



### Education

BS, Geophysics, University of California - Riverside

### Registrations

Certified Hydrogeologist, CA  
 Professional Geologist, CA  
 Professional Geophysicist, CA  
 Professional Geologist, WI  
 Professional Geologist, MN

# Ronald Sorensen

## President, Sr. Hydrogeologist

Mr. Sorensen is President and CEO of Sorensen Groundwater Consulting, Inc. With over 35 years of experience in managing groundwater investigations and water supply projects in California. His career has taken him throughout the United States and abroad. Mr. Sorensen has served as a "Subject Matter Expert" for the State of California Board of Professional Engineers and Land Surveyors, Geologists and Geophysicists in hydrogeology and geophysics. As a Professional Geologist, Professional Geophysicist, and Certified Hydrogeologist, his areas of technical expertise include: hydrogeology, water supply and resource planning, groundwater exploration and development, hydrogeological and environmental site characterization; geohydrologic investigations of landfill sites, geohydrologic investigations of mine sites, ground water basin studies, computer modeling, and numerous geophysical investigations utilizing a variety of geophysical techniques. He has directed and managed multi-disciplinary project teams with multi-million dollar budgets. Mr. Sorensen has provided expert services, depositions, and exhibit preparation for defense and prosecution legal matters. both project proponents and public interest groups.

### Experience

#### Water Resource Assessments and Development

Mr. Sorensen has performed over one hundred groundwater assessments and has overseen the location, design, installation and testing of over 500 public and industrial groundwater supply wells using a full spectrum of drilling and well construction techniques. A majority of these wells have been deep (>1,000 ft) within the alluvial, fractured bedrock and volcanic environments of the arid desert regions of the southwestern United States. A sampling of the types of projects include:

**Mission Springs Water District, Water Resource Development, Desert Hot Springs, California.** Design, management and performance of a geophysical and hydrological basin investigation and analysis relating to groundwater recharge in the Upper Coachella Valley, California. Project area contained approximately 90 square miles. Work included a gravity survey to model the subsurface basin configuration, a ground temperature survey for identifying subsurface groundwater flow patterns, detailed mapping of the region, calculations of groundwater recharge into the basin, peer review of a developing groundwater model. Project also included the location and construction of multiple high capacity production wells.

**American States Water Company, Water Resource Investigations, Los Angeles, California.** Located, designed, oversaw, constructed, and tested four deep production wells in the West and Central Basins of Los Angeles. These wells averaged 1,000 ft in depth with production rates from 900 to over 2,500 gallons per minute.

**California Water Services Company, Water Resource Investigations, Los Angeles, California.** Located, designed, oversaw, constructed, and tested five deep production wells in the West and Central Basins of Los Angeles. Each wells averaged more than 1,000 ft in depth with production rates ranging from 1,100 to over 2,500 gallons per minute. As a result of these projects, the program expanded in area to include the Kernville Water District (KWD). Within the Kernville District, we installed several of the largest production wells within the District.

**California Water Service Company, Well Rehabilitation Program, West Basin, Los Angeles, California.** Performed a detailed evaluation of 36 wells in the Los Angeles' West Basin. The evaluation included a detailed review of lithologic, production records, water quality, physical appearance, repair history, etc. Program lead to the replacement of one well, a recommended program optimizing pumping rates and schedules, and the successful repair of a well which had been experiencing subsidence. The well with the subsidence had been producing sand leading to vast amounts of water being pumped to waste each time the well was turned on and excessive wear on pumping equipment. Through careful design and implementation, the outcome was a well which produced no sand and could be pumped directly into the distribution system.

**Descanso Gardens, Well Feasibility Assessment La Cañada Flintridge, California** -- In an effort to become self sufficient, Descanso Gardens had considered installing their own well to supplement their irrigation supply. Project consisted of a hydrologic assessment of the geology and recharge potential of the Descanso Gardens.

**Sierra Madre Water District, Water Resource Investigation, Sierra Madre, California** Geohydrologic assessment of the District. The assessment included a field reconnaissance, review of the recharge potential (water budget), and water quality trends.

**Annandale Country Club, Water Resource Investigation, Pasadena, California.** The membership opted to take advantage of their long standing water rights in the Basin to reduce their costs of irrigating the Club. Our investigation consisted of a hydrologic assessment of the setting, surface geophysical surveys and borehole drilling. The process resulted in the drilling of two successfully production wells within fractured bedrock that exceeded the Clients expectations for water supply.

