

Robert M. Gailey, P.G., C.H.G.

Principal Hydrogeologist

Summary

Mr. Gailey has 28 years of experience on a wide range of projects in the field of hydrogeology. In the process of conducting projects throughout much of the United States, he has conducted site investigations ranging from preliminary site assessments to remedial investigations, negotiated with regulatory agencies for closure of contaminated sites as well as operation of municipal supply wells, provided critical review of technical documents, prepared written and verbal arguments for litigation and cost allocation, evaluated strategies for capture of groundwater solute plumes, designed and implemented remedial actions, assessed the effectiveness of ongoing groundwater remediation programs, mapped aquifers and assessed conditions for water supply development, performed water supply well siting evaluations, assessed water supply well conditions and performance, evaluated potential effects of well-field operations on water rights for adjacent parcels, and evaluated potential impacts on groundwater supplies related to groundwater contamination and proposed land development. This work has been conducted in accordance with local and state requirements, and federal requirements (CERCLA, RCRA, and SDWA) as administered by both state and federal agencies. Many of the hydrogeologic evaluations have been performed at scales that range up to basin-wide analysis.

For remediation and wastewater projects, Mr. Gailey has worked on both active and inactive industrial and commercial facilities where both organic constituents (petroleum, semi-volatile organic compounds [SVOCs], and volatile organic compounds [VOCs]) and inorganic constituents (heavy metals, nitrate, perchlorate, total dissolved solids [TDS], and tritium) have been present. The types of industries involved include agriculture (dairy and crop), airline, banking, barrel processing, chemical, defense, dry cleaning, electronics, food processing, flare manufacturing, insurance, machining, mining, petroleum (retail, storage, and refining), real estate, steel, trucking, waste disposal, and wood treatment. In addition, he has performed review and analysis for law firms and government agencies (Army Corps of Engineers [ACE], Department of Energy [DOE], Environmental Protection Agency [EPA], and Washington Department of Ecology). This work has involved hydrogeologic evaluation, modeling, statistical and other data analysis, and database management. The purposes of this work have included characterizing site conditions, predicting exposure point concentrations, developing remedial designs, evaluating ongoing remedial effectiveness, and performing comparative data analyses to meet various project needs.

For water supply projects, Mr. Gailey has worked on both municipal and rural facilities. The industries served include private and municipal water supply, agriculture, food processing, hospital, hotel, and mining. This work has involved hydrogeologic evaluation, well siting and performance evaluation (step discharge, pumping and wire-to-water tests), flow and concentration profiling (under pumping and static conditions using both spinner logs and the U.S. Geological Survey [USGS] dye tracer approach) water quality impact assessment (arsenic, bacteria, nitrate, pesticides, TDS, uranium and VOCs), feasibility testing for well modification, modeling, database management, economic and optimization analysis, and preparing construction and equipment specifications. The purposes of this work have been included developing and rehabilitating municipal and other water supplies, enhancing well field operations, and managing groundwater resources.

Project Experience

- Provides technical analysis related to hydrogeologic aspects of projects. Issues for analysis include hydraulic analysis for water supply and construction projects, water supply assessment, the distribution and migration of constituents of concern in groundwater, benefits of naturally occurring biodegradation, remediation system performance, and environmental impact assessment under the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA).
- Provides testimony, technical counsel, and support for regulatory negotiations and litigation involving 1) groundwater/soil cleanup and cost allocation related to serial and adjacent tenancy of commercial, industrial, and retail parcels and 2) conflicts over water resources. Has prepared expert reports and material for interrogatories and declarations, participated in the meet-and-confer process and settlement discussion, developed case strategy under the client-attorney confidentiality umbrella, briefed expert witnesses on technical aspects of cases, and provided deposition testimony.

Water Supply Assessment and Service

- Serving as Technical Lead evaluating the source of PCE in a municipal water supply well located in the Central Valley of California. Vertical flow and concentration profiling (USGS dye tracer approach) under ambient (non-pumping) conditions has been performed and profiling under dynamic (pumping) conditions is planned. The goal of the project is to modify the well and improve water quality at the wellhead.

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Project Experience – *Water Supply Assessment and Service (cont.)*

