interested parties including those who may not have participated in similar past planning processes such as representatives of disadvantaged communities and small and low-income groundwater users. Accordingly, the Todd Groundwater Team, led by its public outreach consultant MIG, will develop and implement a customized public outreach plan tailored to specific opportunities and circumstances of communities in the Basin.

Public outreach will include the following specific tasks:

- Development of a coordinated Outreach Plan and update and maintenance of the interested parties list for the duration of the project.
- Preparation of the initial GSP notification, conductance of eight (8) stakeholder interviews, three (3) public workshops, questionnaires.
- Preparation of collateral materials through the GSP development process, including web content, educational fact sheets, notices for upcoming meetings and workshops, and newsletters.
- Documentation of outcomes of the notifications and communications by the GSA with all interested parties for incorporation in the GSP.

The Todd Groundwater Team, led by MIG, will meet with GSA staff early in the planning process (project kickoff meeting) to clarify expectations and desired outcomes. Information generated from this meeting (as well as carefully selected stakeholder interviews) will help to identify specific community characteristics that will be used to tailor the public outreach plan. This will allow the outreach to be carried out in a way that is accessible and convenient for the intended participants, ensuring they are engaged by the process and their input available to inform the development of the GSP.

For example, some who live in hard-to-reach disadvantaged communities may not have consistent access or time to access information shared only digitally. One way to reach these communities is to leverage local-community based organizations whose representatives can serve as liaisons for outreach into the community. Another is to post flyers in public places such as parks and libraries where people may gather during off-work times. Working with "promotoras" – community health care workers – who have the trust of the community, as well as with local churches, are effective ways to get out the word in Hispanic/Latino communities. If there is a need to engage Native American tribes, then it will be important to get approval from the Tribal government and not assume that the enthusiasm of a Tribal program manager/department head by itself is sufficient for their participation and subsequent support. MIG will work with the YGSA to apply a combination of these methods to ensure effective and efficient public outreach.

The heart of the outreach will be a series of three (3) public workshops to increase awareness of and provide an opportunity for interested stakeholders to participate in the GSP development process. Outreach strategies such as those described above and targeted collateral materials for both the website and community distribution will be used to promote awareness of the public workshops, the GSP TAC meetings, and the overall GSP process. The first public workshop will take place in the early months of GSP development process and will encourage participants to attend the first and subsequent TAC meetings. The second public workshop will take place in late 2019 to review the in time to inform TAC discussions for establishing sustainability goals. The third and final public workshop will be an opportunity to present the administrative draft GSP for public review.

A community questionnaire, both a hard-copy and online versions, will be used to further extend the outreach effort and generate input from a larger number of community members. All collateral materials and the questionnaire will include a Spanish language version and be distributed through multiple communication channels. Still, the final form of the outreach plan will be determined based on what we learn about local communities during the early stages of the planning process.

Task 9 – Technical Advisory Committee (TAC) Meetings

The Yucaipa GSP Work Plan includes thirteen (13) Technical Advisory Committee (TAC) meetings covering each of the core technical elements of the GSP. The TAC meetings are intended to provide a forum to encourage technical input from local stakeholders during GSP development. We will support the YGSA in facilitating these meetings through the preparation of meeting agendas and presentation of findings and recommendations for scheduled topics of discussion.

For budgeting purposes, we assume that the Todd Groundwater Team will be represented in-person by the Project Manager at all TAC meetings. Public outreach team members will attend in-person five (5) meetings expected to attract the most interest from interested parties. We assume this would be the GSP kickoff meeting, the first sustainability criteria meeting, and first actions to achieve sustainability meeting, administrative draft GSP, and draft GSP meeting. Otherwise, MIG staff can participate in

meetings via teleconference. Our project design and cost engineer will participate in the two meetings via teleconference to discuss project feasibility and costs. Following all meetings, we will prepare a summary and all comments received by the GSA or DWR, along with GSA responses.

Task 10 – DWR Grant Administration

For Task 10, we will manage the grant agreement ensuring compliance with grant requirements and provision of supporting grant documentation as required by DWR. We will work closely with YGSA staff and prepare and submit the anticipated 14 quarterly invoices and progress reports and final grant completion report to DWR. Additionally, we will communicate with all YGSA members to keep them apprised of the GSP grant status.

Task 11 – Project Management

Effective project management is essential to providing high-quality services at the right time and within budget. Todd Groundwater has developed reliable project management methods for coordination of team efforts, quality control and adherence to the project scope, schedule, and budget. This task includes coordination of staffing, schedule milestones, budget allocation, and reporting requirements.

Todd Groundwater will track schedule and budget on a monthly basis and track document requirements for the GSP. Invoices will clearly show team members, hours, costs, and progress on project tasks. A monthly progress report will be prepared for each invoice showing progress made during the month, next steps for the following billing cycle, and status of both schedule and budget. The project team will conduct a progress report conference calls to ensure coordination among tasks and sharing of information and data. Communication with YGSA would be done by teleconference. For budgeting purposes, we have assumed participation by all key team members at a Project Kickoff Meeting and have assumed twelve (12) conference calls with YGSA staff for the duration of the project.

Work progress will be effectively tracked and obstacles will be identified at the earliest possible time. Team members will meet to coordinate work tasks with close collaboration and coordinated work sessions, as needed. This regular communication assists in maintaining adherence to the project schedule and allows for “course correction”, if needed, in a timely manner.

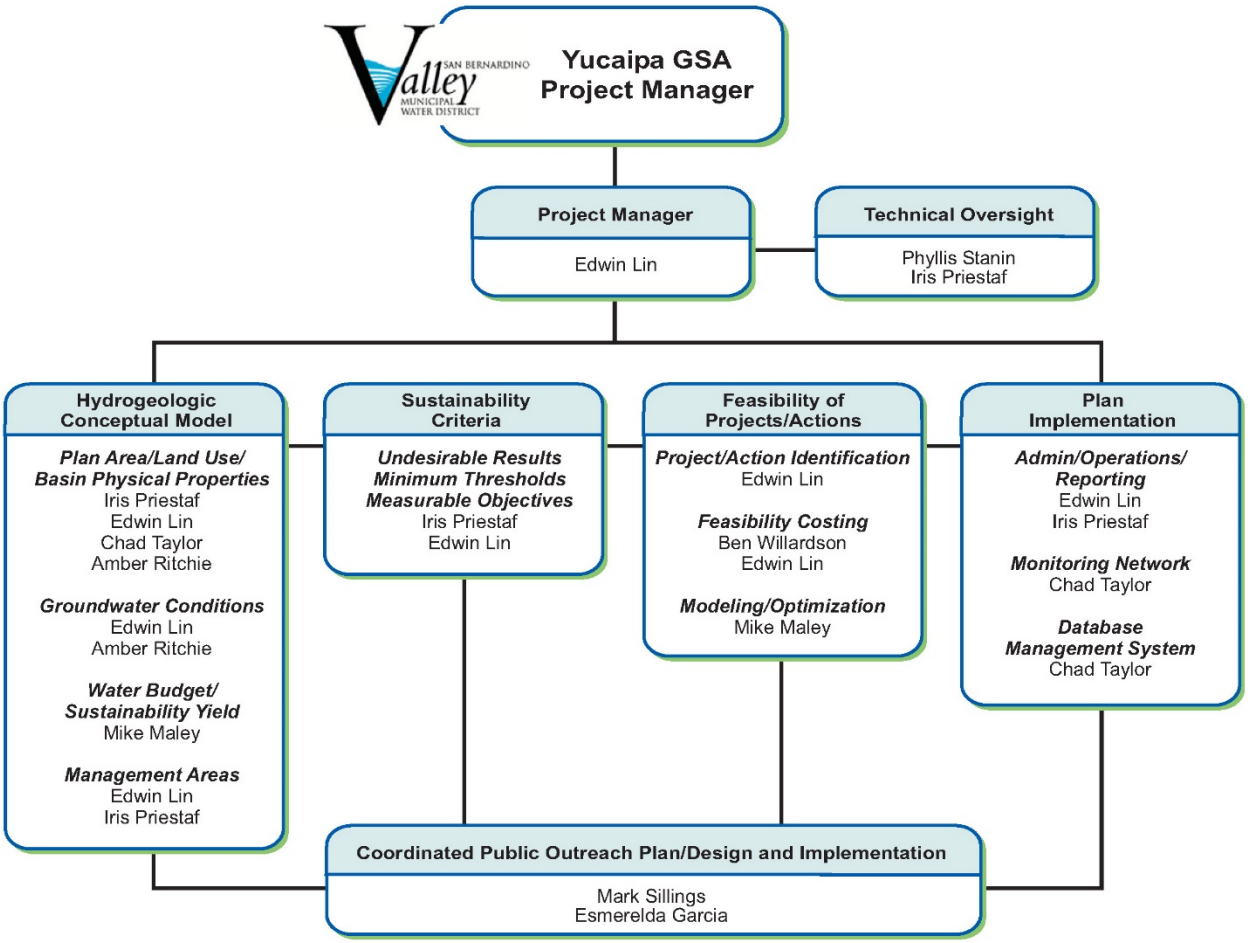
Project Team

Todd Groundwater offers a strong technical team dedicated to working closely with the YGSA staff to develop a successful GSP. We have partnered with MIG Consulting (Pasadena, CA) and CWE Corp (Fullerton) to provide the full breadth of services required for the successful completion of this project. Our Project Team has decades of experience in key areas that will benefit this project including:

- Knowledge of SGMA compliance, GSP regulations, and BMP guidelines
- Basin management involving plans and policies, hydrogeologic conceptual models, assessment of recharge projects using numerical models, and establishment of water monitoring programs
- Feasibility evaluation, design, and cost estimation for in-channel recharge facilities and re-purposing of stormwater detention basins and wastewater ponds
- Development and implementation of custom-tailored public outreach plans
- Local experience working with YGSA members on evaluating projects to meet sustainability goals.

A project organization chart is presented below, followed by a brief description of the team member's role and relevant experience. Firm qualifications and project descriptions with references for Todd Groundwater, MIG, and CWE are presented in the Appendix with resumes of each key team member.

Project Organization Chart



Edwin Lin, PG, CHG (Project Manager/Lead Hydrogeologist) Edwin Lin, Principal Hydrogeologist at Todd Groundwater, will serve as Project Manager and YGSA's primary point of contact. He will be responsible for communicating project status with GSA staff; overseeing the execution of the work, schedule, and budget; participating in public meetings; and coordinating the various team efforts. He will lead or oversee all aspects of the project and ensure that all elements of the GSP meet the GSA's objectives and DWR expectations. He has 20 years of experience in basin management, including all facets of conceptual hydrogeologic model development and evaluation of feasibility, benefits, and regulatory compliance of managed aquifer recharge (MAR) projects involving imported water, stormwater, and recycled water. He is currently working closely with YGSA members to implement the infiltration testing Work Plan that he designed to support GSP development. Mr. Lin has supported his clients with preparation of regulatory-driven groundwater management documents with a vision on expanding conjunctive use. Through these projects, he has developed an appreciation of stakeholder and regulatory involvement and the importance of effective communication of technical subjects to a diverse audience.

Phyllis Stanin, PG, VHG, CEG (Technical Oversight) Phyllis Stanin, Todd Groundwater Vice President and Principal Geologist, will provide Technical Oversight for the project. She has been a professional geologist for more than 30 years with expertise in hydrogeology and groundwater basin management. She has prepared numerous groundwater management plans—including several in the San Joaquin Valley especially in Kern County —and currently is assisting several clients with SGMA compliance. She has also conducted numerous regional hydrogeologic assessments using advanced analytical and numerical modeling tools. She is uniquely qualified to be responsible for this project and provide strong guidance.

Iris Priestaf, PhD (Technical Oversight / Hydrogeologic Conceptual Model / Sustainability Criteria / Plan Implementation) Iris Priestaf, President of Todd Groundwater, has more than 30 years of experience with a focus on groundwater management. She has worked with numerous water agencies, cities, and counties in preparation of management plans and currently is working on several GSPs. A recognized expert on SGMA, she will provide guidance and review and help to develop critical chapters of the GSP to ensure that the project is technically sound, appropriate for SGMA, and responsive to YGSA objectives.

Michael Maley, PE, PG, CHG, CEG, (Water Budgets – Sustainable Yield / Groundwater Modeling / Project Optimization) Mike Maley, Senior Hydrogeologist/Modeler at Todd Groundwater, will serve as the Lead Modeler for the project. He is both a licensed professional geologist and civil engineer with more than 30 years of experience in water resources projects, including GSPs. He is an experienced groundwater modeler well-versed in several modeling codes. He will work the calibrated USGS Model to extract water budgets for historical, current, and future baseline conditions, and will apply the USGS Model to simulate proposed projects and management actions to identify projects that are critical for achieving sustainability goals.

Chad Taylor, PG, CHG, (Hydrogeologic Conceptual Model / Monitoring Network and Database Management) Mr. Taylor, Senior Hydrogeologist with Todd Groundwater, will lead the development of the monitoring well network and the project DMS and prepare portions of the Hydrogeologic Conceptual Model. He has 15 years of experience in hydrogeology, water supply planning and exploration, and basin management and monitoring. Through his projects, he has supported his clients with efficient design and management of geospatial and spreadsheet databases to provide effective visualization of data.

Ben Willardson, PhD, PE, DWRE, QSD/P (Project Engineering Design and Costing). Ben Willardson, Senior Project Manager with CWE, will be the Project Lead for feasibility and cost estimating for management projects involving new recharge facilities. He has 18 years of professional experience and is a highly regarded hydrology and hydraulics specialist heavily involved in planning, design, compiling and analyzing data for water resources infrastructure and special studies related to hydrology, hydraulics, sediment transport, and water quality. He has guided the development of methodologies to evaluate the effective use of BMPs for watersheds throughout California. He formerly managed the operation of 14 dams and 27 spreading grounds for flood control and water conservation within Los Angeles County's complex flood control system.

Mike Sillings / Esmeralda García (Public Outreach Plan) Mike Sillings and Esmeralda García, Facilitation and Outreach Specialists with MIG, will coordinate and facilitate the public outreach plan design and implementation. Both Mark and Esmerelda are based in their Pasadena office and have over two decades of experience with public and agency outreach and the associated management challenges experienced by water agencies in southern California.

Project Schedule

Table 1 shows our proposed project schedule broken down by task. The Todd Groundwater Team can initiate the project upon receipt of a notice-to-proceed in August 2017 and anticipates that the project can be completed by November 2021. Based on our experience, this is a realistic schedule for completing the scope of work and is contingent upon the timely completion of the USGS model and strong cooperation of the YGSA and interested parties.

As shown in the schedule, data collection and review (Task 1) and development of the hydrogeologic conceptual model (Task 2) is expected to take approximately one year with expected completion in July 2019. Development of sustainability goal and management criteria (Task 3) will occur over the subsequent four-month period (August through November 2019) followed by the identification and evaluation of future projects and management actions (Task 4) over a seven-month period (December 2019 through June 2010). Preparation of an implementation plan for the GSP (Task 5) is scheduled for completion by December 2020.

It is anticipated that the administrative draft GSP would be prepared and submitted to the YGSA for review in April 2021. Comments received will be incorporated in the Draft GSP scheduled to be released to the public in June 2021. Comments received from the public will be incorporated into the Final GSP; the schedule allows for the subsequent required 90-day review period. Final adoption is anticipated in October 2021 with submittal to DWR in November 2021. This schedule provides a buffer of two months before the DWR deadline.

The thirteen TAC meetings identified in the GSP Work Plan are scheduled in relation to technical tasks to facilitate discussion of ideas and approaches for developing specific GSP sections and sharing of key findings and recommendations following the completion of technical analyses.

Project Cost Estimate

Table 2 shows the estimated "not-to-exceed" cost for the project by task. Hours are provided for all key team members, illustrating the emphasis on senior professionals for critical work tasks and use of more cost-effective staff for technical support.