**Confidential Client, Spring Investigations, Several Locations within Southern California.** Conducted four spring classification studies for a private investor. Studies included detailed geological investigations, long term monitoring, water quality assessments, potential impacts from the development of the springs, meetings with the State.

**Otay Water District, Desalination Pilot Project, Spring Valley, California.** Performed a Phase I assessment of the financial and hydrogeologic feasibility of developing a groundwater well production system within the Middle Sweetwater River Basin. Determined whether wells could sustain a yield

equivalent to the recharge via purveyed retail sales within the basin. Project included the generation of a project implementation plan, surface geophysics, groundwater modeling, well installation, water quality and quantity testing and a cost assessment and feasibility of the future phases of the project.

**Otay Water District, Rancho del Rey Well Installation Program, Chula Vista, California.** Program was to Provide Otay Water District with a new source of drinking water. Previously, all water supply had been purchased via imports from northern California or the Colorado River. This program included the drilling, construction, and testing of a 915ft deep production well and a nested 5-piezometer monitoring well.

**Paso Robles Inn, Geothermal Use Project, Paso Robles, California.** Performed an assessment of the feasibility of utilizing natural geothermal water derived from below the property to provide a source of hot water for suite hot tubs. Project included an assessment of the quantity and expected temperature of the source. A well was installed which provided over 100 gpm of 120 degree F water flowing to the surface under artesian pressure.

**Long Beach Water Department, Well Rehabilitation Program, Long Beach California.** As part of an assessment of the LBWD's wells, two wells were selected as candidates for rehabilitation. Each well had different conditions which were causing problems. One well had sanding issues leading to enlargement of the perforations, excess sand production, and excessive pump wear. The other well had problems resulting from the materials used when the well was constructed. This lead to the wells becoming approximately 85% plugged. Due to the expected fragility of the casing, a treatment program which was aggressive enough to remove the material plugging the perforations yet passive enough not to destroy the casing had to be developed.

**Long Beach Water Department, Well Site Location Program, Long Beach California.** The Long Beach Water Department commissioned a study to evaluate the current capacities of the existing wells and to identify potential siting areas north of the City of Long Beach. These areas had the highest Transmissivity values which will enhance future local water production and are considered part of a long-term strategy to supplement LBWD's water supply. The strategy consists of several phases. The first Phase consisted of the evaluation based on hydrogeological conditions and infrastructure requirements for potential sites in the City of Paramount and North Long Beach

**Long Beach Water Department, Well Rehabilitation Program, Long Beach California.** The Long Beach Water Department in a Joint venture with the City of Paramount are installing a production well within the City of Paramount limits. Project consists of overseeing the location, design, construction, and testing of this well.

**California Water Service Company, Well Installation Program, Commerce, California.** Project was to increase the available production for the East Los Angeles District. Project will cover overseeing the location, design, construction, and testing of this well. Production estimates for the location are over 3,000 gallons per minute with minor treatment for arsenic and manganese.

**California Water Service Company, Well Installation Program, Montebello, California.** Project to increase the available production for the East Los Angeles District. Project entails elements of water quality, surface water interaction, environmental and production issues. Main element of the project is to oversee the location, design, construction, and testing of a high capacity production well requiring minimal water quality treatment.

**California Water Service Company, Water Main Construction Oversight, Boulevards at South Bay, Carson, California.** Provide the construction oversight of a 16-inch polypipe water main and laterals at a former landfill site. Pipeline is extending along the route of the former haul roads of the site. Inspector was required to maintain all OSHA hazardous waste requirements for medical monitoring and protective equipment.

#### **Groundwater Recharge (ASR)**

**Orange County Water District, Assessment of Basin Recharge Rates, Orange County, California.** Conducted a pre-dredging assessment of the Warren Basin recharge area. The project consisted of collecting hydrologic investigations and geophysical measurements within the filled Basin to identify the areas with the greatest permeability. These results were then used to model predicted flow patterns for the recharge water. Measurements were repeated as the Basin was drained and compared with the model predictions. The results allowed the District to dredge the Basin more effectively and increase the recharge from the Basin. The results were confirmed when measurement were made during the re-filling process

#### **Geophysics**

In geophysics projects, he has designed and conducted numerous geophysical surveys utilizing gravity, seismic, magnetic, resistivity, GPR, ground temperature, and many other geophysical techniques.

**Exxon and Fluor-Daniels, Geophysical Investigation, Chad/Cameroon, Africa.** Conducted an assessment of the thermal properties along a proposed oil pipeline route in Chad/Cameroon Africa. Designed field program and assessed various soil types across the proposed pipeline route to determine the number of heaters required to assist oil flow from Chad to an offshore location.