- Serving as Technical Lead for ongoing supply well water quality evaluations at various locations throughout California. At issue is whether pumping operations and the well screens can be modified to reduce constituent concentrations (i.e., arsenic, manganese, nitrate, TDS, uranium and VOCs) to below drinking water standards. Vertical flow and concentration profile data are often collected from the wells using miniaturized tools so that the pumps do not have to be removed (USGS dye tracer approach). Data collection plans are developed to, among other things, account for uncertainty in pump intake depths, maximize information value and minimize the impact of any data collection uncertainties. For projects where evaluation results indicate that modifications may improve water quality, feasibility testing is performed and, as appropriate, recommendations for final modification of operations and facilities are provided. Management, or support as appropriate, of fieldwork is provided throughout the projects.
- Serving as Technical Lead performing analysis and construction tasks related to rehabilitating and modifying a water supply well for a disadvantaged community located in the Central Valley of California. The goal of the project is to reduce nitrate concentrations at the wellhead. Project work includes preparing technical specifications as well as conducting construction inspection, vertical flow and concentration profiling (USGS dye tracer approach), feasibility testing data analysis.
- Providing technical support to a public utility district regarding data collection and analysis for establishing baseline hydrologic conditions in a small groundwater basin located on the Central Coast of California. The work is being performed to support interest in developing the water resource. Project work has included installing water level and barometric transducers, training district staff regarding transducer maintenance and data retrieval, and data analysis related to evaluating safe yield for the basin
- Serving as Technical Lead to provide technical specifications and construction inspection support for the rehabilitation of four municipal water supply wells located in the Central Valley of California. The work is being performed subsequent to an initial evaluation of ten wells (specific capacity testing, progressive-volume water quality sampling, and video inspection without removing the vertical turbine pumps). The wells have not been rehabilitated within the past 40 to 60 years, and the removal of significant amounts of calcium carbonate scaling is necessary to increase the specific capacities of the wells. Space and wastewater discharge limitations are particular challenges being addressed to successfully complete the project. Particular attention has been given to balancing the benefits of improving hydraulic performance of the wells against the potential costs of damaging the aged wells. Thus far, spinner log and specific capacity testing conducted before and after the rehabilitation work have quantified performance increases in specific capacity of as much as 30 percent.
- Serving as Technical Lead to provide technical specifications and construction inspection support for the rehabilitation of four municipal water supply wells and pumps located in the Central Valley of California. The wells have not been rehabilitated within the past 20 years, and the removal of calcium carbonate and iron oxide scaling as well as bacterial mass is necessary to increase the specific capacities of the wells. Because the municipality relies heavily on the groundwater portion of its water supply, the project is being phased so that the construction activity does not impede the municipality's ability to meet demand. Thus far, spinner log, specific capacity and wire to water testing conducted before and after the rehabilitation work have quantified performance increases in specific capacity of 16 percent and plant efficiency of 32 percent.
- Serving as Technical Lead for evaluating potential hydraulic manipulation evaluation of a municipal water supply well located in the Central Valley of California. The focus of the work is to reduce nitrate concentration at the wellhead by changing how the well draws from strata that contain varying concentrations of nitrate. Vertical flow and concentration profiling data from the well (USGS dye tracer approach) were considered in order to identify a design strategy that would allow the well to be brought back on-line without the use of expensive wellhead treatment. The design strategy entailed well screen modification. Field testing of the design concept entailed step-discharge testing, sequential discharge sampling and packer testing in order to evaluate the potential improvement to water quality and decrease in production capacity associated with the chosen well screen modification design. The testing results proved that well modification will be sufficient to address the water quality issue and no treatment system will be required. Current project activities involve finalizing the well modification.
- Provided technical consultation related to bringing a new municipal water supply well online in the Central Valley of California. At issue were bacterial concentrations (total coliform and heterotrophic plate counts). Extended purging, chlorination and cycle testing resulted in approval from the Department of Public Health for bringing the well online.

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Project Experience – *Water Supply Assessment and Service (cont.)*