Information redacted for evaluation purposes

Table 1. Project Schedule

Year	2018					2019											2020											2021											2022	
Month	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F
Notice-to-Proceed	♦																																								
Develop Groundwater Model (USGS)																																									
Calibrate Model for Historical Base Period																																									
Simulate Future Baseline Scenario																																									
Document Model and Release to Public												♦																													
Perform Field-Scale Infiltration Testing (TODD)																																									
Conduct Tests, Analyze, and Document Results				♦																																					
Task 1. Collect Data and Develop GSP Databases																																									
Collect Data, References, Interested Party Lists																																									
Review Data, Develop GIS/Spreadsheet Databases																																									
Task 2. Develop Basin Conceptual Model																																									
Document Plan Area, Land Use, Basin Physical Properties																																									
Evaluate Current and Historical Groundwater Conditions																																									
Evaluate Water Budget and Sustainable Yield																																									
Define Management Areas																																									
Task 3. Establish Sustainability Goals and Management Criteria																																										
Define Undesirable Results, Min. Thresholds, and Meas. Obj.																																										
Task 4. Identify and Evaluate Management Actions																																									
Identify Projects and Management Actions																																									
Evaluate Project Feasibility, Concept Design, and Costs																																									
Model Project Benefits/Optimization Assessment																																									
Task 5. Prepare Implementation Plan and Management Actions																																									
Develop GSP Admin/Operations/Reporting Plan																																									
Describe Existing/Planned Monitoring Network																																									
Develop Framework for Database Mngt. System																																									
Task 6. Prepare Draft and Final GSP																																									
Prepare Administrative Draft GSP																																									
GSA Review of Administrative Draft GSP																																									
Prepare Draft GSP																																									
Public Review of Draft GSP																																									
Prepare Final GSP																																									
Adoption Resolution (after 90-days)																																									
Submit Final GSP to DWR																																									
DWR Deadline for GSP Submittal (Jan. 31, 2022)																																								♦	
Task 7. Document GSA Governance and Interbasin Agreement																																									
Finalize GSA Governance / Interbasin Agreement																																									
Task 8. Develop/Implement Stakeholder/Public Outreach Plan																																									
Develop Outreach Plan / Maintain Interested Parties List																																									
Prepare GSP Outreach Materials (Website/Newsletters/Etc.)																																									
Implement Outreach Plan (Notification/Workshops/Interviews)																																									
Task 9. Technical Advisory Committee (TAC) Meetings																																									
Meeting 1 - GSP Kickoff					♦																																				
Meeting 2 - USGS Model Inputs							♦																																		
Meeting 3 - Historical Groundwater Levels								♦																																	
Meeting 4 - Historical Groundwater Quality									♦																																
Meeting 5 - Water Budget - Inflows										♦																															
Meeting 6 - Water Budget - Outflows											♦																														
Meeting 7 - Undesirable Results/Thresholds - Levels													♦																												
Meeting 8 - Undesirable Results/Thresholds - Quality														♦																											
Meeting 9 - Undesirable Results/Thresholds - Other															♦																										
Meeting 10 - Actions to Achieve Sustainability 1																		♦																							
Meeting 11 - Actions to Achieve Sustainability 2																						♦																		
Meeting 12 - Adminstrative Draft GSP																																	♦						
Meeting 13 - Draft GSP																																		♦						
Task 10. DWR Grant Administration																																									
Prepare Quarterly Invoices and Progress Reports		♦			♦			♦			♦				♦			♦			♦			♦			♦			♦			♦			♦			♦			♦	
Task 11. Project Management																																									
Project Budget Tracking and Invoicing																																									
Project Kick-Off Meeting	♦																																								
Coordination/Calls with YGSA Staff (12)																																									

Detailed project cost information has been removed for evaluation purposes.

Firm Profiles

Todd Groundwater specializes in the planning, development, management, and protection of groundwater and related surface water resources. Todd was founded in 1978 by Dr. David Keith Todd, who was the author of the widely used textbook, *Groundwater Hydrology*. We are an employee-owned and California-registered Small Business Enterprise. Our office is located in the City of Alameda, convenient to the Oakland Airport. Our contact information is provided below:

Edwin Lin, PG, CHG, Principal Hydrogeologist
Todd Groundwater
2490 Mariner Square Loop Suite 215
Alameda, CA 94501-1080
T: 510-747-6920 x104
F: 510-747-6921
www.toddgroundwater.com
elin@toddgroundwater.com

Our staff is composed of fourteen professionals and two administrative staff. We maintain a small, specialized team focused on groundwater services. Our professional staff members have advanced degrees in civil engineering, geology, hydrogeology, geochemistry, geography, and environmental sciences. All of our geologists and engineers are professionally registered, and most of our geologists are also certified hydrogeologists and engineering geologists. With an average staff tenure of 15 years, we provide our clients with reliable and consistent service from a cohesive team.

Over the past 40 years, Todd has provided the full spectrum of hydrogeological and groundwater management services to numerous private and public clients. Most of our work is conducted for California public agencies, particularly water agencies, cities, and counties. In fact, 96 percent of our work in 2017 was for state and local agencies, and half of our projects were based in Southern California. Our work for public agencies includes basin characterization, water supply assessment, groundwater exploration, well siting, design, and installation, wellfield optimization, water quality characterization and geochemistry, water supply planning, groundwater flow and water quality modeling, managed aquifer recharge, environmental impact evaluations, engineering evaluations and annual reporting, and development of Groundwater Sustainability Plans (GSPs) in compliance with the Sustainable Groundwater Management Act (SGMA). Because most of our work is for California agencies, we are well versed in the evolving water code and regulations that guide groundwater management. We also know that our work is for public agencies; hence we take particular care in providing documents and presentations that are accessible and useful to staff, stakeholders, and the public.

We are currently working for Valley District and its partners in the Yucaipa Valley to determine the infiltration capacity of vadose zone sediments underlying proposed recharge areas and are familiar with groundwater management issues in the basin.

Todd Groundwater has been committed to groundwater basin management for decades. Because of this work, we not only tracked but participated in development of the SGMA. Through membership of Todd principals on the Association of California Water Agencies (ACWA) Groundwater Committee, we've had the opportunity since before 2014 to engage regularly with California Department of Water Resources (DWR) personnel on regulation development. Moreover, Todd principals have helped advance understanding of SGMA through numerous invited presentations and panels on SGMA (see staff resumes). Most importantly, Todd Groundwater has been actively engaged in SGMA planning for water agencies, including completion of a successful GSP Alternative Plan for Zone 7 Water Agency; this work can be viewed as a "practice run" for the GSP process.

The summary table below presents groundwater management projects from 1994 up to the present. Because of our SGMA planning activities for other listed water agencies (including successful applications for grant funding), we soon will be engaged in preparation of multiple GSPs. This means that we will be able to provide Yucaipa GSA with up-to-date working knowledge and experience; this is crucial, given that SGMA is a new law and many agencies are exploring how to prepare GSPs and achieve sustainability.

Todd SGMA Support and Groundwater Management Experience

Project	Client	Applicability
GSP Preparation, 2018-	Cawelo Water District GSA	GSP preparation and coordination with other GSPs
SGMA Support, GSP, 2016-	San Benito County Water District GSA	GSA formation, GSP planning, boundary modification, grant application, GSP preparation
GSP Support, 2018-	Bedford-Coldwater Basin GSA	Data compilation for GSP preparation
SGMA Support, 2017	City of Paso Robles	GSP planning
GSP Preparation, 2016-	Kern River GSA	GSP planning and preparation
SGMA Support, GSP, 2017-	City of Modesto/ Stanislaus Tuolumne Rivers Groundwater Basin Association GSA	Planning for GSP preparation, application for SGMA Grant, GSP initiation
SGMA Support, GSP, 2017-	West Turlock Subbasin GSA	Application for SGMA Grant with GSP work plan, GSP preparation
SGMA Support, 2015-	City of Corona/Temescal Subbasin GSA	GSP planning, boundary modification, grant application
Alternative Plan Responses, 2017	Alameda County Water District	Preparation of responses to comments, SGMA Alternative Plan
Alternative Plan Preparation, 2016	Zone 7 Water Agency	Preparation of SGMA Alternative Plan
GWMP, 2015	City of East Palo Alto	Preparation of Groundwater Management Plan
GWMP Update, 2013	Kern Delta Water District	Preparation of Groundwater Management Plan
GWMP, 2012	Bighorn-Desert View Water Agency	Preparation of Groundwater Management Plan
GWMP, 2008	City of Corona	Preparation of Groundwater Management Plan
GWMP, 2007	Wheeler Ridge-Maricopa Water Storage District	Preparation of Groundwater Management Plan
GWMP Update, 2003	San Benito County Water District	Preparation of Groundwater Management Plan
GWMP, 2002	Madera County	Preparation of Groundwater Management Plan
GWMP, 1994	Scotts Valley Water District	Preparation of Groundwater Management Plan

FIRM PROFILE

CWE is a dynamic, award-winning civil engineering firm that provides civil engineering, water resources, stormwater management, environmental engineering, and construction management services to clients throughout the Western United States. Founded on the principles of producing the highest quality work products for projects that enhance and improve our communities and environment, CWE makes personalized connections with each client to serve their goals and objectives, instill trust, and fulfill our commitment to **creating a better tomorrow, TODAY.™**

In 2017, CWE ranked 34th on *Fortune* magazine's "Inner City 100," which recognizes the fastest-growing urban businesses in the nation. The Zweig Group similarly recognized CWE as both a 2017 "Hot Firm" and "Best Firms to Work For". While these Architect-Engineer (A/E) industry-specific awards reflect our steadily increasing client successes and commitment to maintaining a positive and supportive employee work environment, our clients reap the benefits of our broadening repertoire of high-quality professional services, continuing proactive communication, and timely delivery of cost-effective solutions and services.

We are a US Small Business Administration certified **8(a) firm** and Disadvantaged (**DBE**), Minority (**MBE**), and Small Business Enterprise (**SBE**) making our positive mark in the A/E industry.

Organization Structure	
Legal Name	CWE
Legal Entity	S Corporation
Owners of Firm	Vik Bapna (50%) and Jason Pereira (50%)
Date Established	January 1, 2006
Office Locations	Fullerton and San Diego, California Springville, Utah
Number of Employees	40
Service Lines	➢ Civil Engineering ➢ Stormwater and Watershed Management ➢ Water Resources ➢ Environmental Engineering ➢ Construction Management

MIG, Inc. is a multidisciplinary firm specializing in public outreach, inter-agency collaboration, facilitation, communications, and graphic design. Founded in 1982, MIG has worked extensively with public agencies and policy makers throughout California to effectively communicate complex issues to key stakeholders and the public, enabling them to actively participate in planning, design, and development processes and make informed decisions. For over 30 years, the firm has celebrated proven successes in involving community members and stakeholders, building consensus, and developing a base of support for project outcomes.

MIG specializes in bringing interests together and creating comprehensive plans that go beyond regulatory requirements and mitigation issues to identify solutions that benefit the surrounding and impacted communities. This benefits-oriented approach helps to foster projects that are widely supported and that are based on a firm foundation and knowledge of fiscal and operational realities. MIG's unique combination of land use planning and urban design expertise, coupled with their graphic design and communications capabilities provides support for an informed and comprehensive public outreach and education process.

With offices across the country, our key project staff are based in Pasadena, California and have considerable experience with southern California water management issues (see resumes). Please visit our website for more firm information - www.migcom.com.

Project Descriptions and References

Relevant Experience:

- Preparation of Groundwater Sustainability Plan
- Coordination with other GSAs and GSPs in a critically-overdrafted basin

Active Dates: Jan 2018-present

Budget: $484,000

Reference:

Mr. David Hampton
Assistant General Manager
Cawelo Water District
661.393.6072
dhampton@cawelowd.org

Key Staff:

Mike Maley, Phyllis Stanin, Iris Priestaf, Amber Ritchie

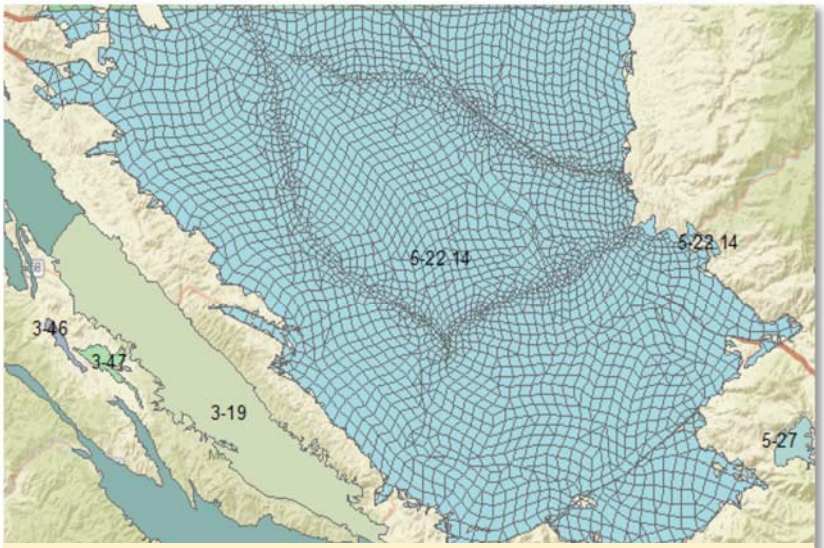
Groundwater Sustainability Plan
Cawelo Water District GSA, Kern County

The Cawelo Water District has formed a Groundwater Sustainability Agency (GSA) in the high-priority and critically-overdrafted Kern County Groundwater Subbasin. The Cawelo GSA is one of 18 members of the Kern Groundwater Authority (KGA), which is coordinating regional Groundwater Sustainability Plan (GSP) efforts for its members. Because the basin is critically overdrafted, local GSPs must be completed by 2020.

While collaborating with KGA, Cawelo GSA is building on its decades of active water management. This management includes development of a unique and diversified water portfolio including groundwater, imported water from the State Water Project, local surface water from Poso Creek, and produced water that is treated and delivered to CWD from nearby oil field operations. Cawelo has also developed a Groundwater Management Plan and Agricultural Water Management Plan, and has been active in the Irrigated Lands Regulatory Program.

Todd Groundwater is assisting the GSA in preparing a GSP that complies with GSP regulations, makes best use of existing local data and management programs, establishes meaningful sustainability criteria and management actions for Cawelo, and coordinates with other KGA members and adjacent GSAs. Recognizing the challenging deadline, Todd Groundwater is moving ahead with the GSP preparation and already has prepared draft GSP chapters documenting the GSA and describing the Plan Area; preparation of other chapters is underway. In addition, Todd Groundwater is moving ahead with numerical modeling, utilizing Todd Groundwater's regional contract to update the DWR's integrated California Central Valley Groundwater-Surface Water Simulation Model (C2VSim) for application to Kern Subbasin GSPs.

Mike Maley is Project Manager and Lead Groundwater Modeler and is supported by Phyllis Stanin (Principal in Charge), Iris Priestaf and Amber Ritchie (preparation of specific sections of the GSP).



C2VSim numerical computer model grid in Kern County Subbasin

TODD GROUNDWATER

Relevant Experience:

- Basin-wide, regulatory-driven management plan
- Comprehensive data review and hydrogeologic characterization
- Preparation of SNMP document
- Development of comprehensive groundwater monitoring program
- Stakeholder outreach

Active Dates: 2013-2015

Budget: $179,000

Reference:

Mr. Lance Eckhart
Director of Basin Management and Resource Planning
Mojave Water Agency
760.946.7015
leckhart@MojaveWater.org

Key Staff:

Edwin Lin, Phyllis Stanin

Salt and Nutrient Management Plan
Mojave Water Agency, San Bernardino County

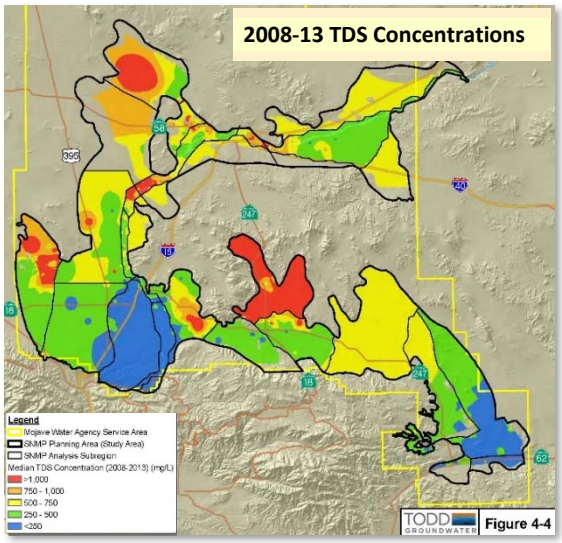
Mojave Water Agency (MWA) retained Todd Groundwater to prepare a Salt and Nutrient Management Plan (SNMP) for its service area, which overlies portions or all of 36 local groundwater basins and is governed in part by two completed adjudications. The MWA encompasses over 16,000 mi^2 of urban areas, rural communities, and farmland; sources of water supply include SWP water, local groundwater, and recycled water. The MWA service area also is governed by the two Regional Water Quality Control Boards.