**Confidential Client, Geophysical Investigation, Antigua, West Indies, Caribbean.** Conducted subsurface mapping of the island of Antigua. Performed a combination of three geophysical techniques mapping the structure across the island. From the results, provided an assessment of the geohydrologic conditions and available water supply for a proposed golf course and hotel development.

**Jurupa Community Services District, Geophysical Investigation, Chino Basin, California.** Conducted a gravity survey of the Chino Basin, California. The survey area consisted of over 100 square miles. Depth to bedrock was then modeled identifying the deepest part of the basin. The results were then integrated with a ground thermal survey to assess the most active groundwater flow areas. Combined, this investigation allowed the client to drill and install multiple successful wells within unpolluted aquifers.

**The City of Paso Robles, Assessment of the Geothermal Resources below the City of Paso Robles, Paso Robles, California.** Conducted an areal geophysical assessment of the geothermal resources beneath the City of Paso Robles. Project included the use of various geophysical techniques including shallow ground temperatures to map the areas with higher than expected temperatures. The studies began prior to the 2003 San Simeon earthquake and in the period following the earthquake, we were able to gather an additional data set. This allowed for an additional assessment of how the regional geothermal signature changed as a result of the ground movement. Several target areas and projects were identified for the City to pursue capturing the geothermal water including the heating of the City pool.

### **Groundwater Modeling**

**Cargill Salt, Groundwater Modeling Program, Kern County, California.** Designed and constructed several large basin groundwater models. Located in Kern County, CA, incorporated approximately 150 square miles. This model included calibration to steady state (historical records), intermittent pumping cycles, re-injection, multi-aquifer extractions, faulting, and a complex series of surface water recharge.

### **Seepage and De-watering Investigations**

**MTA, Leakage Investigations, Los Angeles, California.** Designed and implemented a geophysical program to investigate seepage patterns behind an active subway tunnel liner. The liner was concrete lined. Groundwater leaked through the seams and was corroding the rebar within the concrete. Previous repair attempts made by the client were unsuccessful because the water would flow around the attempted repair site. Through the results of the geophysics, Client was able to successfully eliminate groundwater flow into the tunnels.

**Browning-Ferris Industries, Landfill Seepage Investigation, Azusa, California.** Performed a hydrologic assessment of the Azusa Landfill to accomplish a landfill seepage assessment. The investigation included a geophysical surveys to detect leachate seepage laterally and vertically from the perimeter of the landfill. Once potential pathways were identified, cut-off wells were installed as part of the leachate collection system.

**Cargill Salt, Leakage Investigation, Belle Isle, Louisiana.** Managed a safety investigation for two mine shafts (1,500 ft and 1,800 ft deep) located in the bayous of Louisiana. The shafts were seeping seawater from various stages of the shaft liners. The seawater was dissolving the salt, creating voids behind the liner, and further increasing the seepage. Through geophysics, the shafts were found to have pervasive downward seepage occurring behind the liner. Due to the cost to repair the seepage and the safety risk to mine employees, the mine was closed.

**Multiple Clients, Dam Seepage Investigations, Throughout the United States.** Designed and installed more than 25 seepage monitoring systems at dams throughout the United States. The systems were installed to first identify areas where seepage was most extensive. These areas were repaired utilizing upstream blankets, grout curtains, or by other engineering methods. The monitoring systems were permanently emplaced so that the effectiveness of the mitigation measures could be evaluated and future changes in seepage could be identified quickly.

**BP Pipelines, De-watering Projects, Los Angeles California.** Designed and implemented several de-watering projects for the BP Pipelines organization. On these projects, shallow water was expected to be encountered during the construction of new pipelines. Prior to construction, a hydrologic assessment was conducted and estimates of groundwater flow and quality were made. From this assessment, de-watering wells were installed and the system began pumping. Construction began with no problematic water encountered. The de-watering wells were sampled for water quality and depth to water throughout the operational period. After construction was finished, the de-watering wells abandoned according to State and Local regulations.

**Army Corps of Engineers, Seepage Investigation, San Joaquin River Delta** Conducted a pre- and post-dredging geophysical investigation along the northern levee of Mandeville Island. The purpose of the investigation was to assess whether the dredging operations had a negative effect on the integrity of the levee structure. The results on the investigation noted several areas where seepage did in fact increase following the dredging process. The ACOE made repairs to the identified areas and the survey was repeated to evaluate the effectiveness of the repairs.