- Served as Technical Lead to perform an analysis for a county water management agency in northeastern California that determined the applicability of alternative monitoring approaches for compliance with the California Statewide Groundwater Elevation Monitoring (CASGEM) program. Six basins were evaluated and a report consistent with California Water Code requirements was prepared within five weeks to meet a client deadline. The report, first in the state to be accepted by the California Department of Water Resources (DWR), was finalized with only minor revisions after review by the DWR.
- Provided technical review of a draft Environmental Impact Statement prepared in accordance with NEPA for a proposed shale gas hydraulic fracturing project to be performed in a western state. At issue were a variety of concerns related to impacts upon water quantity and quality.
- Served as Technical Lead for an expedited review of well and pumping system conditions for four municipal supply wells located in the Central Valley of California. Issues of interest were 1) reduced production rates over time and 2) potential improvements in water quality through well modification in order to avoid the use of treatment systems. Miniaturized equipment was used to video log the wells in order to perform an initial assessment of well and pumping system condition. The pumps in all four wells were further evaluated by performing wire-to-water testing. Three of the wells were further evaluated by performing flow and concentration profiling (USGS dye tracer approach). The constituents of potential concern were arsenic, uranium, manganese and TDS. The findings were that 1) reduced production rates had resulted from both pump wear and well screen fouling and 2) well modification likely would not significantly improve water quality. The field work and reporting was completed in just under four weeks to meet this client's schedule requirements.
- Provided consultation related to increasing the water supply for a medical facility in northern California. The initial task was to review water development efforts in a limited-access area that had been unsuccessful and to recommend additional efforts in the same area. After reviewing the available information and performing field reconnaissance of the subject area, an alternative course of action was identified. The alternative approach to water development was based upon making a connection, previously missed by others, between pieces of information related to the groundwater availability and pumping system capacity. Once limited pumping capacity was identified as the primary issue, additional work in the remote access area was avoided and a significant water supply was readily developed.
- Served as Technical Lead for evaluating potential hydraulic manipulation of a municipal water supply well located in southern California east of Los Angeles. The focus of the work was to reduce arsenic concentrations at the wellhead by changing how the well draws from strata that contain varying concentrations of arsenic. Vertical flow and concentration profiling data (USGS dye tracer approach) from the well were considered along with other water supply system information in order to identify a design strategy that would allow the well to be brought back on-line without the use of expensive wellhead treatment. The design strategy included a combination of well screen modification and blending of the well discharge with that from two other wells. Field testing of the design concept entailed step-discharge testing, sequential discharge sampling and packer testing in order to evaluate the potential improvement to water quality and decrease in production capacity associated with the chosen well screen modification design. In this case, it was established that the site hydrogeology did not support successful well modification.
- Served as Technical Lead for evaluating the potential to hydraulically manipulate a municipal water supply well located in the Central Valley of California. The constituent of concern was arsenic. Vertical flow and concentration profiling data (USGS dye tracer approach) were collected. No additional work related to well modification was performed since it was determined that the distribution of arsenic concentrations in strata located along the well screen was not conducive to well modification.
- Served as Technical Lead for a groundwater supply management analysis for a city in the Central Valley of California. The purpose of the project was to evaluate current production operations and suggest operational guidelines and facility modifications to both maintain required production and protect water quality from a variety of constituents (nitrate, uranium and VOCs).
- Served as Technical Lead for developing an irrigation supply well for an athletic park in a coastal area of northern California. Issues considered included well siting, design and yield, and potential water quality impacts from a nearby municipal wastewater treatment facility. An opinion on the potential affects on the groundwater system with respect to production potential and water quality was also prepared for use in a CEQA analysis.

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Project Experience – *Water Supply Assessment and Service (cont.)*

- Served as Technical Lead for a water supply well source area contamination assessment in the Central Valley of California. The sources and migration pathways related to nitrate and other potential contaminants were evaluated through 1) property and well records review, 2) focused well sampling and 3) isotopic analysis to evaluate the age of water pumped from different screened intervals (USGS dye tracer approach) in the municipal well and fingerprint the source of contamination. The purposes of the assessment were to provide information for 1) designing a wellhead treatment system, 2) addressing groundwater cleanup needs and 3) negotiating with the responsible party (RP) and the Central Valley Regional Water Quality Control Board (RWQCB).
- Served as Technical Lead for a hydrogeologic evaluation of water supply development potential in a basin located near the Central Coast of California. Factors considered included geologic formation and structure of water-bearing strata, groundwater flow patterns, existing well yields, water quality distribution patterns and trends, and hydrogeologic conditions specific to the parcel considered for development. Because the basin was not in a state of overdraft, recommendations were made for site-specific investigation of the parcel.
- Served as Technical Lead for a water quality impact analysis in support of regulatory negotiations regarding plans for increased groundwater pumping by a growing community in the Central Valley of California. At issue was whether additional deep pumping would degrade water quality by causing shallow nitrate contamination to migrate downward in significant quantities. The available data were reviewed and historic conditions under which downward migration of nitrate had occurred were identified. This information suggested that the increased pumping would not cause water quality degradation. Technical negotiations with the State Water Board were conducted and a limited amount of additional hydrogeologic data was collected. The collected data corroborated the original findings and the plans for increased pumping were approved.
- Provided technical review for a hydrogeologic impact assessment of dewatering related to expansion of gravel mining operations in the Central Valley of California. The review entailed comparing the results of two different groundwater modeling studies, explaining differences in results of the two studies, and evaluating these differences within the context of potential impacts to the local groundwater system.
- Served as Senior Hydrogeologist for the preparation of a State loan application/workplan to conduct a feasibility study for supplementing a municipal groundwater-based drinking water supply in the Central Valley of California. The workplan included tasks related to modeling groundwater recharge and wellfield operations, and groundwater management planning under the Groundwater Management Act.
- Served as Senior Hydrogeologist and Project Manager on a water well rehabilitation and maintenance project for a water purveyor in northern California. The initial focus of the project was to develop and implement a course of action to rehabilitate under-performing wells. The second focus of the project was to develop and implement a long-term plan for preserving efficiency and extending the lives of satisfactorily-performing wells by considering the economic life expectancy of each well and specifying data collection requirements for tracking performance. This information was managed using database and economic analysis software.
- Served as Senior Hydrogeologist Project Manager for the rehabilitation of a municipal water supply well in northern California. Services included developing specifications for both chemical/mechanical rehabilitation of the well screen and installation of a new pumping system that was compatible with an existing variable-frequency drive.
- Served as Project Manager and Senior Hydrogeologist for a new well and reservoir siting study conducted for a municipality in northern California. The goal of the project was to identify viable sites for the new facilities from the list of surplus city-owned lands. Issues considered included aquifer characteristics, proximity to groundwater contamination, proximity to existing facilities, potential for well interference, site suitability for aboveground facilities, aesthetics, and other criteria.
- Served as Project Manager on the design of pumping and transmission facilities for two new municipal water supply wells on the Central Coast of California. Services included developing equipment and construction specifications, and providing construction and system startup inspection. Timely completion of the project allowed the client to apply for project cost reimbursement from Federal funds.