Similar to the GSP process, the development of an SNMP is guided by State law (Recycled Water Policy), must satisfy detailed technical requirements, and is intended to be a local stakeholder-driven process. The Mojave SNMP required development of a conceptual hydrogeologic model and estimates of water budgets and salt and nutrient (S/N) loading analysis for 22 analysis subregions using a dynamic water quality mixing model incorporating existing USGS MODFLOW model outputs; an anti-degradation analysis; evaluation of future water quality conditions considering population growth, recycled water projects, and local implementation measures and plans; and development/documentation of a groundwater and surface water quality monitoring program.

To facilitate stakeholder engagement and public outreach, the Mojave SNMP was folded into the Mojave Water Agency Integrated Regional Water Management (IRWM) planning process. The stakeholder group included 58 water purveyors, several County agencies, 14 state/federal agencies, and over 30 local community interest groups. Separate public workshops and meetings with disadvantaged communities and tribes were held. Several workshops were held with Lahontan and Colorado Regional Board staff to discuss SNMP data collection efforts, analysis methodologies, findings, and the Regional Boards' approach to SNMP adoption.

The SNMP revealed that SWP recharge water improves and/or stabilizes groundwater quality with respect to S/Ns, and that planned recycled water projects would not exceed the available assimilative capacity in any local subregions. The existing monitoring program was deemed adequate to track constituents of concern relative to water quality objectives.

Phyllis Stanin served as Project Manager, and was supported by Edwin Lin, who led the hydrogeologic and groundwater quality characterization and S/N loading analysis, including the model assessment. Both Edwin Lin and Phyllis Stanin participated in the stakeholder outreach process.



TODD GROUNDWATER

Relevant Experience:

- SGMA planning
- Technical support for agency collaboration and GSA formation
- Preparation of Groundwater Sustainability Plan

Active Dates: 2016-present

Budget: $360,000

Reference:

Mr. Mark Mulkay
General Manager
Kern Delta Water District
661.834.4656
mulkay@kerndelta.org

Key Todd Staff:

Phyllis Stanin, Mike Maley, Iris Priestaf, and Chad Taylor

Groundwater Sustainability Plan
Kern River GSA, Kern County

The Kern River Groundwater Sustainability Agency (GSA) (KRGSA) was the one of the first GSAs to form in the high-priority Kern County Groundwater Subbasin (5-22.14), where more than 50 water and irrigation districts, municipalities, water storage districts, the County, other local agencies, and mutual water companies rely on the shared groundwater resources. The KRGSA was formed through a Memorandum of Understanding among Kern Delta Water District, the City of Bakersfield, and the Improvement District No. 4 of Kern County Water Agency. The proactive actions of the KRGSA have allowed the early formation of a governance structure and initial steps toward preparation of a Groundwater Sustainability Plan (GSP), which must be completed in early 2020. Todd Groundwater, the technical consultant for the KRGSA, is preparing the GSP.

Todd Groundwater's approach is to develop a technically-credible GSP guided by the GSP regulations, reliant on existing data and analyses to the extent practical, and based on locally-appropriate best management practices (BMPS) for groundwater management. Todd is building on existing management planning documents and foundational data sets and applying locally developed numerical models (the Kern Delta Water District Superposition Model) along with C2VSIM, the regional model of the California Central Valley developed by DWR. Todd Groundwater is preparing GSP chapters for submittal to the KRGSA, including documentation the GSA, Plan Area, basin setting, and definition of minimum thresholds and measurable objectives. Management actions and projects are being defined within the context of overall conjunctive use of surface water and groundwater, and adaptive management. Todd Groundwater is also supporting GSP stakeholder collaboration and public outreach efforts through preparation of technical fact sheets for public distribution and agenda items for GSA meetings.

Phyllis Stanin serves as the Project Manager and is supported by Mike Maley (lead groundwater flow modeler) and Iris Priestaf (technical oversight and specific GSP chapter development) and Chad Taylor (hydrogeologic conceptual model and monitoring plan GSP chapter development).

Relevant Experience:

- Hydrogeologic conceptual model for two management subareas
- Evaluation of hydrogeologic data for 8,000+ study area wells
- Analysis of surface water-groundwater interaction
- Development of subarea-wide water budgets covering 80 years
- Application of regional USGS groundwater flow model
- Evaluation of existing recharge operations using SWP water

Active Dates: 2010-2013

Budget: $435,000

Reference:

Mr. Lance Eckhart
Director of Basin Management and Resource Planning
Mojave Water Agency
760.946.7015
leckhart@MojaveWater.org

Key Staff:

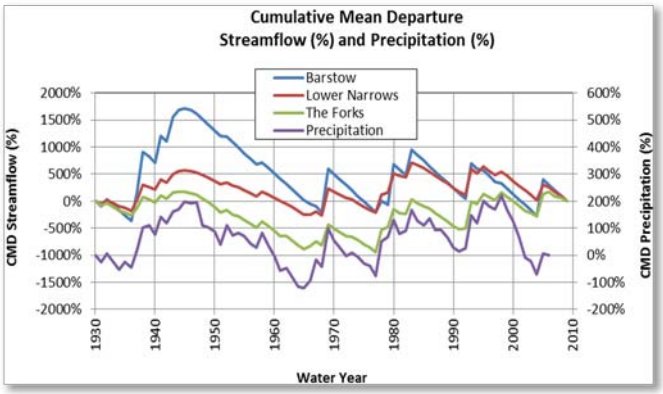
Edwin Lin, Phyllis Stanin

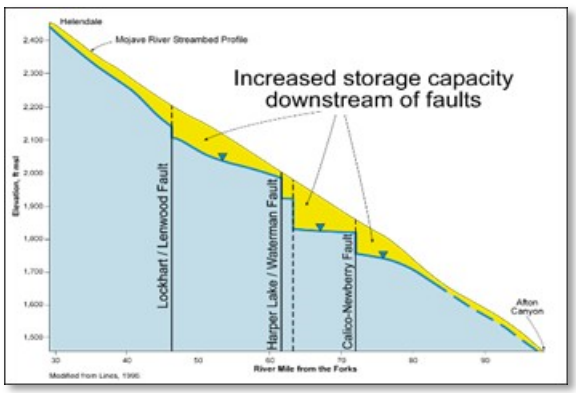
Basin Conceptual Model for Centro and Baja Management Subareas, Mojave River Groundwater Basin, Mojave Water Agency, San Bernardino County

Mojave Water Agency (MWA) is responsible for managing the adjudicated Mojave River Groundwater Basin. Since the 1950s, groundwater levels in the basin have declined due to historical overproduction. Although a physical solution was developed in 1995, water level declines have continued in downgradient portions of the basin, where groundwater use exceeds the natural supply. In 2010, MWA selected Todd Groundwater to develop a basin conceptual model of the Centro and Baja management subareas, which represents the lower Mojave River Basin region. These two subareas cover over 2,500 mi^2 and include the cities of Barstow, Lenwood, and Newberry Springs and communities such as Hinkley.

The project involved the synthesis of documents and data compiled over more than 80 years. Data sets included over 10,000 water level measurements, 75,000 water quality records, 150,000 streamflow measurements, production records for more than 250 wells, and 8,000 lithologic logs. Detailed geologic cross sections, aquifer parameter estimation, streamflow and water level trend analyses, water quality source diagramming, and subarea water budgets were completed and documented in a final project report. Meetings with Subarea Advisory Groups were held to ensure key issues were addressed. Water budgets from the regional USGS Mojave River Basin model were compare with independent analyses. The study has provided MWA with the technical foundation needed to manage these subareas within the context of the physical solution identified in the Mojave Basin Area Adjudication.

Phyllis Stanin was the Project Manager with Edwin Lin as Lead Hydrogeologist.





TODD GROUNDWATER

Relevant Experience:

- SGMA technical support
- Groundwater basin boundary modification
- Successful grant application and assistance with grant contracting

Active Dates: 2016-present

Budget: $68,000

Reference:

Mr. Jonathan Daly, General Manager
Department of Water and Power
City of Corona
951.736.2467
jonathan.daly@ci.corona.ca.us

Key Todd Staff:

Phyllis Stanin**,** Chad Taylor, and Iris Priestaf

Sustainable Groundwater Management
City of Corona / Temescal GSA, Riverside County

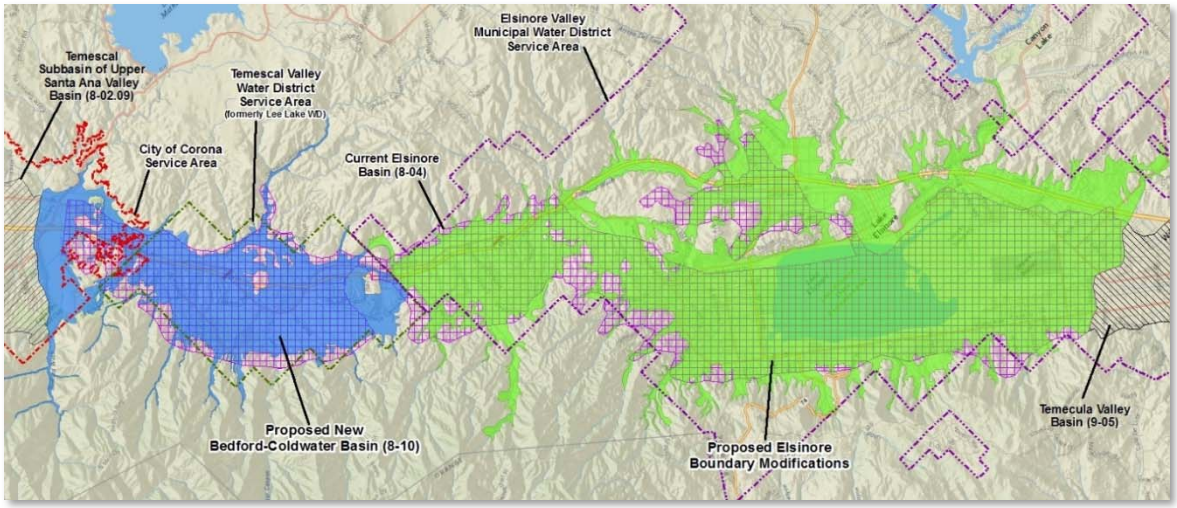
The City of Corona relies on local groundwater for about half of its total water supply. To more actively manage this limited resource, the City retained Todd Groundwater to prepare a Groundwater Management Plan (GWMP) which was adopted in 2008 and has served to guide groundwater exploration, recharge investigations, salt loading studies, and numerical modeling.

Todd Groundwater is currently assisting the City with SGMA planning for the Temescal Groundwater Basin. This assistance included initial review of jurisdictions and existing groundwater management activities in light of DWR-defined basin boundaries.

A specific effort was successful development of an application to DWR to modify the boundaries of the Temescal Basin and adjoining Elsinore Basin; this was a collaborative effort by the City, Elsinore Valley Municipal Water District (EVMWD), and Temescal Valley Water District (TVWD). The modification involved delineation of the southern Temescal boundary, partition of the northernmost Elsinore Basin—creating a new Bedford-Coldwater Basin—and improved alignment of basin boundaries with alluvium. Justification of the boundary changes was based on scientific evidence and explanation of how the modifications would enhance local management. Todd Groundwater organized and synthesized substantial information and assisted with submittal of the application, which was approved by DWR.

The City of Corona, City of Norco, and Home Gardens County Water District have formed a GSA for the Temescal Basin and are coordinating to prepare a GSP before 2022. Todd Groundwater assisted the Temescal GSA with preparation of a successful Sustainable Groundwater Planning grant application. Todd Groundwater also has assisted in tracking and reviewing SGMA activities in adjacent groundwater basins that potentially could affect the City. This has included analysis of suggested basin boundary revisions and review of an Alternative Plan (prepared by Orange County Water District).

Phyllis Stanin is the Project Manager leading the project; Chad Tayler is the Project Hydrogeologist mapping GSA boundaries, describing the managed area, and identifying stakeholder; and Iris Priestaf is providing overall technical review.



TODD GROUNDWATER

Relevant Experience:

- Characterized groundwater level and water quality conditions
- Evaluated infiltration test results and assessed recharge capacities
- Prepared conceptual recharge facility design and engineering cost estimates
- Constructed MODFLOW/MT3D model, simulated future recharge and recovery operations, and assessed groundwater flow and quality changes

Active Dates: Mar 2016 – Dec 2016

Budget: $168,000

Reference:

Mr. Steve Bigley
Director of Environmental Services
Coachella Valley Water District
760.398.2651
sbigley@cvwd.org

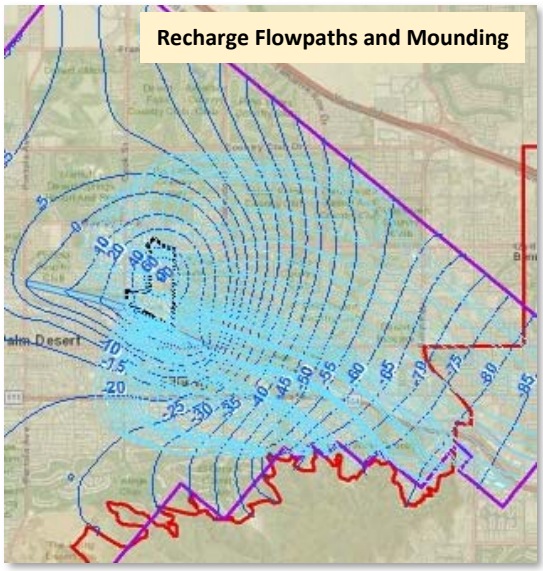
Key Todd Staff:

Edwin Lin, Amber Ritchie

Palm Desert Aquifer Recharge Facility Study, Coachella Valley Water District (CVWD), Riverside County

CVWD is responsible for management of groundwater resources across the Coachella Valley Groundwater Basin. Todd Groundwater was retained to assist CVWD in evaluating the feasibility of recharging up to 40,000 acre-feet per year (AFY) of Colorado River Water (CRW) at its Palm Desert property and in the adjacent Whitewater River Storm Channel. The purpose is to help mitigate historical groundwater level declines and improve groundwater quality primarily within the West Whitewater River Subbasin Area of Benefit, equivalent to a SGMA-defined management area.

Todd Groundwater designed and completed the recharge feasibility study that included (1) construction of a local MODFLOW/MT3D groundwater flow and solute transport model to predict future dynamic water level and water quality impacts from CRW recharge (2) development of concept recharge facility designs and cost analyses (by project teaming partner, CWE), and (3) evaluation of regulatory permitting requirements for re-purposing secondary effluent discharge basins as recharge basins at the CVWD Water Reclamation Plant (WRP) 10 facility and construction of silt berms in the Whitewater River Stormwater Channel. Results of the study indicated that the proposed project can accommodate the recharge goal. Recharge will provide long-term water level and water quality benefits for nitrate and chromium. CVWD has completed final designs and an EIR for a 25,000-AFY project. Todd Groundwater is assisting CVWD under separate a contract to satisfy revised Waste Discharge Requirement (WDRs) for the WRP 10 facility. Edwin Lin served as Project Manager. Amber Ritchie managed GIS and water databases and developed detailed cross sections to support groundwater modeling.



TODD GROUNDWATER

Relevant Experience

- Developing diversion systems for recharge facilities
- Design development for improved efficiency in operation and maintenance of off-channel basin diversion system
- Local experience with drainage modification design, permitting, and cost estimation

Active Dates: 2015 - 2017

Budget: $400,000

Reference:

Mr. Daniel B. Cozad
General Manager
San Bernardino Valley Water Conservation District
909.793.2503
dcozad@sbvwcd.dst.ca.us

Key CWE Staff:

Ben Willardson

Debris Management Improvement and Design for Mill Creek Diversion, San Bernardino Valley Water Conservation District, San Bernardino County

CWE developed design plans for a modified diversion system that redirects debris and sediment while allowing flows to be routed to the existing spreading grounds. The project involved hydraulic modeling; Plans, Specifications, and Estimates (PS&Es) development; and permitting support for the development of an improved water diversion system for the Mill Creek Spreading Grounds to reduce and prevent debris from accumulating at the diversion gate. Tasks included: developing project concepts, schematic design drawings, and preliminary cost estimates for three alternative concepts; evaluating the performance and maintenance characteristics of the conceptual alternatives; determining the most cost-effective and maintainable design for the diversion system; analyzing existing conditions for flow depths, velocities, debris accumulation, and long-term channel sedimentation trends; calculating the hydrostatic, hydrodynamic, and debris impact loads for the 5-, 10-, 25-, 50-, and 100-year storms; and identifying required permits.