**Plains All-American Pipeline L.P., De-watering Investigation – Pier 400, Long Beach California.** Plains All American Pipeline, L.P. (Plains) planned to construct and operate a deep-water crude oil marine offloading facility on Pier 400. In addition, Plains planned the construction of a tank farm, and a pipeline distribution system. All proposed construction was on property owned by the Port of Los Angeles (POLA). Ground water was expected to be encountered within the 30 bore and receiving pits used to facilitate the installation of 7.5 miles of underground piping and other structures. These pits would extend to depths of up to 40 feet below ground surface. The objectives of the dewatering study were to: Estimate depth to groundwater and tidal influences on groundwater levels within the study area; Estimate groundwater flow rates necessary to dewater the bore and receiving pits during construction activities; Assess groundwater quality at the locations of the bore and receiving pits during construction dewatering activities, and; Provide recommendations for dewatering system design, and treatment and disposal of groundwater extracted during construction dewatering activities.

#### **Litigation Support**

**Niagara Bottling LLC, Litigation Support, Orange County, California.** Provided expert witness services for a water bottler located within Orange County, California. Prepared reports, exhibits and depositions in preparation for trial. Opposition withdrew case following deposition.

**Clyde Baker Jr., Baker VS the US Government, Litigation Support, California.** Assisted with the preparation of materials, data analysis, exhibits and field data collection for an agricultural corporation north of Sacramento, California to assist the Client in the winning of their case. Following the winning of this trial, several other cases were brought up and won for multiple farmers in Central California.

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## **Environmental Site Assessments (ESAs)**

**RSR Corporation, Environmental Site Assessment, City of Industry, California.** Perform Phase I and Phase II assessment of a battery lead recycling facility in the City of Industry. Program consisted of assessing the facility, installation of monitoring wells and Quarterly sampling. Process was overseen by the Regional Water Quality Control Board and Client was able to eventually obtain site closure.

**Molycorp, Inc., Site Environmental Assessment, Mountain Pass, California.** Responsible for the supervision and technical oversight of environmental investigations. Assessments included: geohydrologic mapping, installation of monitoring and recovery wells, groundwater modeling, and surface geophysics at multiple large mining facilities. Provided technical support to the client through reviewing technical work products by various consultants. Negotiated with the Regional Water Quality Control Board regarding workplans and forward planning.

**Browning-Ferris, Industries., Landfill Investigations, Multiple Locations throughout United States.** Investigated more than 10 existing landfill sites for leachate migration. Designed and oversaw the installation of leachate monitoring systems and early warning systems. Dealt with the regulatory boards permitting issues.

**Lockheed Martin, Cross-Contamination Program, Glendale/Burbank, California.** Managed a cross-contamination program in the Glendale-Burbank area. Operator had constructed monitoring wells across multiple aquifers. Using geophysics, Client was advised how to repair/modify the well construction to eliminate the vertical cross-flow occurring between aquifers.

**Eagle Mountain Landfill, Geohydrologic Environmental Investigation, Riverside County, California.** Managed the geohydrologic investigation of a large proposed landfill in Riverside County. The project was within a complex fractured bedrock setting. Investigations included detailed mapping, installation of over 50 monitoring wells, geophysical investigations of the basin (over 20 square miles), prepared the ROWD, worked under a high level of regulatory scrutiny from the US EPA and California Regional Water Quality Control Board. Project contained many technical hurdles and necessitated "thinking-outside-the-box". This project was the inspiration for designing and application for patent to utilize downhole images for determining fracture trends.

**British Petroleum, Site Environmental Assessment, Carson Refinery, Los Angeles, California.** Project focused on the LNAPL plume investigation of the North Tank Farm region of the refinery. Types of work performed included groundwater modeling, monitoring well installation, regulatory interaction with the Regional Water Quality Control Board and California EPA.

## **Professional associations**

Groundwater Resource Association  
National Ground Water Association  
American Water Works Association

### **Training and certifications**

Interpretation of Geophysical Logs  
Geochemical Prospecting for Ore Deposits  
Submersible Pump Problems and Repair  
OSHA 40-hr HAZWOPER Training  
OSHA 10-hr Construction Training  
OSHA 8-hr Refresher  
OSHA 8-hr Manager/Supervisor  
H<sub>2</sub>S Training  
Smith System Defensive Driving  
Red Cross CPR and First-aid Training  
RSO Training  
TWIC Security  
CDPH Water Treatment Operator Grade III  
CDPH Water Distribution Operator Grade IV (pending)

### **Technical specialties**

Groundwater & Soil Subsurface Investigation  
Natural Resources Management  
Program Management  
Project Support & Consulting  
Water Resources Management  
Water Supply Permitting & Development