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Project Experience – *Water Supply Assessment and Service (cont.)*

- Provided consultation regarding the rehabilitation needs of a municipal water supply well located in the Central Valley of California. Services provided included consulting with the client on issues that arose during field implementation of the rehabilitation measures.
- Served as Senior Hydrogeologist for an electronics manufacturing facility siting assessment in western Mexico. Issues related to the quality and reliability of the water supply for the proposed site were considered as part of the assessment.
- Served as Senior Hydrogeologist for assessing conditions for developing a groundwater supply for a fruit processing facility located in the northern Central Valley of California. The local groundwater quality was poor, and a well was designed to maintain efficiency and integrity under anticipated use scenarios. Requirements for the well installation and related water treatment system construction were specified in accordance with the California Department of Health Services Office of Drinking Water.
- Developed and installed groundwater and surface water level measurement instruments for a watershed monitoring project in southwestern Mexico. The work was part of a larger malaria control research project.
- Evaluated potential impacts on groundwater supplies related to a proposed land development project on the Central Coast of California. Available hydrogeologic data were reviewed within the context of plans for groundwater withdrawal related to the development. Potential reductions in water availability were identified, and recommendations were made to further assess the degree of impact.
- Performed data collection and interpretation for groundwater resource evaluations in eastern South Dakota. Glacially derived aquifers were delineated and characterized in support of agricultural water supply development.

Wastewater

- Serving as Technical Lead for review and commenting on a draft Waste Discharge Requirements (WDRs) General Order issued by the Central Valley RWQCB regarding the Irrigated Lands Regulatory Program. Specific areas of contribution address potential problems with the proposed groundwater monitoring requirements given the local hydrogeology. Project deliverables to date have included presentation at a RWQCB workshop and a report of findings.
- Serving as Technical Lead related to renegotiation of WDRs for a cheese plant in southern California east of San Diego. The project is driven by changes in the wastewater stream. Tasks performed include 1) characterization of the wastewater quantity and quality, 2) preparation of a Report of Waste Discharge and a Nutrient/Salt Management Plan, and 3) contribution of various types of information and insights to support infrastructure modifications at the facility. Negotiation with the Colorado River Basin RWQCB on the WDR modification is in-process.
- Serving as Technical Expert reviewing and commenting on draft language for a General Order and WDRs regarding the Irrigated Lands Regulatory Program that has been prepared by the Central Valley RWQCB.
- Served as Project Manager for an environmental site assessment conducted on a 150-acre mixed-use/agricultural parcel located in the Central Valley of California. The purpose of the assessment was to facilitate acquisition of the parcel for expansion of wastewater land application operations at a food processing facility. Accordingly, the list of details for the assessment was expanded to address the intended use of the parcel.
- Served as Technical Lead for planning and analysis related to technical and regulatory aspects of performing surface and groundwater drainage in a coastal area of northern California. Issues considered include potential rates of drainage, surface water quality, septic discharges and permissible ocean discharges.
- Served as Technical Lead related to renegotiation of WDRs for a dairy in southern California east of San Diego. The project was driven by changes in both the wastewater stream and the lands to which the water would be discharged. Tasks performed include 1) completion of a water use audit that resulted in a 40% reduction in wastewater production, 2) preparation of a Nutrient Management Plan and an Engineered Wastewater Management Plan that were accepted by the RWQCB in initial form, 3) contribution of various types of information and insights that supported infrastructure modifications at the facility, and 4) expedited negotiation with the RWQCB on the WDR modification.