CWE

Relevant Experience

- Development of off-stream recharge basin modification concepts
- Development of in-channel basin concepts
- Estimation of capital and O&M costs

Active Dates: Jun 2016 – Dec 2016

Budget: $23,998

Reference:

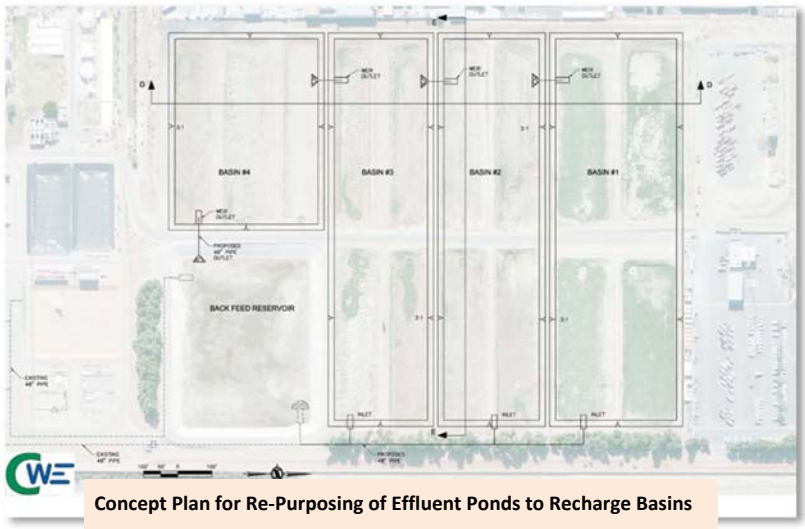
Mr. Edwin Lin
Principal Hydrogeologist
Todd Groundwater
510.747.6920 x104
elin@toddgroundwater.com

Key CWE Staff:

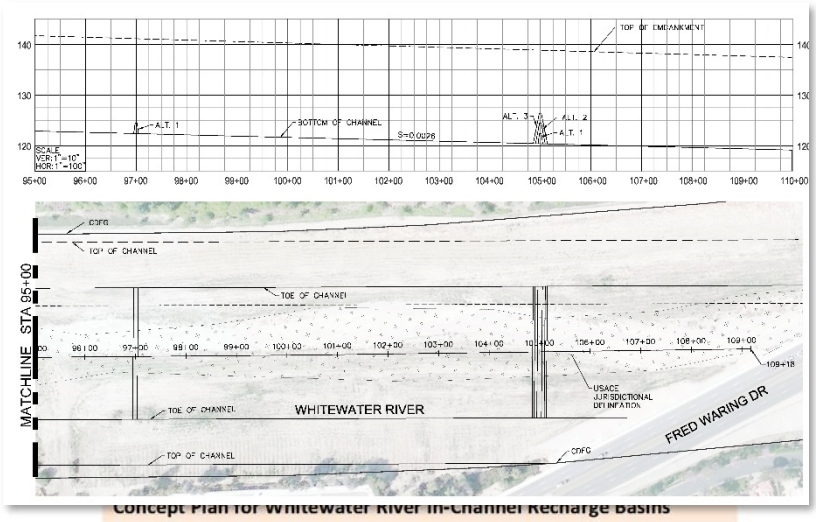
Ben Willardson

Palm Desert Aquifer Recharge Facility Study, Coachella Valley Water District (CVWD), Riverside County

CWE evaluated recharge on the Whitewater River for the Coachella Valley Water District (CVWD). The study evaluated the feasibility of recharging Colorado River water (CRW) in the Palm Desert area in a 2 mile reach of the Whitewater River storm channel that crosses through the Palm Springs/Palm Desert area. The river reach is a 300-foot wide channel with sloped, concrete-lined banks with a soil cover and a natural bottom. We worked with Todd Groundwater to evaluate several concepts that included river and offline basin recharge facilities to spread stormwater and CRW. Tasks included review or existing facility design, operations, and maintenance; evaluation of multiple concepts which included development of concept design drawings, cost estimation, and evaluation based on criteria such as capital cost, operation and maintenance costs, and water recharge capacities, and preparation of a basis of design report for CVWD.



Concept Plan for Re-Purposing of Effluent Ponds to Recharge Basins



Concept Plan for Whitewater River In-Channel Recharge Basins

CWE

Relevant Experience:

- Multi-agency coordination
- Public and stakeholder information
- Consensus-building among numerous constituents

Active Dates: 2007-2008

Budget: $1,200,000

Reference:

Mr. Jeff Ford
(formerly) Principal Water Resources Planner, Castaic Lake Water Agency
(currently) Senior Scientist, Kennedy/Jenks Consultants
661.297-1600 x281
jeffford@kennedyjenks.com

Key MIG Staff:

Mark Sillings

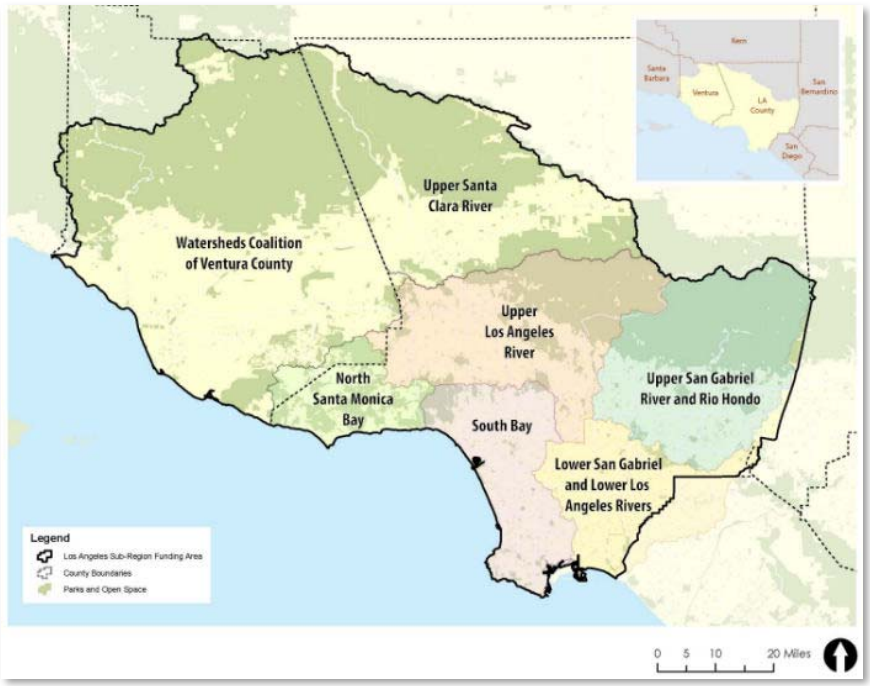
Upper Santa Clara River TMDL and IRWMP / Los Angeles County Water Quality Control Board, Los Angeles County

The Los Angeles Regional Water Quality Control Board (Regional Board) and the Sanitation Districts of Los Angeles County (Sanitation Districts) jointly developed and performed a number of technical studies required by the Upper Santa Clara River Chloride Total Maximum Daily Load (TMDL).

MIG was selected to assist with the development and facilitation of a collaborative process and communication materials to implement the Chloride TMDL in the Upper Santa Clara River. The goal of the project was to ensure that, by the end of the process, there was substantial agreement by Regional Board staff, Sanitation Districts' staff, and other major stakeholders that there was sufficient and credible scientific and technical information upon which to base decisions about standards and the Implementation Plan for the Upper Santa Clara River.

MIG designed and facilitated the collaborative process, and developed a website, http://santaclarariver.org, to provide a vehicle for the exchange of information. The website allowed all stakeholders involved in the process to share documents, schedule meetings, study research information, and review project deliverables.

MIG also facilitated the stakeholder process that produced an approved Integrated Water Management Plan (IRWMP) for the Upper Santa Clara River. MIG worked with the technical team and Regional Water Management Group to identify key issues for stakeholder discussion and to ensure broad participation and collaborative project proposals. The plan was adopted by all participating agencies in Summer 2008.



MIG

Relevant Experience

- Public workshops
- Identified community needs and concerns regarding water resources

Active Dates: 2013-2014

Budget: $106,995

Reference:

Ms. Yvonne Hester
Director of Community Outreach and Cultural Relations
Mojave Water Agency
760.946.7067
yhester@mojavewater.org

Key MIG Staff:

Mark Sillings and Esmeralda Garcia

Mojave Integrated Regional Water Management Plan Update, Mojave Water Agency, San Bernardino County

Working closely with the Mojave Water Agency (MWA), as a subconsultant to Kennedy/Jenks Consultants, to update the Mojave Region's IRWM Plan, MIG led the public outreach component of the planning process. This process was a collaborative, stakeholder driven effort to manage all aspects of water resources and to develop a vision for at least a decade of water management in the Mojave Region.

A series of seven public workshops were held throughout the Mojave Region to engage community members in the planning process and identify their community-specific concerns and needs relating to water resources. Four of the public workshops were intended for any and all members of the public and three additional meetings were geared specifically for residents of disadvantaged communities. Since the intent of the outreach effort was to identify the water-related challenges and opportunities of the Mojave Region at the community level, both the general public workshops and the disadvantaged community meetings were designed to provide the same information and have similar formats. A benefit to making the meetings similar was that it allowed flexibility for people to attend a meeting at the most convenient time and location and so ensure that there were no gaps in the information provided across the region. All the workshops were publicized on the project website, with flyers posted in public areas, distributed via U.S. mail, and advertised in local newspapers. Despite the geographic size of the region, most of the meetings were well attended.

All workshops and meetings had an interactive format consisting of a brief information presentation followed by prompted dialogue between project team members and participating community members. Workshop attendees were then gathered into smaller groups for discussion sessions. Five common areas of concern emerged during the small group discussion sessions of all the workshops:

- Rising cost of water
- Declining water quality
- Limited water resources
- Limited funding resources to address water-related needs
- Need for regional collaboration to carry-out projects

Information gathered through these workshops was subsequently used to help design IRWM Plan objectives, projects and programs, which took shape in a series of nine stakeholder meetings held at MWA headquarters over an 18-month period. MIG also provided support and documentation for these meetings. The planning process was successful with the Final 2014 Mojave IRWM Plan being adopted by all stakeholders during their final meeting together in June 2014.

MIG

Relevant Experience

- Stakeholder outreach process
- Facilitated regional subgroups to develop plan
- Communities meetings and additional outreach

Active Dates: 2008

Budget: $108,000

Reference:

Mr. Lloyd Fryer
Administrative Manager
Kern County Water Agency
661.634.1446
lfryer@kcwa.com

Key MIG Staff:

Mark Sillings

Kern County IRWMP / Kern County Water Agency, Kern County, California

Working closely with technical consultants and the Kern County Water Agency, MIG managed the stakeholder process for developing the Tulare Lake Basin Portion of the Kern County Integrated Regional Water Management Plan (Kern IRWMP). The Kern IRWMP is a collaboration of water suppliers, community and government representatives, environmental groups, businesses and a variety of other interested parties which seeks to preserve the economic and environmental health of Kern County communities through comprehensive and efficient management of its water resources. The Kern IRWMP balances the needs of local economies, which are highly dependent on agriculture, with the needs of growing communities within the Greater Bakersfield area.

MIG helped to manage and facilitate activities with 8 sub-regional groups to develop a plan which represented the multiple objectives and needs of the region. MIG helped the group to stay focused and achieved the project timetable. MIG also provided additional assistance to ensure that the needs of environmental justice interests within the watershed were represented. MIG assisted with a community meeting and conducted interviews and outreach to ensure that diverse interests were aware of and engaged in the planning process.

MIG

Relevant Experience

- Multi-agency coordination
- Strategic communications and outreach
- Consensus-building among numerous constituents

Active Dates: 2012-2013

Budget: $900,000

Reference:

Mr. Mark Pestrella, Director
Los Angeles County Dept. of Public Works
626.458.4001
mpestrella@dpw.lacounty.gov

Key MIG Staff:

Mark Sillings and Esmeralda Garcia

Water Quality Storm Drainage Fee / Los Angeles County Department of Public Works, Los Angeles County, California

MIG worked with the County on a multi-billion-dollar countywide storm drainage user fee to improve water quality in rivers, lakes and coastal waters. The MIG Team helped bring 85 cities and a multitude of stakeholders to agreement on the fee level, how revenue would be allocated, governance, local return and priority projects.

The strategy included Advisory Working Committees with city managers and county representatives, as well as with environmental groups. Overlaying the Advisory Committees is the Community Task Force, which consists of elected mayors and councilmembers; executive directors of business, building/development, taxpayer groups and environmental organizations. The emphasis of the initiative is to develop multi-objective solutions by incorporating natural filtration and groundwater recharge, parks and green infrastructure, open space, riparian and aquatic habitat restoration and economic development opportunities.

The team conducted focus groups and polling to develop ballot language and project priorities. Although the Board of Supervisors put a hold on the project, the effort laid the groundwork for ongoing discussions and work toward an eventual funding measure.

MIG

Resumes

Edwin H. Lin, PG, CHG

Principal Hydrogeologist

EDUCATION

MS, Groundwater Hydrology, Flinders University (Australia), 2006
BS, Geological and Environmental Sciences, Stanford University, 1998

REGISTRATIONS

Professional Geologist California, No. 8312
Certified Hydrogeologist California, No. 907

PROFESSIONAL SUMMARY

Mr. Lin has 20 years of experience in groundwater basin management, including managed aquifer recharge (MAR) evaluations, hydrogeologic conceptual model development, and water supply and demand analysis. Mr. Lin has published papers on well clogging mechanisms and pre-treatment options for Aquifer Storage and Recovery (ASR) in cooperation with the Australian Commonwealth Scientific and Industrial Research Organisation. Mr. Lin has also been responsible for the design and construction of municipal water supply and monitoring wells using a variety of drilling methods, and analysis of aquifer pumping tests. He is skilled in Geographical Information Systems (GIS), database development, geochemical analyses, and application of advanced environmental statistics. A few recent projects are described below demonstrating Mr. Lin's expertise with emphasis on MAR projects.

Mojave Salt and Nutrient Management Plan, Mojave Water Agency

As project hydrogeologist, Mr. Lin developed a Salt and Nutrient Management Plan (SNMP) for the Mojave Region Integrated Regional Water Management (IRWM) plan area, which includes 36 groundwater basins covering a 16,000-mi^2 area. His responsibilities included compiling and managing an extensive data set including data from more than 1,000 monitoring and production wells, characterizing total dissolved solids and nitrate distribution, and documented current and potential salt and nutrient (S/N) loading sources. Mr. Lin completed an assimilative capacity analysis that involved the evaluation of S/N loading sources for 22 analysis subregions using a dynamic water quality mixing model combining existing USGS MODFLOW model outputs with S/N estimates. He also was responsible for an anti-degradation analysis, development of a monitoring and reporting plan, and preparation of the SNMP. The SNMP process was folded into the MWA IRWM process, and as such, Mr. Lin was responsible for communicating project status and key findings at IRWM technical advisory committee (TAC) meetings, and also coordinated with two Regional Water Quality Control Boards (RWCBs) to ensure plan compliance. The SNMP revealed that recharge of State Water Project water improves and/or stabilizes groundwater quality with respect to S/Ns, and

that planned recycled water projects would not exceed the available assimilative capacity in any local subregions.

San Bernardino Valley Municipal Water District (Valley District) Yucaipa Infiltration Testing
Valley District and its partner agencies and water retailers are preparing to manage its groundwater resources conjunctively with SWP water, and increase basin recharge with enhanced natural storm runoff and recycled water to meet future demands while maintaining independence during periods of water shortages. Todd Groundwater developed a Work Plan to determine the infiltration capacity of vadose zone sediments underlying the proposed recharge areas. The infiltration testing is currently being planned and conducted by Todd Groundwater. Estimated infiltration rates will be combined with other hydrogeologic information (e.g., subsurface stratigraphy, fault mapping, groundwater levels, and water quality data) to prioritize potential sites, estimate long-term groundwater banking potential, and support preliminary design of recharge facilities. Additionally, infiltration rates will be used to evaluate the impacts (benefits) of various MAR projects scenarios on groundwater storage and basin perennial yield (using the basin-wide USGS MODFLOW model) and estimate subsurface recharge flowpaths to assess groundwater quality changes and recovery efficiency.

Groundwater Basin Conceptual Models for Baja and Centro Subareas of Mojave River Basin, Mojave Water Agency
As project hydrogeologist, Mr. Lin developed basin conceptual models and evaluated water supply and demand conditions for Mojave Water Agency of the Centro and Baja subareas, two subareas comprising over 2,000 acres in the lower portion of the adjudicated Mojave River Groundwater Basin. He synthesized findings from historical studies dating back to the early 1900s with analyses of new geologic, groundwater level and water quality data into one comprehensive document, which will be used to support future groundwater management planning, including MAR of imported SWP water. Project responsibilities included characterization of basin geometry, aquifer properties, impacts of hydraulic (fault) barriers on groundwater flow; groundwater water level trend analysis; evaluation of impacts of local and regional pumping and dam construction on surface water flows and downstream recharge along the Mojave River; development of independent basin subarea water balances; MODFLOW model water budget extraction and review; groundwater quality characterization; and water demand forecasting.

Managed Aquifer Recharge Feasibility Studies for Mid-Valley and CVWD Palm Desert Areas, and Groundwater Replenishment Expansion Evaluation of the Thomas E. Levy (TEL) Facility, Coachella Valley Water District (CVWD)
As project manager/lead hydrogeologist for three independent CVWD managed aquifer recharge feasibility studies, Mr. Lin reviewed CVWD's domestic pumping and recharge operations to assess the feasibility of expanding groundwater replenishment through surface spreading of Colorado River water in the West and East Whitewater River Subbasin Areas of Benefit. He obtained pertinent data to characterize lithologic, groundwater production, groundwater level, and water quality conditions across 60 square miles of CVWD's service area. Mr. Lin oversaw the construction of three local-scale MODFLOW/MT3D groundwater flow and solute transport models used to simulate future groundwater level and water quality impacts from proposed recharge. Results indicated that desired recharge amounts could be

accommodated in the Mid Valley and Palm Desert and provide long-term water level and water quality benefits for nitrate and chromium-6. CVWD is currently moving forward with environmental planning and final facility design at the Palm Desert site. Results of the TEL study indicated that future CVWD recharge, pumping and drain operations could be optimized to maximize groundwater storage, recovery effectiveness, and water quality.

Managed Aquifer Recharge Feasibility Study, Western Alto Subarea, Upper Mojave River Basin, Mojave Water Agency (MWA)

MWA is evaluating the feasibility of recharging SWP water in off-river surface spreading basins within the western Alto Subarea of the Upper Mojave River Groundwater Basin (Basin). A successful MAR project in the region would increase MWA's capacity to store and recover SWP water and provide future long-term replenishment of the Regional Aquifer. Since 2016, Todd Groundwater has been assisting MWA with field investigations to characterize the subsurface stratigraphy and infiltration potential of the vadose zone, which extends down to 550 feet below ground surface. As project manager, Mr. Lin designed and supervised the first phase of field investigations, which included regional surface geophysical surveys and field-scale infiltration testing complemented by borehole infiltration tests. Infiltration tests were conducted at three sites by MWA staff under direction of Todd Groundwater, with test basin geometries ranging from approximately 600 to 1,800 ft^2. Tests were conducted from 15 to 21 days. Results indicated that near-surface soils at all three sites are relatively permeable and generally suitable for recharge through surface spreading basins. Average vertical infiltration rates were 1.6, 4.3, and 11.1 ft/day for the three sites. The project is proceeding to the second phase of investigation with drilling, installation, and groundwater quality sampling of two sonic-drilled monitoring wells, evaluation of geochemical (leaching) properties of selected vadose zone sediments, and borehole instrumentation to track the vadose zone wetting front during future pilot-scale infiltration tests.

Pure Water Monterey Phase 1 and 2 Injection Well Facilities Design and Construction, Monterey One Water

The Monterey Peninsula Pure Water Monterey (PWM) Project involves the recharge of 3,500 acre-feet per year of advanced treated recycled water into the Seaside Groundwater Basin. Todd Groundwater has completed detailed hydrogeologic assessments over several years with emphasis on the evaluation of target aquifers, recharge methods, and injection and recovery sites. Mr. Lin serves as manager of the project's field programs, which to-date has included the installation of the project's first deep injection well and initial monitoring wells. Field activities have included sediment core analysis for hydraulic and geochemical assessment, geochemical assessment of recycled water and groundwater compatibility, and regional groundwater quality monitoring. Mr. Lin has evaluated recharge impacts to satisfy project EIR requirements, prepared 60%, 90%, and 100% design submittals of well drawings and technical specifications for two phases of construction (including the installation, development, equipping, and performance testing of two deep injection wells, a vadose zone injection well, and seven monitoring well clusters), and is managing and coordinating the drilling and installation of all deep injection, vadose zone, and monitoring wells. Additionally, Mr. Lin is working with project water reclamation to establish water treatment goals and civil engineers to ensure conveyance pipelines can accommodate peak recycled water deliveries to injection well facilities.

Recharge Site Characterization for Recharge Feasibility, Western Municipal Water District
As project hydrogeologist, Mr. Lin designed and supervised a hydrogeologic field investigation to characterize the suitability of five separate sites in the Arlington Basin for managed aquifer recharge of surface reservoir water. Subsurface characterization methods included Cone Penetration Testing (CPT), hollow-stem auger drilling, double-ring infiltrometer tests, and lab analyses for hydraulic and geotechnical properties. Mr. Lin performed analytical mounding analyses to estimate the recharge potential of each site. Investigation results, including geotechnical analyses performed by subcontractor Ninyo & Moore, indicated that an enhanced recharge project at each of the five sites was feasible. Sites were ranked according to the most favorable hydrogeologic conditions for recharge and conceptual designs were developed for one site.

Groundwater Basin Conceptual Models, Feasibility Study, and Groundwater Management Plan, Mojave Water Agency (MWA) and Bighorn-Desert View Water Agency
As project hydrogeologist, Mr. Lin developed basin conceptual models and evaluated water supply and demand conditions to evaluate the feasibility of MAR with SWP water in three High Desert basins. As part of the study, Mr. Lin helped design a geophysical surveying program to confirm vadose zone lithology and fault locations. Findings indicated a MAR project would benefit communities in the Ames Valley basin. Mr. Lin assisted MWA and the local water agency in preparing environmental review documents and implementing a feasibility study to characterize the preferred MAR site. A feasibility study was completed, involving the drilling and installation of monitoring wells, aquifer testing, water quality analysis, and core analysis of vadose zone samples to evaluate the infiltration potential of the target recharge location. Mr. Lin helped to construct a MODFLOW groundwater flow model used to predict groundwater mounding and recharge flowpaths. The model demonstrated the feasibility of enhanced recharge and identified downgradient wells that would intercept and benefit from enhanced recharge. Mr. Lin also assisted with modifying a multi-agency pumping agreement and basin groundwater management plan, forming the basis for sustainable groundwater management of the basin.

SELECTED RECENT PUBLICATIONS AND PRESENTATIONS

Regional Water Quality Changes from Recycled Water Recharge. Groundwater Resources Association 1st Symposium in Series on Groundwater Management "Managed Aquifer Recharge in the Urban Environment: Technical and Policy Challenges", Burlingame, CA, May 2013.

Storing water in California desert basins: selection of managed aquifer recharge sites in the Ames Valley Groundwater Basin (San Bernardino County, CA). with P. Stanin, A. Garcia, and L. Eckhart., Groundwater Resources Association, 3rd symposium in the groundwater resource series: "Increasing groundwater storage to meet California's future demand: challenges and solutions", Long Beach, CA, June 2007.

Evaluation of Roughing Filtration for Pre-treatment of Stormwater prior to Aquifer Storage & Recovery (ASR). with D. Page, P. Pavelic, P. Dillon, and J. Hutson Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO) Land & Water Science Report March 2006.

Phyllis Stanin, PG, CEG, CHG

Vice President and Principal Geologist

EDUCATION

MS, Environmental Management, University of San Francisco, 1999
BS, Geology, University of North Carolina, 1978

REGISTRATIONS

Professional Geologist California, No. 5311
Certified Engineering Geologist California, No. 1899
Certified Hydrogeologist California, No. 482
Registered Geologist Arizona, No. 45605

PROFESSIONAL SUMMARY

Phyllis Stanin has been a professional geologist for more than 35 years with expertise in hydrogeology and groundwater basin management, and a particular emphasis on managed aquifer recharge (MAR) and conjunctive use. She also has experience with groundwater resource development including production and injection wells, geophysical applications, aquifer testing, and monitoring. She has conducted numerous regional hydrogeologic assessments using advanced analytical and numerical modeling tools. Her expertise also includes fate and transport of contaminants in groundwater including constituents of emerging concern. She has performed geologic investigations in seven states across the U.S. and conducted independent research on impacts to groundwater flow from geologic faults. Groundwater projects demonstrating the variety of her experience are described below.

Groundwater Sustainability Plan (GSP) and Subbasin Modeling, Kern River Groundwater Sustainability Agency (GSA)

Ms. Stanin is project manager for preparation of the GSP for the Kern River GSA, one of the first in the high-priority Kern County Subbasin. In this role, Ms. Stanin is leading the hydrogeologic conceptual model; analysis of groundwater conditions; historical, current, and projected water budgets; sustainability criteria development, project analyses and modeling, and implementation of the plan. Todd Groundwater is also leading the effort to develop a subbasin-wide groundwater model to provide coordinated subbasin water budgets as required by GSP regulations. The Kern Groundwater Authority and other GSAs in the subbasin are participating in this effort by providing Todd Groundwater with water budget data for model revisions.

Groundwater Sustainability Plan, Cawelo Water District GSA

Todd Groundwater currently is assisting the Cawelo GSA with preparation of their GSP. Ms. Stanin is the principal in charge, providing technical oversight and direction for the project.

Groundwater Basin Conceptual Model, Baja and Centro Subareas, Mojave River Groundwater Basin, Mojave Water Agency, San Bernardino County, California

Ms. Stanin was project manager for a multi-year study of two subareas comprising over 2,000 acres in the lower portion of the adjudicated Mojave River Groundwater Basin. The project synthesized findings from historical studies dating back to early 1900s with analyses of new geologic, groundwater level and water quality data into one comprehensive document. This document has been used to support future groundwater management planning, including MAR of imported SWP water. The project included conceptual and numerical groundwater flow model development and review; characterization of basin geometry, aquifer properties, impacts of hydraulic (fault) barriers on groundwater flow, groundwater water level trend analysis, evaluation of impacts of local and regional pumping and dam construction on surface water flows and downstream recharge along Mojave River; transient basin subarea water balance development; MODFLOW model water budget extraction and review; groundwater quality characterization; and water demand forecasting.

Sustainable Groundwater Management Act (SGMA) Alternative Plan, Zone 7 Water Agency

Zone 7 Water Agency has been actively managing the Livermore Valley Groundwater Basin for decades and is the exclusive GSA for the basin. Given its successful management, Zone 7 prepared an Alternative Plan, which was functionally equivalent to a GSP. Ms. Stanin, as project manager, assisted Zone 7 staff with an overall approach to Alternative Plan preparation, reviewed numerous documents for integration into the Plan, and wrote substantial sections, including refinement of thresholds and definition of undesirable results consistent with GSP regulations.

Technical Support for SGMA, City of Corona, Elsinore Valley Municipal Water District (EVMWD), and Temescal Valley Water District (TVWD), Riverside County, California

Ms. Stanin has had the opportunity to assist the City of Corona with numerous issues related to new regulations under SGMA including technical support for GSA formation for the three groundwater basins within the City's water service area. She has also prepared resolutions and outreach material to support the GSA process. From January through March 2016, she led a successful basin boundary modification for the City, EVMWD, and TVWD using scientific and jurisdictional rationale for the creation of a new Bedford-Coldwater Subbasin to facilitate SGMA activities. She has also reviewed basin boundary modification requests by agencies in adjacent subbasins and assessed potential impacts of those requests on future GSPs. Currently, she is providing technical support and review of a GSP Alternative Plan being prepared by Orange County Water District in a portion of the Corona service area that overlaps the Orange County Groundwater Basin.

Mojave Water Agency (MWA) Service Area Salt and Nutrient Management Plan (SNMP)

Ms. Stanin was the project manager for the SNMP for the Mojave Water Agency service area. The plan included estimates of water budgets and salt and nutrient loading analysis for 22 analysis subregions using a dynamic water quality mixing model incorporating existing USGS MODFLOW model outputs, an anti-degradation analysis, development of a monitoring and reporting plan, and preparation of the SNMP.

Technical Support for SGMA and Preparation of GSP, Turlock Groundwater Basin Association (TGBA), Stanislaus and Merced Counties, California

Ms. Stanin has organized and is leading a consultant team to assist TGBA with SGMA compliance. Beginning in 2016, this assistance has included development of a Planning Document to guide SGMA compliance and GSP implementation, development of a Data Management System, analysis and recommendation of technical approaches (e.g., for modeling), assistance with public outreach and agency collaboration, development of a fiscal strategy, and assistance with preparation of a grant funding application. As of 2018, the consultant team is beginning the first phases of GSP preparation for the West Turlock Subbasin GSA.

Technical Support for SGMA, Modesto Subbasin, Stanislaus County, California

Ms. Stanin is assisting the Stanislaus and Tuolumne Rivers Groundwater Basin Association Groundwater Sustainability Agency (STRGBA GSA) with SGMA compliance for the Modesto Subbasin. In 2017, she assisted the seven STRGBA GSA parties (i.e., cities of Modesto, Oakdale, Riverbank and Waterford; Stanislaus County; and Oakdale and Modesto irrigation districts) with formation of the GSA and with preparation of an application for the Sustainable Groundwater Planning grant program. As of 2018, she is assisting with exploration of potential modification of the eastern boundary of the Modesto Subbasin, prior to embarking on preparation of the Groundwater Sustainability Plan for the STRGBA GSA.

Aquifer Characterization and Recharge Feasibility Study, City of Modesto, Stanislaus County, California

Ms. Stanin is project manager for an ongoing groundwater study for the City of Modesto. The project is the first step in the City's MAR Program to develop strategies for recharge of treated surface water. The project involved foundational aquifer characterization work through construction of nine hydrogeologic cross sections and incorporated groundwater quality and aquifer parameter data to select favorable areas for MAR. For part of the recharge analysis, Todd Groundwater modified and applied the USGS MERSTAN model, a regional groundwater flow model developed by USGS. Groundwater modeling indicated that MAR was feasible, but that depth to groundwater was a critical parameter. The project is being funded through a grant from the Local Groundwater Assistance Program (LGA) with oversight by the California Department of Water Resources.

Groundwater Banking and Groundwater Model Construction, Kern County, California

Ms. Stanin is project manager for an evaluation of groundwater banking operations in Kern County, California. This ongoing project involves the development of a regional groundwater flow model to assess the effects of the groundwater banking projects on the Kern Fan. The MODFLOW groundwater model covers a 430-square mile area, and comprises a three-layer aquifer system using over 1 million model cells. Calibration to dynamic flow conditions over the period 1986-2010 was completed successfully and the model has been applied to scenarios with and without banking; this has revealed the relative effects on groundwater levels of various banking projects.

Pure Water Monterey Groundwater Replenishment Project, Monterey Regional Water Pollution Control Agency (MRWPCA), Monterey County, California

Ms. Stanin has served as the project manager for this project, which involves planned recharge of highly treated recycled water into the Seaside Groundwater Basin. Detailed hydrogeologic assessments have been completed including the evaluation of target aquifers, recharge methods, and injection and recovery sites. Design for vadose zone recharge wells was completed. The conceptual design was completed with the application of a steady state numerical MODFLOW model constructed by Todd Groundwater. Ms. Stanin has worked with the Division of Drinking Water (DDW) on project design and the monitoring well program. She assisted with CEQA compliance. Ms. Stanin teamed with Nellor Environmental and Trussell Technologies to develop the Project Engineering Report for Title 22 compliance and for the recharge permit from the Central Coast Regional Water Quality Control Board. As of 2018, the project is being expanded and is progressing to installation of project monitoring well clusters, deep injection wells, and vadose zone injection wells.

SELECTED PUBLICATIONS / PANELS / PRESENTATIONS

Data for Sustainable Groundwater Management, Sustainable Groundwater Management Workshop, Hosted by Turlock Groundwater Basin Association (TGBA), October 29, 2015.

Groundwater Replenishment in the Seaside Basin: Increasing Basin Yield with Recycled Water, 14th Biennial Symposium on Managed Aquifer Recharge, Groundwater Resources Association and Arizona Hydrological Society, July 31, 2014.

Recharge in the Ames Valley: Making it Happen, with D. Craig and E. Lin, Todd Engineers and M. West, Bighorn-Desert View Water Agency, Managed Aquifer Recharge Symposium, Increasing Opportunities for Groundwater Storage, National Water Resources Institute (NWRI), January 26, 2011.

Optimizing Recharge and Recovery at Recharge Basins in the Pauba Valley, Stann, P., Craig, D., Lin, E., Managed Aquifer Recharge Symposium, Increasing Opportunities for Groundwater Storage, National Water Resources Institute (NWRI), January 26, 2011.