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Groundwater Modeling and Optimization Analysis

- Served as Technical Lead for a prospective performance evaluation of a new wastewater storage pond liner technology proposed at a dairy in the Central Valley of California. Information on site conditions and planned pond design were used to construct a groundwater flow and transport model. A range of estimated seepage rates through the liner were simulated with the model in order to evaluate potential impacts to shallow groundwater quality. The evaluation was used to finalize construction requirements and permitting details for the new wastewater pond.
- Served as Technical Lead for a probabilistic cost analysis regarding the remediation of a commercial property in the Central Valley of California that was impacted by chlorinated volatile organic compounds. Site conditions were somewhat uncertainty because only preliminary characterization of soil, soil gas and groundwater had been performed. The set of tasks required to perform the cleanup were identified and cost ranges were estimated based upon the existing uncertainties. A Monte Carlo analysis was performed to evaluate the range in total project cost and the probabilities of occurrence for costs within the range. The results provided a cost-benefit basis for the potential purchaser of the property to make decisions regarding site management.
- Served as Technical Lead for sea water intrusion and groundwater/surface water interaction modeling studies. The work considered past and potential future effects of groundwater extraction for irrigation upon flow and water quality in a river and estuary on the Central Coast of California. Technical aspects of this work were assessing buried channel geometry and hydraulic properties from the wide range of available data, and evaluating the simultaneous effects of groundwater pumping and spring tide occurrence. Detailed transient models that included several river reaches and hourly tidal variations were created based upon previously available information and data collected for this project. The work was used to support negotiations with the California Department of Fish and Game and, ultimately, hearings at the State Water Resources Control Board.
- Served as Technical Lead for flow and transport modeling conducted to evaluate the source of nitrate contamination to a municipal water supply well located in the Central Valley of California. The model was calibrated using the results of 1) a 30-day pumping test and 2) flow and concentration profiling performed on the impacted municipal supply well. Important aspects of the modeling were 1) simulating the contaminant plume response to different historical pumping periods and 2) including the effects of a nearby improperly constructed water supply well that acted as a vertical conduit.
- Served as Technical Lead for hydrogeologic analysis and development of software for the prediction of groundwater quality impacts resulting from operations at a northern California facility. The software used historic and projected facility operations to predict sourcing and migration of tritium in groundwater. A flow and transport code was developed to simulate advection, dispersion, decay and other processes particular to the site that are not included in standard modeling packages (in-place constituent mass creation and rate-limited mass transfer at multiple spatial scales). Once calibrated, the model was used to evaluate the impacts of various future operations scenarios within the context of making facilities management and regulatory negotiation decisions.
- Served as Technical Advisor for modeling performed in support of a feasibility study regarding groundwater cleanup in the Central Valley of California. Flow and transport modeling were performed to evaluate contaminant plume movement under different remedial pumping scenarios. Of particular importance in this work were the effects of many water supply wells located near the plume and flows between vertically adjacent water-bearing zones.
- Served as Technical Lead for a study that developed conjunctive use strategies and wellfield operational rules related to meeting future municipal water supply requirements of a growing community in the Central Valley of California. The project entailed developing a groundwater flow model that included 1) the operations of wellfields run by two adjacent communities and 2) groundwater-surface water interactions. Once calibrated, the model was linked to optimization tools in order to cost effectively evaluate a range of operational scenarios. At issue was how to meet projected higher demands without mobilizing contaminants (naturally occurring total dissolved solids and two plumes containing VOCs and pesticides) that would result in increased future treatment costs. Results of the study included wellfield operations guidelines, suggested maximum extraction schedules, and proposed coordination of wellfield operations by the two adjacent communities. The model was extended in time and recalibrated four years later. Future plans are to use the model as part of water supply planning for city expansion.

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Project Experience – *Groundwater Modeling and Optimization Analysis (cont.)*