Benefits of Recycled Water Recharge of a Coastal Groundwater Basin, with T.G. Cole, R.B. Chalmers, and R.B. Holden, proceedings of the WateReuse Association Annual Conference, Seattle, WA, September 2009.

Complexities of Using Recycled Water to Recharge an Over-drafted Groundwater Basin, with T.G. Cole, R.B. Chalmers, and R.B. Holden, proceedings of the WateReuse Association Annual Conference, Newport Beach, California, March 2008.

Storing Water in California Desert Basins: Selection of Managed Aquifer Recharge Sites in the Ames Valley Groundwater Basin San Bernardino County, California, with E. Lin, A. Garcia, and L. Eckhart, at "Increasing Groundwater Storage to Meet California's Future Demand: Challenges and Solutions", Groundwater Resources Association, 3rd Symposium in the Groundwater Resource Series, June 2007.

Managed Aquifer Recharge (MAR) Standards Committee, American Society of Civil Engineers (ASCE) and Environmental Water Resources Institute (EWRI), MAR Guidelines Development Subcommittee, 2004 to present.

Iris Priestaf, PhD

President

EDUCATION

PhD, Geography, University of California at Berkeley, 1983
MA, Geography, University of California at Berkeley, 1976
BA, Honors, Geography, University of California, Santa Barbara, 1974

PROFESSIONAL SUMMARY

Iris Priestaf, PhD, has more than 30 years' experience in groundwater investigations. She has consulted on numerous projects involving groundwater basin characterization, development, and management. She has worked with water agencies, cities, counties, and other organizations in preparing groundwater management plans, beginning with one of the first AB 3030 plans in 1994. Through the Groundwater Committee of the Association of California Water Agencies, she participated actively with staff of State agencies (DWR and SWRCB) in planning for the Sustainable Groundwater Management Act (SGMA), on behalf of water agencies and land use planning agencies. She has shared her expertise on SGMA at numerous seminars and conferences for groundwater professionals, attorneys, and planners in Sacramento, Los Angeles, San Diego County, and elsewhere. She is working now with diverse agencies toward SGMA compliance.

Groundwater Sustainability Plan, Kern River Groundwater Sustainability Agency (GSA)
Todd Groundwater currently is assisting the Kern River GSA (including City of Bakersfield, Kern Delta Water District, and Kern County Water Agency ID4) with preparation of a GSP. Dr. Priestaf has prepared draft sections of the Groundwater Sustainability Plan (GSP), for example, documenting and describing the GSP area and relevant jurisdictions. She also is providing ongoing review and editing of additional sections.

GSPs, Kern River GSA and Cawelo Water District GSA
Todd Groundwater currently is assisting the Kern River GSA (including City of Bakersfield, Kern Delta Water District, and Kern County Water Agency ID4) and the Cawelo GSA with preparation of their respective GSPs. Dr. Priestaf has prepared draft GSP sections, for example, documenting and describing the GSP area, monitoring and management programs, and relevant jurisdictions. She also is providing review and editing of additional sections.

Sustainable Groundwater Management, City of Corona
Todd Groundwater prepared the City's groundwater management plan, adopted in 2008; Dr. Priestaf served as internal reviewer. She since has advised on subsequent work, including feasibility studies of potential production well sites, assessment of groundwater recharge locations, and evaluation of salt loading. Todd Groundwater is assisting the City in compliance

with SGMA, including preparation of a successful application to modify local groundwater basin boundaries. This application involved documentation of the local hydrogeology, groundwater agencies, management activities, and explanation of how the basin boundary changes would enhance management. Todd Groundwater also assisted the City with a successful funding application for GSP preparation. Dr. Priestaf has provided SGMA advice and internal review.

SGMA Alternative Plan, Zone 7 Water Agency

SGMA designated Zone 7 as an exclusive GSA within its statutory boundaries. SGMA requires GSAs to prepare a GSP; alternatively, SGMA allows a functionally equivalent Alternative Plan if such a Plan can demonstrate sustainable management. Given its long history of sustainable management, Zone 7 elected to prepare an Alternative Plan, which included all elements of a GSP. Undesirable results, minimum thresholds, and measurable objectives were defined for multiple, distinct management areas. Dr. Priestaf assisted Zone 7 staff, providing research into a wetland issue involving connected groundwater and surface water, writing several sections of the Plan, and serving as peer reviewer and editor. The Alternative Plan was submitted in December 2016, successfully meeting the challenging SGMA deadline.

Sustainable Groundwater Management, San Benito County Water District (SBCWD)

Dr. Priestaf has worked closely with SBCWD in its active management of groundwater in the San Juan, Bolsa, and Hollister basins, including preparation of an updated groundwater management plan in 2003 and provision of Annual Groundwater Reports. With passage of SGMA in 2014, the District initiated SGMA planning. Dr. Priestaf has led a Todd Groundwater team which has evaluated groundwater basin boundaries and planned for complete GSA coverage of three groundwater basins (which extend into Santa Clara County). In 2017, Todd assisted the District in becoming a GSA, developing an agreement with Santa Clara Valley Water District for GSP development, and preparing a successful application for funding through the Sustainable Groundwater Planning Grant Program. Todd Groundwater is providing ongoing technical and public outreach support toward preparation of a GSP.

Technical Support for Sustainable Groundwater Management, City of Paso Robles

Dr. Priestaf has provided groundwater management support to the City of Paso Robles since 1999. This support has included service as an expert witness and peer review of studies. Subsequently, she worked with representatives of the County of San Luis Obispo, City, and landowners to support groundwater basin management planning. Most recently she has provided planning support to the City for SGMA compliance, including guidance through the detailed and comprehensive GSP Requirements, linking previous work and existing documents/data sets to specific GSP code sections and assessing respective level of effort. She also prepared a timeline and task-by-task guidance for GSP preparation.

SGMA Alternative Plan Assistance, Alameda County Water District (ACWD)

Since 1914 ACWD has successfully managed the Niles Cone Groundwater Basin, including active recharge above the Hayward Fault area, recovery from historical overdraft, and repulsion of brackish water in the Below Hayward Fault area. With such a history, ACWD prepared an Alternative Plan for compliance with SGMA. In response to public comments on this Alternative Plan, ACWD took a fresh look at several issues including the characteristics of its northern boundary and its management regarding Groundwater Dependent Ecosystems.

Dr. Priestaf worked closely with ACWD staff in analyzing these issues and preparing responses to comments in the context of ACWD's ongoing, adaptive management.

Sustainable Groundwater Management, City of Corona

Todd Groundwater prepared the City of Corona groundwater management plan, which was adopted in 2008; Dr. Priestaf served as internal reviewer. She since has advised on subsequent work, including feasibility studies of potential production well sites, assessment of groundwater recharge locations and evaluation of salt loading. Currently Todd Groundwater is assisting the City in compliance with SGMA, including preparation of a successful application to modify local groundwater basin boundaries. This application involved documentation of the local hydrogeology, groundwater agencies, management activities, and explanation of how the basin boundary changes would enhance groundwater management. Dr. Priestaf provided SGMA advice and internal review.

Groundwater Management Plan, City of East Palo Alto

Dr. Priestaf served as project manager for the Groundwater Management Plan for the City, which long relies solely on imported water. Recognizing the need for water supply reliability and additional supplies, the City embarked on groundwater development and management. Although the City overlies only a portion of a low-priority basin, Dr. Priestaf guided the effort to fulfill plan requirements of the Sustainable Groundwater Management Act (SGMA), including public hearings, stakeholder and agency outreach, description of the physical setting, presentation of maps, definition of management issues, identification of objectives and actions, and development of a monitoring program. The management plan and monitoring program address all the SGMA sustainability indicators including groundwater levels and storage, saltwater intrusion, groundwater quality, subsidence and surface water-groundwater interactions. The management plan is the first in the San Mateo Plain Groundwater Basin.

Scotts Valley Groundwater Management, Scotts Valley Water District (SCVWD)

For many years, Iris Priestaf was project manager for SVWD management of the Scotts Valley groundwater basin in Santa Cruz County. This active AB 3030 groundwater management program has included groundwater exploration and hydrogeologic investigations, and development and maintenance of a comprehensive water resources monitoring program that was featured in the California Department of Water Resources bulletin California Groundwater. The program also involved evaluation of the perennial yield, updating and application of a regional computer model, evaluation of potential artificial recharge projects, and initiation of a water recycling program. Dr. Priestaf also prepared annual reports addressing groundwater quantity and quality, and management activities. Installation of dedicated monitoring wells and evaluation of hydrogeology was funded by an AB 303 grant obtained through a joint effort by the District and Todd.

Peer Review of Water Balances, Kern County Water Agency

Dr. Priestaf served as project manager for a peer review of water balance methodologies used by Kern County Water Agency Improvement District 4. Review of the groundwater level monitoring program addressed field techniques, timing of measurements, distribution of monitored wells, data compilation and QA/QC procedures, and techniques used to document changes in storage. Results of the review were documented in a Hydrogeologic Balance

Report, which included a summary of the water balance, review of methodologies, commentary on uncertainty, and recommendations to improve the hydrogeologic balance methodology and reporting.

SELECTED PUBLICATIONS AND PRESENTATIONS

Integrating Land Use Planning into GSP Development, Groundwater Resources Association, Sacramento, California, October 3, 2017.

Achieving Groundwater Sustainability, American Planning Association Annual Conference, Sacramento, California, September 25, 2017.

Coordinating Land Use Outside Basin Boundaries, invited moderator, Uncommon Dialogue Workshop: Fostering Meaningful Coordination Between Land Use Planning and Groundwater Management Under the Sustainable Groundwater Management Act, Stanford University, Palo Alto, California, October 7-8, 2017.

Development of GSPs: Technical Tips and Issues, invited speaker, Fourth Annual Advanced Conference on Tribal Water Law, Law Seminars International, Valley Center, California, October 28, 2016.

Progress Report: Developing Groundwater Sustainability Plans, invited speaker, Comprehensive Conference on Sustainable Groundwater in California, Law Seminars International, Sacramento, California, June 6, 2016.

Moving forward: the Groundwater Sustainability Plan, invited speaker, Comprehensive Conference on New Legislation for Groundwater Regulation in California, Law Seminars International, Los Angeles, California, November 29-30, 2015.

Time for Planners to Get Their Feet Wet: Groundwater Sustainability Plans, American Planning Association Annual Conference, Oakland, California, October 3-6, 2015.

Overcoming Overdraft: California's New Groundwater Law, presentation to Association of Environmental Professionals, State Conference, Santa Barbara, California, March 22-25, 2015.

The Groundwater Sustainability Plan: What is it?, invited speaker, Comprehensive Conference on New Legislation for Groundwater Regulation and Management in California, Law Seminars International, Sacramento, California, March 2, 2015.

Sustainability from the Ground Up: Groundwater Management in California, presentation to the California County Planning Commissioners Assoc. Annual Meeting, October 12, 2012, and poster presentation, Association of Environmental Professionals, NAEP/AEP Joint Conference, Los Angeles, California, April 1-4, 2013.

Michael P. Maley, PE, PG, CHG, CEG

Senior Hydrogeologist

EDUCATION

MS, Geological Engineering, University of Missouri – Rolla, 1987
MS, Geology, University of Oklahoma, 1986
BS, Geology, Texas Christian University, 1983

CALIFORNIA REGISTRATIONS

Professional Engineer (PE), Civil, No. 53424
Professional Geologist (PG), No. 5270
Certified Hydrogeologist (CHG), No. 654
Certified Engineering Geologist (CEG), No. 1869

PROFESSIONAL EXPERIENCE SUMMARY

Mr. Maley is both a licensed professional geologist and civil engineer with over 30 years of experience in groundwater management, water resources, regulatory support and environmental projects. His extensive water resources experience includes groundwater basin evaluations, sustainable yield estimates, water quality evaluations, groundwater-surface water interactions, and groundwater recharge programs. Through this work, he has evaluated the sustainable yield and groundwater quality for many heavily-used groundwater basins for groundwater management plans in California. He has developed and applied integrated groundwater-surface water models and water quality analysis to assess groundwater impacts for feasibility studies and CEQA/NEPA support for large engineering projects including percolation ponds, injections wells, recycled water, and wastewater disposal.

Mr. Maley is a specialist at applying groundwater models using MODFLOW-MT3D, GSFLOW, IWFM and FEFLOW. He has demonstrated the capability to successfully calibrate complex models through close attention to the physical processes that govern groundwater flow and contaminant transport. Models developed by Mr. Maley have undergone rigorous peer, regulatory, and expert review. Through his experience, he has provided valuable insight into the hydrogeological controls that influence groundwater flow from large groundwater basins to local engineering projects.

Kern River Water Allocation Plan (WAP) Supplemental EIR, Kern Delta Water District, Kern County, CA
Mr. Maley evaluated groundwater impacts from implementation of a series of prioritized management actions detailed in the WAP. The analysis evaluated groundwater conditions that may be adversely impacted over time as a result of re-direction of Kern River release water. Mr. Maley used a MODFLOW superposition model based on the USGS Central Valley Hydrologic Model (CVHM) for the analysis.

GSP, Kern River Groundwater Sustainability Agency, Kern County, CA.
Mr. Maley is the lead groundwater modeler for updating DWR's integrated groundwater-surface California Central Valley Model (C2VSim) to properly account for surface water deliveries, imported water,

groundwater banking, and irrigation water demand for developing local and basin-wide water budgets for the GSP. Working with local water districts to compile data.

GSP, Cawelo Water District, Kern County, CA
Mr. Maley is the project manager and lead hydrogeologist to develop GSP to meet SGMA requirements to meet long-term sustainability. He is working with District to develop the GSP following DWR guidelines.

GSP, James Irrigation District, Fresno County, CA
Mr. Maley is the project manager and lead hydrogeologist to develop GSP to meet SGMA requirements to meet long-term sustainability. He is working with District to develop GSP following DWR guidelines.

Palms Recharge Project, Buena Vista Water Storage District, Kern County, CA
Mr. Maley evaluated groundwater impacts to support CEQA compliance for the recharge project. He applied a MODFLOW superposition model based on USGS CVHM to assess potential groundwater impacts associated with recovery operations for the Palms Project to neighboring banking operations and overall basin conditions.

Expanded Water Banking Project, North Kern Water Storage District, Kern County, CA.
Mr. Maley evaluated groundwater impacts to support CEQA compliance for a proposed groundwater banking expansion project. He applied a MODFLOW superposition model based on USGS CVHM to assess potential groundwater impacts associated with recharge and recovery operations.

Groundwater Recharge Feasibility Study, Palmdale Water District, CA
Mr. Maley conducted detailed hydrogeologic evaluations to evaluate potential groundwater recharge sites along Little Rock Wash utilizing recycled and State Water Project (SWP) water. He adapted the latest version of the USGS Antelope Valley MODFLOW model to evaluate bank operations, water quality issues, and mounding to support the feasibility study and engineering design. Developed well spacing criteria based on land subsidence modeling.

Groundwater Banking and Blending Study, Antelope Valley-East Kern Water Agency, Palmdale, CA
Mr. Maley conducted detailed hydrogeologic evaluations at multiple sites in the Antelope Valley to support feasibility studies to use groundwater banking to increase local groundwater supply. He adapted the latest version of the USGS Antelope Valley MODFLOW model to evaluate recharge/extraction operations, water quality issues, mounding and land subsidence to support engineering design and CEQA evaluation of banking and blending alternatives.

Whittier Narrows Groundwater Modeling, Water Replenishment District of Southern CA
Mr. Maley used an existing FEFLOW groundwater flow model to evaluate the travel time of injected recycled water at the Advanced Water Treatment (AWT) facility recycled water for recharge to nearby potable supply wells to assess compliance with Division of Drinking Water recharge regulations. The model evaluated mounding near the wells and potential discharge of recycled water to the nearby San Gabriel River. The modeling demonstrated that adequate separation exists between injection and nearby potable supply wells to meet the required Response Retention Time underground and that injection well groundwater mounding was not significant, and recycled water would not discharge to the river.

Groundwater/Salt and Nutrient Management Plans, Twentynine Palms Water District, CA
Mr. Maley conducted a comprehensive study of the Mesquite Lake Groundwater Basin to evaluate geology, water budget, groundwater recharge, and groundwater storage change. He developed a basin-wide MODFLOW model to evaluate shifting groundwater pumping to improve long-term water supply. He updated the Groundwater Management Plan with basin management objectives, a monitoring plan and stakeholder meetings. He prepared a Salt and Nutrient Plan to assess potential groundwater quality

impacts from septic tanks and developed strategies to protect the groundwater resources with approval from local Regional Water Quality Control Board (RWQCB).

Numerical Model Development, United Water Conservation District, Ventura County, CA
Mr. Maley worked with District to update the existing USGS MODFLOW model of the Santa Clara-Calleguas Groundwater Basin to a format that was usable by the District. He significantly improved the calibration of the model. The model was used by the District to evaluate groundwater management programs, CEQA analysis for wastewater facility upgrades and groundwater recharge program.

Numerical Model Development, Calleguas Municipal District, Ventura County, CA
Mr. Maley adapted the existing regional USGS MODFLOW model to support local groundwater management, CEQA analysis for wastewater facility upgrades, groundwater recharge and desalter programs. He worked with District to update the hydrogeological interpretation of complex bedrock units. Focused model updates and recalibration on the groundwater-surface water interactions with Arroyo Las Posas were performed. The model is being applied by the District for long-term planning and evaluation of aquifer storage and recovery project.

State Water Project Chloride Modeling Analysis, Castaic Lake Water Agency, Santa Clarita, CA
Mr. Maley developed a water balance model of SWP to evaluate water quality changes with varying flows for historical, current, and simulated projected water quality conditions in Castaic Lake. He simulated changes in chloride concentrations over time under different hydrologic conditions including dry and critically dry years of a future drought in the context of anticipated SWP and contractor operations in response to the recent court decisions for the Sacramento-San Joaquin Delta.

Water Quality Evaluation, Elsinore Valley Municipal Water District, Elsinore, CA
Mr. Maley updated an existing MODFLOW/MT3D numerical model to evaluate nitrate transport within the enclosed groundwater basin. He provided characterization of nitrate sources within the basin and calibrated the model to groundwater elevations and nitrate trends. Mr. Maley developed scenarios to evaluate future nitrate trends at municipal production wells and presented results of long-term septic tank impacts to the local RWQCB.

Discharge Compliance Project, Incremental Recycled Water Program, City of Santa Rosa, CA
Mr. Maley evaluated the hydrogeology of the Healdsburg, Alexander Valley, and Santa Rosa Plain basins including groundwater-surface water interactions with the Russian River. He developed MODFLOW/GSFLOW models to support project siting, engineering design, and CEQA impact analysis of wastewater disposal ponds along the Russian River. He evaluated the impact to groundwater levels, water quality (metals and chloride), and groundwater-surface water interactions on siting and engineering criteria. He analyzed engineering aspects of percolation ponds and injection wells and developed siting criteria for potential indirect discharge of treated wastewater.

Coupled Surface Water-Groundwater Scoping Study, Sonoma County Water Agency, CA
Mr. Maley evaluated available modeling codes to select the appropriate code for a coupled Russian River and Alexander Valley Basin surface water-groundwater model to simulate the complex interactions between the Russian River and the groundwater and test various river management scenarios. He applied a code selection process to balance technical capability, adaptability, time and cost requirements and the ability to integrate with other models used by Russian River Stakeholders.

Groundwater Management Services, Scotts Valley Water District, Santa Cruz County, CA
Mr. Maley has provided over ten years of consulting to the District, supporting groundwater management actions and ongoing evaluations to mitigate historical groundwater level declines and provide a more

secure and reliable water supply. He developed and calibrated a MODFLOW model of the groundwater basin to define sustainable yield, assess groundwater-surface water interactions, and stormwater recharge.

Conjunctive Use Project, Santa Cruz County Dept. of Health Services, Santa Cruz, CA
Mr. Maley used an existing MODFLOW/GSFLOW model to evaluate methods to mitigate declines in groundwater levels in the project area to provide a more secure and reliable water supply. The project evaluated a variety of approaches to off-stream diversion of water to optimize utilization of flows to off-stream groundwater recharge ponds, in a manner that satisfies aquatic habitat preservation requirements while fulfilling operational objectives.

Recycled Water Facility Plan, Pierce County, WA
Mr. Maley developed a groundwater model to evaluate the capacity of recycled water discharge to shallow aquifer to determine volume, size and location of potential injection well and percolation ponds alternatives. He evaluated impacts of groundwater mounding and interactions with salt water from Puget Sound.

SELECTED PUBLICATIONS AND PRESENTATIONS

H. Victor Church Award – Best poster at 2001 Pacific Section AAPG/Cordilleran Section GSA Meeting "Defining Hydrostratigraphic Units within the Heterogeneous Alluvial Sediments at Lawrence Livermore National Laboratory", Universal City, CA, April 2001 (Blake, R., C. Noyes, and M. Maley)

Maley, M., S. Itagaki, and T. Reynolds, 2016, "Development and Application of the Santa Margarita Basin Groundwater Model, Scotts Valley, California", Presentation at 25th GRA Annual Meeting, Concord, CA, October 2016.

Onsoy, S., L. Chau, M. Maley, M. Baillie, L. Takaichi, and D. Marks, 2013, State Water Project Chloride Modeling Analysis, Presentation at 2013 DWR Municipal Water Quality Program Annual Meeting, Sacramento, CA, July 2013.

Maley, M., and J. Peters, 2012, "Hydrogeological Analysis for Developing Drought Contingency Plan, Mendocino, California", Presentation at 21st GRA Annual Meeting, Rohnert Park, CA, October 2012.

Maguire, S., M. Maley, M., and R. Swartz, 2011, "Water Quality Risks to the Long-term Sustainability of Groundwater in Northern Sacramento County", Presentation at 28th Biennial Groundwater Conference/ 20th GRA Annual Meeting, Sacramento, CA, October 2011.

McCraven, S., V. De La Piedra, G. Cook and M. Maley, 2009. "Groundwater Vulnerability Assessment in the Santa Clara Valley." Presentation at 27th Biennial Groundwater Conference/GRA Annual Meeting, Sacramento, CA, October 2009.

Maley, M., and J. Peters, 2008. "Use of MODFLOW in Developing Drought Contingency Plan, Mendocino, California." Proceedings MODFLOW and More 2008 Conference, Golden, CO, (E. Poeter, M. Hill, and C. Zheng, editors), International Ground Water Modeling Center, 5 p.

Maley, M., P. Leffler, P. Sorensen, M. Javaherian, and M. Pinto, 2003. "Water Balance and MODFLOW Simulations for Cummings Basin, Kern County, California." Presentation at 24th Biennial Groundwater Conference/GRA Annual Meeting, Ontario, CA.

Chad N. Taylor, PG, CHG

Senior Hydrogeologist

EDUCATION

BS, Earth Sciences, University of California Santa Cruz, 1999

REGISTRATIONS

Professional Geologist California, No. 8443
Certified Hydrogeologist California, No. 915

PROFESSIONAL SUMMARY

Mr. Taylor is a licensed Professional Geologist and Certified Hydrogeologist with over 18 years of experience in conceptual hydrogeologic model development, water supply planning and exploration, protection of groundwater resources, design of water supply wells, and soil and groundwater contamination investigations. Mr. Taylor has worked on groundwater projects throughout California and Colorado and has a very strong working knowledge of the hydrogeology and regulatory framework in both states. Mr. Taylor is a native of California, having grown up in the foothills of Fresno County, where he has strong ties to local groundwater issues. Mr. Taylor has been responsible for a range of projects involving groundwater basin evaluations, groundwater resource assessment and management, design and installation of water supply wells, analysis of large and complex datasets, geographic aquifer test data, and analytical groundwater flow modeling in California and Colorado. Mr. Taylor specializes in developing meaningful and useful conceptualizations of groundwater systems. These include three-dimensional representations, unique customized analytical tools, and numerical groundwater models.

SGMA Groundwater Sustainability Agency (GSA) Formation, Bedford-Coldwater Subbasin, City of Corona, Riverside County, CA

Mr. Taylor currently serving as the project manager and hydrogeologist for the City of Corona as they work with the Elsinore Valley Municipal Water District (EVMWD) and Temescal Valley Water District (TVWD) to form a Groundwater Sustainability Agency (GSA) for the newly created Bedford-Coldwater Subbasin of the Elsinore Groundwater Basin. The City, EVMWD, and TVWD are forming a Joint Powers Authority to collaboratively manage the subbasin. He has been working with the City in coordinating the components required for submittal of a GSA notification in accordance with the California Sustainable Groundwater Management Act (SGMA). This includes mapping the proposed GSA boundaries, describing the managed area

and the agencies past management efforts, and identifying stakeholders in the GSA and Groundwater Sustainability Plan (GSP) process.

Kern River Groundwater Sustainability Agency SGMA Groundwater Sustainability Plan Preparation, Kern County, California

The Kern River Groundwater Sustainability Agency is a Groundwater Sustainability Agency (GSA) covering the service areas of the City of Bakersfield, Kern Delta Water District, and the Kern County Water Agency Improvement District Number 4 in Kern County. Mr. Taylor is a project hydrogeologist on the team that is preparing the Groundwater Sustainability Plan (GSP) for the GSA in accordance with the California Sustainable Groundwater Management Act (SGMA). The GSA is within the high-priority Kern County Subbasin of the San Joaquin Valley Groundwater Basin; an area with high groundwater demand and significant historical groundwater management challenges. He is formulating a conceptual model of the GSA area, assisting with regional groundwater modeling and water balance calculation, and preparing the GSP report.

SGMA Basin Boundary Modification, Elsinore Groundwater Basin, City of Corona, EVMWD, and TVWD, Riverside County, CA

Mr. Taylor recently served as project manager and hydrogeologist for a successful effort to modify groundwater basin boundaries undertaken collaboratively by the City of Corona, EVMWD, and TVWD. This boundary modification task was completed in accordance with the California Sustainable Groundwater Management Act (SGMA) under the guidance provided by the legislature, California Water Code, and the California Department of Water Resources (DWR). He worked with the City EVMWD, and TVWD to define new groundwater basin boundaries for the Elsinore Groundwater Basin. The former boundaries for this basin were modified to align with mapped alluvial deposits to more accurately reflect the groundwater system. The modification also included division of the Elsinore Basin into two separate subbasins; the Elsinore Valley Subbasin and the Bedford-Coldwater Subbasin. The boundary modification requests were submitted to DWR based on scientific and jurisdictional rationale and DWR agreed with the requests and approved the changes to the mapped basin boundaries. Mr. Taylor led the effort in collecting, compiling, and submitting the data and information required to make this request successful.

SGMA Planning and Preparation, James Irrigation District, San Joaquin County, California

Mr. Taylor serves as the project hydrogeologist for the James Irrigation District (JID) in San Joaquin County, California as they prepare to comply with the California Sustainable Groundwater Management Act (SGMA). JID is an exclusive Groundwater Sustainability Agency (GSA) located in the high-priority Kings Subbasin of the San Joaquin Valley Groundwater Basin. As a first step in the SGMA Groundwater Sustainability Plan (GSP) process, JID asked Todd Groundwater to compile a database of local well information, prepare a set of groundwater elevation contour maps, and estimate recent groundwater storage changes. Mr. Taylor worked with JID to compile a preliminary dataset of wells in the vicinity of JID and evaluate the suitability of these wells for future analyses, monitoring, and management. Mr. Taylor and the Todd Groundwater team are currently working with JID to refine his well information dataset for use in further analyses, and ultimately for the GSP.

Groundwater Management Plan, Kern Delta Water District, Kern County, California
Mr. Taylor has assisted the Kern Delta Water District as the project hydrogeologist of a Groundwater Management Plan Update. The project involved a re-assessment of aquifers, development of a water budget, and documentation of numerous conjunctive use activities including a formal groundwater banking project with the Metropolitan Water District of Southern California and other water agencies. Mr. Taylor assisted in refining the conceptual model of the study area, identifying, documenting, and categorizing existing groundwater wells. The plan was adopted in September 2013.

Groundwater Recharge Assessment, City of Corona
Mr. Taylor served as project manager and hydrogeologist for the City of Corona's project to evaluate the feasibility of enhancing recharge of groundwater by capturing stormwater in a highly urbanized environment with significant impervious area causing reduced natural recharge. Mr. Taylor was responsible for a multifaceted project to evaluate the potential to use existing stormwater retention basins for capturing and recharging groundwater.

IPR Groundwater Studies, Santa Clara Valley, CA, Santa Clara Valley Water District (SCVWD)
Mr. Taylor has served as project hydrogeologist for a study to site and assess regulatory compliance and potential water quality impacts of planned Indirect Potable Reuse (IPR) recharge to groundwater (spreading and injection) of advanced-treated recycled water. Mr. Taylor led the development of a geographically enabled basin-wide hydrogeologic conceptual model and assisted in refinement of SCVWD's groundwater flow model. These tools were used to predict travel times to nearby supply wells, assess mounding from groundwater recharge, and help site the IPR facilities. Mr. Taylor has also led field programs to site and evaluate new recharge facilities, and construct monitoring facilities. Mr. Taylor has designed and is coordinating the installation of a series of nested groundwater monitoring wells designed to track recycled water at various depths in the subsurface. He has also led the field testing of two prospective surface spreading recharge facilities, including long-duration managed infiltration tests using constant head test infiltration basins to assess recharge rates and vadose and subsurface flow of infiltrated water. The project also includes dissolution studies and geochemical analysis of potential effects of recharging advanced treated water in the specific selected locations.

Modeling of Groundwater Banking Projects, Kern County Water Agency
Mr. Taylor served as project hydrogeologist for the evaluation of groundwater banking operations in Kern County, California. This ongoing project involves the development of a comprehensive groundwater model to assess the effects of the largest groundwater banking project in the world. Mr. Taylor developed a conceptual model of the project area utilizing all existing sources of geologic, hydrogeologic, and hydraulic data, assisted in the development of a comprehensive water balance detailing the inflow and outflow to the project area, and construction of a complex transient three dimensional groundwater flow model of the system. The water balance included calculation of agricultural, municipal, industrial, and groundwater banking activities. The transient numerical model covers a time period of over 20 years and has been calibrated to closely simulate groundwater conditions in the Kern River Fan area through variable historical hydrologic conditions. The calibrated model has been thoroughly reviewed and is now being used to simulate groundwater conditions without local groundwater recharge and banking project contributions. The ultimate goal is to produce a

tool that can be used by local parties to evaluate the impacts of banking on other water users in the area.

Feasibility Study for Recycled Water Recharge, Temescal Valley Water District (formerly Lee Lake Water District)

Mr. Taylor assembled available data for a little studied subbasin of the Elsinore Groundwater Basin, the Bedford Subbasin, and synthesized a hydrogeologic conceptual model. This conceptual model was used to evaluate the potential for recharge of recycled water in the subbasin. The entire 6.5 square mile subbasin was evaluated to locate the most appropriate areas for the application of recharge water. These areas were then independently evaluated using analytical modeling techniques to simulate the effects of recharge upon local and regional groundwater elevations. The study concluded that there is adequate unsaturated aquifer capacity to allow for the managed application of recycled recharge water at the selected locations.

Managed Aquifer Recharge and Pumping Feasibility Study, City of Palo Alto, CA

Mr. Taylor is currently the project hydrogeologist for hydrogeologic studies portions of a Recycled Water Strategic Plan assessing the potential for managed recharge of recycled water in the City of Palo Alto. The study includes a complete reevaluation of the basin hydrogeologic conceptual model, refinement of a numerical modeling tool, assessment of increased groundwater extraction and recycled water recharge via spreading basins and injection wells, and a recharge feasibility evaluation.

Groundwater Monitoring for Water Recycling, City of Hollister

Mr. Taylor served as project manager for the design and construction of the City of Hollister's recycled water irrigation groundwater monitoring network. As part of the California Environmental Quality Act (CEQA) documentation and requirements by the Central Coast Regional Water Quality Control Board (CCRWQCB), the City was required to install monitoring wells at each site where recycled water will be used for irrigation. Mr. Taylor evaluated the hydrogeology of each site through a thorough review of construction and testing information from existing wells and published hydrogeologic conditions, then identified monitoring well locations for each site. Mr. Taylor prepared detailed specifications for the drilling and construction of the monitoring well network and oversaw the drilling and construction of the wells. Several of the locations include nested wells for depth-discrete monitoring of near-surface groundwater and the shallow aquifer.

Managed Aquifer Recharge (MAR) Feasibility Study, Turlock Irrigation District, Stanislaus and Merced Counties, CA

Mr. Taylor was one of the project hydrogeologists on the team that developed a regional evaluation of recharge methods, strategies, and favorable areas for enhancing recharge in the Turlock Subbasin. Recharge feasibility was assessed by mapping and evaluating soils (including vertical hydraulic conductivity), restrictive barriers (including hardpan and lithic soils), and depth to groundwater. This information was developed into spatial datasets in a Geographic Information System (GIS) database, which allowed identification of target areas for various managed aquifer recharge (MAR) strategies. Four strategies for conceptual projects were identified including centralized infiltration basins, de-centralized trenches/canals, in-stream recharge in natural drainages, and urban stormwater recharge.