- Served as Technical Lead on a groundwater management study performed to support remedial design for a landfill site in Arizona. Remedial designs necessary to accommodate Groundwater flows resulting from present and future water supply management practices were evaluated with a groundwater model developed for the project. The goal of the work was to develop designs that were both economically viable and able to contain the leachate plume as water supply pumping and basin recharge practices changed.
- Served as Senior Hydrogeologist for a feasibility study and remedial action at an industrial site in the Central Valley of California. The project was reviewed by the California Department of Toxic Substances Control (DTSC) and entailed hydrogeologic analysis and groundwater modeling to mitigate impacts to a water supply wellfield by VOCs. Evaluating and implementing wellhead treatment as the remedial approach entailed accounting for both seasonal variations in wellfield pumping demand and economic constraints on performance of the project. Use of automated/optimization techniques for assessment of design options streamlined the modeling process and reduced project expenditures. The work also included developing a cost-effective monitoring program for the remedial action.
- Served as Senior Hydrogeologist for a remedial action at a decommissioned research facility located in northern California. The project was reviewed by the EPA, DTSC, and the Central Valley RWQCB. It included hydrogeologic analysis and modeling to mitigate impacts to groundwater and nearby irrigation supply wells by VOCs, and litigation support. This work supported preparation of an Engineering Evaluation/Cost Analysis and an Interim Remedial Action, and favorable settlement of the litigation matter. The work also included an assessment of rehabilitation needs for injection wells used in the remedial action.
- Served as Technical Lead for an assessment of potential VOC, SVOC and metals concentrations in groundwater at an industrial facility located in northern California. The project, reviewed by the EPA, DTSC, and National Oceanic and Atmospheric Administration, entailed modeling groundwater transport of constituents of potential concern and mixing of the constituents with surface waters. The concentration predictions were used to support performance of ecological and human health risk assessments.
- Served as Technical Lead on a groundwater supply management study for a mining operation located in the western United States. The focus of the project was exploring options for both meeting water production requirements and capturing impacted water while accounting for restrictions related to water rights and well/transmission line capacity limits. Use of automated/optimization techniques for assessing options streamlined the process and allowed a more detailed study to be conducted with a limited budget.
- Served as Technical Lead for an evaluation of groundwater drainage rates and volumes resulting from a planned tunnel construction project in the Sierra Nevada of California. A spreadsheet model was constructed to simulate transient drainage from fractured host rock surrounding the planned tunnel construction. Best- and worst-case estimates of the drainage rates and volumes were prepared to support plans for removal of suspended solids from the water prior to discharge.
- Provided consultation regarding the feasibility of modeling groundwater flow and solute transport in an alluvial valley located in the western United States. Flow in the valley has been increasingly influenced by water supply pumping. Key elements for conducting the assessment were development of a complete conceptual model of how groundwater flow patterns have changed over time, and identifying a viable approach for model calibration.
- Served as Senior Hydrogeologist to develop a remedial approach for an industrial site in Nevada impacted by chlorinated VOCs. Groundwater modeling was used as a planning tool for phased implementation of a pumping system to address remediation requirements for the 7,000-foot-long plume. The plume was present throughout the saturated alluvium in a small valley, and viable remedial pumping designs are highly sensitive to available drawdowns and potential dewatering. Use of automated/optimization techniques for model calibration and design development streamlined the modeling process and reduced project expenditures.
- Supported development of technical strategy and provided senior review for groundwater modeling performed for remedial investigation/feasibility study and litigation tasks related to a site in Oregon impacted by chlorinated VOCs. Hydrogeologic analysis involved accounting for the effects of nearby water supply well pumping on VOC transport in the vicinity of the site. Automated/optimization techniques were developed and demonstrated to streamline the modeling process.

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Project Experience – *Groundwater Modeling and Optimization Analysis (cont.)*

- Evaluated an optimization model for cost-effective disposal of dredging wastes for potential application to San Francisco Bay. The evaluation was performed for the ACE. Methods were developed for applying the model to problems that included constraints imposed by environmental regulations. A result of the evaluation was the determination that increased permitting fees might not change disposal patterns within the Bay.
- Analyzed transient hydraulic head data collected during soil boring to estimate the hydraulic conductivity and potential solute migration rates for a petroleum site in Oregon. The analysis entailed developing a mathematical model for assessing slug test data in a three-dimensional flow field. Performance of the analysis reduced project costs by providing migration rate information without installation of monitoring wells.
- Conducted a modeling study for the DOE to determine the effect of spatially variable solute adsorption on groundwater solute concentration predictions. This included use of statistical techniques to increase the reliability of the transport predictions. These techniques have recently been used on other projects to defend conclusions that are based upon model predictions.
- Developed pump-and-treat designs for capturing organic and heavy metal compounds at an impacted groundwater site in Canada. The design involved development of a site-specific model of groundwater flow and solute transport for prediction of exposure point concentrations and application of optimization techniques for developing designs. The designs involved minimum capital and recurring remediation costs. Reliability of concentration predictions upon which the designs were based was demonstrated through application of statistical techniques.

Modeling, statistical analysis, and database management tasks performed by Mr. Gailey on many of the above-referenced projects have entailed use of software including Groundwater Vistas, MODFLOW, MODPATH, MT3D, SEAWAT, RT3D, MOC, Bioscreen, Bioplume II/III, SUTRA, PEST, LINDO, STARPAC, GEOEAS, NPSOL, AQMAN, Visual MODFLOW, GMS, ModelCad and GIS/Key.

Groundwater Remediation

- Provided technical support on subsurface characterization, modeling and reporting for a solvent contamination site in southern California. Much of the work focused on addressing technical challenges posed by the hydrogeologic setting (structurally deformed, fractured sedimentary rock). The project included significant scientific contributions in the areas of field characterization and groundwater flow modeling.
- Served as Principal Hydrogeologist for ongoing remedial action at an industrial site located in northern California. The project entailed conducting remedial activities (groundwater and soil vapor extraction) and monitoring progress toward cleanup for a multiparty, subregional plume of chlorinated VOCs. Reporting and interaction with the San Francisco Bay RWQCB involved completing semi-annual Self Monitoring Reports. Recent activity also included conducting a Five-Year Remedial Effectiveness Evaluation. Documenting and emphasizing the effects of impediments to pump-and-treat and naturally occurring biodegradation were important aspects of this project with respect to limiting future remedial requirements.
- Served as Principal Hydrogeologist for ongoing remedial action at an industrial site located in northern California. The project entailed conducting remedial activity (groundwater extraction) and monitoring progress toward cleanup for a plume of chlorinated VOCs. Reporting and interaction with the North Coast RWQCB involved completing semi-annual Self Monitoring Reports. Other project work also included reassessment of the hydrogeology and the approach to groundwater extraction with the goal of increasing project efficiency.
- Served as Principal Hydrogeologist for evaluating the results of shutting down a groundwater extraction system at an industrial site located in northern California. The San Francisco RWQCB approved remedial system shutdown on a temporary basis because (1) on-going pump-and-treat efforts had resulted in only limited progress toward attaining remedial goals and (2) there was evidence that naturally occurring biodegradation may have prevented plume migration. The project entailed evaluating the groundwater data (elevations as well as VOC and inorganic water chemistry) for pre- and post-shutdown periods. A convincing case for VOC degradation was made based on spatial data trends. A case for plume stabilization was also been made based on temporal data trends. Accounting for the effects of concentration rebound after pumping and plume migration from the source area was an important consideration for future site monitoring in order to assess whether the plume front was stable.

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Project Experience – Groundwater Remediation (cont.)

- Served as Principal Hydrogeologist for proposing monitored remedial system shutdown at an industrial site in northern California. The proposal to the North Coast RWQCB included a workplan for collecting the necessary groundwater data to demonstrate the effects of naturally occurring biodegradation of VOCs in groundwater.
- Served as Principal Hydrogeologist for ongoing remedial action at an industrial site located in northern California. The project entailed enhancing remedial activities (groundwater and soil vapor extraction) for a plume of chlorinated VOCs. Reporting and interaction with the DTSC involved conducting expedited conceptual and engineering design for expansion of a remedial system. Plans were also been developed for collecting data to document the potential effects of naturally occurring biodegradation in order to limit future remedial requirements. This work was conducted within the context of negotiating a Prospective Purchaser Agreement for an adjacent parcel that was impacted by the plume.
- Served as Principal Hydrogeologist for ongoing remedial action at an industrial site located in northern California. The project entailed conducting remedial activity (groundwater extraction) and monitoring progress toward cleanup for a specific site within a multiparty, subregional plume of chlorinated VOCs. Reporting and interaction with the EPA involved semi-annual Self Monitoring Reports. Recent activity also included reevaluating measures for maintaining a site-specific capture zone given that remedial activities were also occurring on adjacent sites.
- Served as Lead Hydrogeologist for remedial action design related to petroleum-impacted groundwater near residential water supply wells in central California. The constituents of concern included MTBE, and the Central Valley RWQCB conducted a detailed review of the Remedial Action Plan. The potential effects of residential well pumping were factored into the remedial pumping design so that containment of the constituents of concern was achieved and the water supplies were protected.
- Served as Senior Hydrogeologist for a fate and transport analysis related to petroleum-impacted groundwater near residential water supply wells in Alaska. The effects of naturally occurring biodegradation were incorporated into the analysis and supported the conclusion that risk to the water supplies was low.
- Served as Senior Hydrogeologist for a remedial investigation and action at an industrial facility in central California. The project was reviewed by the Central Valley RWQCB. It included hydrogeologic analysis, historical review, and negotiation to define remedial action requirements and allocate responsibility among responsible parties.
- Served as Project Manager and Senior Hydrogeologist for a subsurface investigation of an air cargo facility at the San Francisco International Airport. The project was reviewed by the RWQCB and parties involved in cost allocation for cleanup of petroleum-impacted groundwater and soil. Evaluation of subsurface impacts and recommendation of future actions was conducted within the context of maintaining current business activities at the site and deferring any intrusive remedial activities until an appropriate time in the future.
- Served as Senior Hydrogeologist for a landfill closure in Mexico City, Mexico. Tasks performed included acquiring data on potential leachate production rates and recommending design parameters for a leachate collection system. Collection of the leachate was required to facilitate the next step of the closure, extraction of accumulated landfill gas.
- Served as Senior Hydrogeologist for a five-year review and remedial effectiveness evaluation of a groundwater cleanup operation in northern California. The project entailed evaluation of remedial performance data for six groundwater extraction systems installed in alluvial sediments and was reviewed by the San Francisco RWQCB. Key points considered during the evaluation were hydraulic containment of the chlorinated VOC groundwater plume, cumulative removal of groundwater and VOCs, VOC removal efficiency, offsite sources of VOCs, and the potential for attaining cleanup goals set by the RWQCB. Presentation of the project findings positioned the client well for negotiation on further remedial actions.
- Provided technical/economic analysis and technical review for remedial investigations/ feasibility studies involving three industrial sites owned by a single client in southern California. The work was performed under the review of the DTSC. Project findings were used to develop estimates of cleanup cost and facilitate completion of real estate transactions for the benzene-impacted properties. Detailed evidence of naturally occurring biodegradation was developed and used to limit the extent of cleanup measures that were considered.