Amber J. Ritchie, PG

Associate Hydrogeologist

EDUCATION

MS, Hydrogeology, Illinois State University, 2012
BS, Geology, Clemson University, South Carolina, 2010

REGISTRATIONS

Professional Geologist, No. 9476, California

PROFESSIONAL SUMMARY

Ms. Ritchie joined Todd Groundwater in January 2013. She has five years of experience with a variety of groundwater topics such as groundwater management plans, field work (including well installation, monitoring, and aquifer testing), groundwater basin characterizations, and GIS database and data management. With a certification in Geographic Information Systems (GIS), Ms. Ritchie brings experience in database creation and application to groundwater investigations.

Palm Desert Aquifer Recharge Feasibility Study, Coachella Valley Water District (CVWD)
Todd Groundwater assisted the CVWD evaluate the feasibility of recharging up to 40,000 acre-feet per year of Colorado River Water in the Coachella Valley Groundwater Basin. Ms. Ritchie, as project hydrogeologist, assisted with water quality and water level data management and characterization, Geographical Information System (GIS) development and preparation of hydrogeologic cross sections.

Groundwater Sustainability Plans, Kern River GSA and Cawelo Water District GSA
Todd Groundwater currently is assisting the Kern River GSA (including City of Bakersfield, Kern Delta Water District, and Kern County Water Agency ID4) and the Cawelo GSA with preparation of their respective GSPs. Ms. Ritchie is helping with database management and drafting of GSP sections, for example, monitoring and management programs.

Kern County Groundwater Sustainability Planning, CA
This project consists of preparing a Groundwater Sustainability Plan (GSP) for the Kern County Groundwater Sustainability Agency area. Ms. Ritchie is playing a key role in the hydrogeologic and basin setting of this GSP. Her responsibilities include collecting and incorporating groundwater levels and groundwater quality data from multiple sources, database and GIS management, and preparing a hydrogeologic assessment for the sustainability analyses.

Turlock Subbasin GSP
This ongoing project aims to prepare a GSP for the Turlock subbasin, overlying both Merced and Stanislaus counties. Ms. Ritchie is leading the data acquisition and development of a basin-wide database that includes water levels, water quality, well construction, and well production information.

Zone 7 Sunol SGMA
This project focused on assisting the Zone 7 Water Agency in Alameda County in meeting all requirements under the Sustainable Groundwater Management Act (SGMA) to become the GSA for the Sunol Basin and prepare a GSP. Ms. Ritchie's work focused on ensuring data was collected and analyzed within the basin to assess the hydrogeology of the basin and to identify current monitoring, data gaps, and monitoring needs.

Groundwater Monitoring Program, City of East Palo Alto
The City of East Palo Alto overlies 2.5 square miles of the San Mateo Plain groundwater basin. As part of its groundwater development and management program, the City initiated a monitoring program, which was designed and conducted by Todd Groundwater to protect against potential overdraft, saltwater intrusion, and subsidence. This ongoing project includes monitoring of groundwater levels, groundwater quality, and subsidence plus tracking of rainfall and San Francisquito Creek flows. Ms. Ritchie has been responsible for measurement of groundwater levels in six wells and sample collection from five wells for groundwater quality analysis. She also manages the monitoring program database (including data collected by Todd Groundwater staff and other monitoring entities) and assists in annual reporting to the City.

Indirect Potable Reuse (IPR) Groundwater Studies, Santa Clara Valley Water District (SCVWD)
SCVWD retained Todd Groundwater to lead groundwater investigations to support planned IPR including update of the hydrogeologic conceptual model. This has involved review of geologic and hydrogeologic information produced over the past 20+ years and development of a 3D model of the hydrogeologic framework using the ArcHydro tool in GIS. Ms. Ritchie used her knowledge of GIS database management to collect and organize data from a variety of sources.

Groundwater Characterization and Recharge Study, City of Modesto, CA
The City of Modesto and the Stanislaus-Tuolumne Rivers Groundwater Basin Association (STRGBA) are conducting a feasibility study of aquifers and groundwater conditions in the City of Modesto service area for managed aquifer recharge. Ms. Ritchie served as staff hydrogeologist on this project to develop a hydrogeologic conceptual model, evaluate groundwater levels, groundwater quality, and develop recommendations for a managed aquifer recharge program.

Numerical Modeling of Kern Fan: Kern County Water Agency, CA
This project consists of the evaluation of the groundwater banking in Kern County, California. Ms. Ritchie determined characteristic hydraulic conductivity values of the area using information acquired from various well logs in the county. Discrete zones of varying hydraulic conductivity were determined in order to create a comprehensive water balance detailing the

inflow and outflow to the project area that includes agricultural, industrial, municipal, and groundwater banking activities.

San Mateo Basin Assessment, San Mateo County, CA

San Mateo County recognized that groundwater development is increasing in the San Mateo Plain Basin and sponsored a basin-wide hydrogeologic assessment. This involved characterization of the hydrogeology, assessment of the water balance, documentation of groundwater quality, and consideration of groundwater management options. Ms. Ritchie's responsibilities included database and GIS management of water levels, well logs and construction, and water quality. Ms. Ritchie handled large amounts of data to create figures, maps, charts, and graphs to characterize the groundwater basin. This information was used in developing a first-ever basin-wide groundwater analysis.

Hydrogeologic Characterization of the Eastern Turlock Basin, City of Turlock, CA

The City of Turlock and Turlock Groundwater Basin Association (TGBA) conducted a comprehensive hydrogeologic characterization of the eastern Turlock Subbasin, which is undergoing significant agricultural and domestic development. Nonetheless, groundwater conditions are not well known. Ms. Ritchie served as staff hydrogeologist on this project, which involved evaluation of hydrostratigraphy and aquifer properties, groundwater occurrence and flow, groundwater quantity and quality, changes in groundwater use (and land use) over time, soils and vadose zone permeability, restrictive layers (such as duripans), and water budgets.

Basin Characterization and Groundwater Quality, San Benito Annual Report

As staff hydrogeologist, Ms. Ritchie collected water quality data from a variety of public and private sources and organized all data into a database to characterize water quality throughout San Benito County, California. Ms. Ritchie also provided GIS maps and visualization of trends in water quality, particularly nitrate and total dissolved solids, in order to update water quality records and incorporate new data into the database.

Eastern Municipal Water District (EMWD), San Jacinto, CA

This project focused on a basin-wide understanding of the San Jacinto groundwater basin to evaluate groundwater recharge and recovery from new EMWD San Jacinto facilities. Ms. Ritchie led the GIS and data management of this project to determine groundwater quality, quantity, and water levels within the basin to understand regional groundwater conditions with the intention of future placement of recharge sites and groundwater geochemical modeling within the basin.

Copeland Creek Recharge Basin Investigation, Sonoma County Water Agency

Ms. Ritchie served as field hydrogeologist for an investigation of proposed detention/recharge basins along Copeland Creek in the City of Rohnert Park, California. The local hydrogeology is complex, with inter-fingered fluvial, alluvial, and volcanic units offset by faulting. Ms. Ritchie conducted a field investigation including cone penetrometer test (CPT) soundings to assess site lithology and occurrence of groundwater, and drilling, logging and soil sampling during installation of monitoring wells. The investigation revealed shallow perching conditions that limit potential recharge. Nonetheless, the site may be used for stormwater detention with release of water for recharge along the creek.

Ben Willardson

PhD, PE, ENV SP, D.WRE, QSD/P

Hydrology and Hydraulics Lead

Dr. Ben Willardson has 18 years of professional experience and is a highly regarded hydrology and hydraulics specialist heavily involved in planning, design, compiling and analyzing data for water resources infrastructure and special studies related to hydrology, hydraulics, sediment transport, and water quality. Ben has developed several master plans for drainage and stormwater capture, including the POLB Port-Wide Capital Improvement Stormwater Infrastructure Master Plan and award-winning LADWP Stormwater Capture Master Plan, and provided comprehensive training to several municipalities on hydrologic methodologies. He formerly managed the operation of 14 dams and 27 spreading grounds for flood control and water conservation within Los Angeles County's complex flood control system. He has acted as an expert witness for litigation related to flooding and has also conducted asset assessment for asset management programs related to flood control channels and road pavement. In 2015, Ben was recognized as an "Industry Icon" by *Storm Water Solutions* magazine.

Years of Experience

18

Education

PhD, Civil Engineering, University of Southern California

MS, Civil Engineering, Utah State University

BS, Civil Engineering, Utah State University

Registrations

Civil Engineer, CA, 64937

Civil Engineer, UT, 368681-2202

Envision™ Sustainability Professional Credential

Diplomate, Water Resources Engineer, 00668

Qualified SWPPP Developer/ Practitioner, 24214

Awards and Recognition

Storm Water Solutions magazine, "Industry Icon," 2015

RELEVANT EXPERIENCE

Coachella Valley Water District Palm Desert Groundwater Replenishment Feasibility Study - Team Lead for evaluating recharge on the Whitewater River for the Coachella Valley Water District (CVWD). The study evaluated the feasibility of recharging Colorado River water (CRW) in existing

secondary effluent ponds of the CVWD Water Reclamation Plant No. 10 and within an adjacent 2-mile reach of the Whitewater River storm channel that crosses through the Palm Springs/Palm Desert area. The river reach is a 300-foot wide channel with sloped, concrete-lined banks with a soil cover and a natural bottom. We worked with TODD Groundwater to evaluate several concepts that included river and offline basin recharge facilities to spread stormwater and CRW. Tasks included review or existing facility design, operations, and maintenance; evaluation of multiple concepts which included development of concept design drawings, cost estimation, and evaluation based on criteria such as capital cost, operation and maintenance costs, and water recharge capacities, and preparation of a basis of design report for the CVWD.

San Bernardino Valley Water Conservation District Debris Management Improvement and Design for Mill Creek Diversion Project Manager developing design plans for a modified diversion system that redirects debris and sediment while allowing flows to be rerouted to the existing spreading grounds. The project involves hydraulic modeling, engineering design, and permitting support for development of an improved water diversion system for the Mill Creek spreading basins to reduce and prevent debris from accumulating at the diversion gate. Tasks include: developing project concepts, schematic design drawings, and preliminary cost estimates for three alternative concepts; evaluating the performance and maintenance characteristics of the conceptual alternatives; determining the most cost-effective and maintainable design for the diversion system; analyzing existing conditions for flow depths, velocities, debris accumulation, and long-term channel trends; calculating the hydrostatic, hydrodynamic, and debris impact loads for the 5-, 10-, 25-, 50-, and 100-year storms; and identifying required permits.

Enhanced Watershed Management Program Plans Hydrology and Hydraulics Lead for the development of one WMP and six EWMPs, including the Los Angeles River Upper Reach 2 WMP and CIMP; City of Los Angeles Dominguez Channel Watershed EWMP; City of Los Angeles Ballona Creek EWMP; Rio Hondo/San Gabriel River Water Quality Group EWMP; City of Los Angeles Santa Monica Bay Jurisdictions 2, 3, and 7 CIMP and EWMP; City of Los Angeles Upper Los Angeles River EWMP; and South Bay Beach Cities Watershed Management Group CIMP. Tasks included: the development of an EWMP Work Plan, RAA, and CIMP; regional project planning; coordination with the watershed groups; and project schedule and cost estimate development.

City of Los Angeles One Water LA 2040 Plan Phase I Project Manager for evaluating the expected water conservation numbers provided from the five EWMP Plans which cover the City jurisdiction, the Los Angeles Department of Water and Power (LADWP) Stormwater Capture Master Plan (SCMP), and the Los Angeles Basin Stormwater Conservation Study (LA Basin Study) drafted by the U.S. Department of the Interior's Bureau of Reclamation and the Los Angeles County Department of Public Works' Flood Control District; reviewed and analyzed these studies to determine the stormwater flow and potential stormwater capture identified in each study. In each of these plans, key assumptions, planning parameters, and data sources were identified.

AREAS OF EXPERTISE

- Community Planning Facilitation
- Park and Recreation Planning
- Strategic Planning
- Organizational Development

EDUCATION

- Master of Business Administration, Boston University, Boston, Massachusetts
- Bachelor of Arts, History, University of Chicago, Chicago, Illinois

Mark Sillings

COMMUNITY OUTREACH AND FACILITATION

Mark Sillings has over 25 years of experience in public agency planning and management consulting. He applies his strong group facilitation, research, and communication skills to ensure the successful implementation of complex projects and planning processes in a wide range of fields, including community planning, environmental studies, parks and recreation planning, watershed management, and open space and natural resources.

Mark has provided planning, research and facilitation on several water resource management projects, including a water quality funding initiative for the Los Angeles County Flood Control District, and development of Integrated Regional Water Management Plans (IRWMPs) for the Mojave Region, the Upper Santa Clara River Watershed, and the Tulare Lake Basin/Kern County IRWMP. He managed development of the Rio Hondo Watershed Management Plan and the San Gabriel River Corridor Master Plan. Both efforts focused on the interrelated issues of flood control, water conservation, and water quality improvement.

RELEVANT EXPERIENCE

- Mojave Integrated Regional Water Management Plan, Mojave Water Agency, San Bernardino County, California
- LA County Water Quality Funding Initiative, Los Angeles County Department of Public Works, Los Angeles County, California
- Upper Santa Clara River Integrated Regional Water Management Plan, Los Angeles County Department of Public Works, Los Angeles County, California
- Tulare Lake Basin/Kern County Integrated Regional Water Management Plan, Kern County Water Agency, Kern County, California
- San Gabriel River Corridor Master Plan, Los Angeles County, California
- Rio Hondo Watershed Management Plan, San Gabriel Valley Council of Governments, Pasadena, California
- Los Angeles County Department of Public Works Watershed Management Division Strategic Plan, Los Angeles County, California
- Los Angeles County Department of Public Works Strategic Plan Update, Los Angeles County, California
- Kern County Parks and Recreation Master Plan, Kern County, California
- Enhanced Watershed Management Plan Program Environmental Impact Report, Los Angeles County Department of Public Works, Los Angeles, California
- Orange County Harbors, Beaches and Parks Strategic Plan, Orange County, California
- Los Angeles County Department of Regional Planning Strategic Plan, Los Angeles, California

AREAS OF EXPERTISE

- Community Planning
- Diverse Communities
- Outreach
- Public Involvement
- Strategic Communications

EDUCATION

- Bachelor of Arts, Art History, California State University, Los Angeles

Esmeralda Garcia

FACILITATION AND OUTREACH SPECIALIST

Esmeralda García is a community planning and public outreach expert whose projects often tackle complex social and economic issues associated with public services and infrastructure, transportation, housing, and urban planning and design. Through her early volunteer work, she was exposed to community organizing and governance, which sparked her passion for collaborative engagement and inclusive decision-making. Esmeralda is widely recognized for her ability to reach and connect with communities of diverse backgrounds and cultures — many of whom are under-served and often go unheard. She combines her extensive experience in facilitation and strategic planning with her broad knowledge of planning and communications to bring people together to identify and resolve problems. With her fluency in Spanish and English, Esmeralda is uniquely positioned to articulate challenges, opportunities, and goals for both clients and constituents. Whether it's a freeway corridor impacting tens of thousands of residents and businesses or a neighborhood park serving a hundred families, she is dedicated to forging understanding and cooperation to find implementable solutions that improve the lives of everyone.

RELEVANT EXPERIENCE

- Los Cerritos Wetlands Facilitation, Los Cerritos, California
- LA County Water Quality Funding Initiative, Los Angeles County Department of Public Works, Los Angeles County, California
- San Gabriel River Corridor Master Plan, Los Angeles County, California
- Rio Hondo Watershed Management Plan, San Gabriel Valley Council of Governments, Pasadena, California
- Los Angeles County Watershed Management Programs EIR, Los Angeles County, California
- Water Replenishment District Design Charrette, Southern California
- Mojave Integrated Regional Water Management Plan, Mojave Water Agency, San Bernardino County, California
- LACDPW Sediment Management Listening Session, Los Angeles County, California
- Balboa Reservoir Public Meeting Facilitation, San Francisco, California
- Pasadena Open Space and Conservation Outreach, Pasadena, California
- Los Angeles County Metropolitan Transportation Agency (MTA) I-710 Major Corridor Study and Corridor Project EIR/EIS, Los Angeles County, California
- Marina del Rey Visioning and Local Coastal Program Update, Department of Regional Planning, County of Los Angeles, California
- Environmental Protection Agency Green Zones Commerce Facilitation, Commerce, California