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Project Experience – Groundwater Remediation (cont.)

- Served as Senior Hydrogeologist for a remedial investigation conducted at a commercial site in northern California. The investigation was performed under review of the San Francisco Bay RWQCB. Communication with the RWQCB on technical aspects of the investigation prior to commencing work positioned the client well for negotiations on further investigative requirements. The option for cost recovery was developed by maintaining consistency with the National Contingency Plan during the remedial investigation and interim remedial action, and by presenting arguments for the presence of off-site sources of chlorinated VOCs. Potential off-site source areas were identified, and arguments for requiring subsurface investigation by neighboring parties were supported through an analysis of site hydrogeology and migration potential. The arguments were presented and defended to the RWQCB. The ultimate goal of this effort is to identify other parties also responsible for the cleanup so that costs may be shared.
- Served as Project Manager and Senior Hydrogeologist for a soil and groundwater remedial investigation/feasibility study and an ecological river assessment conducted at a decommissioned wood treatment facility in Michigan. Creosote was present at the facility as a dense nonaqueous phase liquid. Negotiations with state regulatory agencies were key to successfully limiting the scopes of the investigations. Early data review allowed expeditious performance of the site characterization and development of a risk assessment strategy that both met regulatory requirements and was protective of client cleanup liability. The quality of the site characterization work contributed to the cooperative relationship between the client and regulatory agency, which reduced the potential for natural resource damage claims by the state.
- Performed remedial investigations and developed site closure arguments for petroleum sites in California, Florida, Massachusetts, and Rhode Island. The work in California was performed under the review of the Kern County Department of Environmental Health. Site closure arguments were accepted in all four states.
- Performed an emergency investigation, and designed, installed, and maintained a petroleum recovery system in response to a high-volume spill of diesel fuel into the subsurface at a commercial site in Massachusetts. Implementation of interim petroleum recovery measures minimized petroleum migration away from the source area. During the first year of recovery system operation, 25,000 gallons of fuel were recovered. System enhancements were then made to maintain recovery rates. Project costs were defrayed by reuse of the recovered fuel.
- Designed, installed and maintained numerous petroleum and groundwater recovery systems in several states. This work also included evaluation of overall remedial effectiveness and the benefits of using groundwater infiltration systems to enhance petroleum recovery. Work in California was performed under review of the Central Valley RWQCB.
- Performed site assessments for real estate transactions involving retail petroleum, commercial, and industrial sites throughout California and Massachusetts. The assessment findings were used to facilitate completion of the transactions.

Litigation Support

- Recent cases in which Mr. Gailey has been declared as an expert:
 - RF Land Inc. v. City of Ripon (California) 2010
 - Raymond Coldani v. Jack Hamm and Patricia Hamm (Federal 2009)
 - NCH Corporation v. Hartford Accident and Indemnity Company, et al. (New Jersey) Deposition testimony in 2007
 - Union Bank of California v. Rheem Corp. (California), 2006
 - Pinal Creek Group v. Newmont Mining Corp., et al. (Federal – Arizona) Deposition testimony in 2003 and 2006
- Serving as a Technical Consultant regarding responsibility for VOC contamination of a municipal water supply well. The case is being heard in the California courts.
- Served as an expert witness regarding financial responsibility for nitrate contamination of a municipal supply well from an industrial facility in northern California. Contributions included planning both data collection from the impacted well and inspection of the industrial facility, as well as presenting findings during mediation. The case, filed in the California state court system, ultimately settled.

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Project Experience – *Litigation Support (cont.)*

- Served as an expert witness regarding responsibility for nitrate contamination of groundwater in the vicinity of a dairy in northern California. Work on the case, filed under the Clean Water Act in the California state court system, involved field investigation and analysis, mediation support and presentations, and preparing a technical declaration in support of a motion for recovery of attorney/expert fees and costs. The case was ultimately rescinded.
- Served as an expert witness regarding cost recovery and future apportionment among RPs for cleanup of a large acid mine drainage site in Arizona. The case involved several RPs active over almost a century and located throughout a mining complex, had been filed under CERCLA, and was heard in the federal court system. Expert analysis included a comprehensive consideration of the site hydrogeology and historic mining activities, and flow calculations (water budgets and mass balance assessments on surface water and groundwater flows, and three-dimensional groundwater flow modeling) to assess the relative contributions to the acid plume by various RPs. Video taped deposition testimony was given twice.
- Served as an expert witness regarding insurance coverage claims related to cleanup of a Superfund site. The case was filed under CERCLA and heard in the New Jersey state court system. Analysis and opinion development focused on hydrogeologic and regulatory factors that would influence the ultimate cost of the cleanup. Methods for incorporating uncertainty into the cost estimates was also addressed. Deposition testimony was given. Issues related to the above-referenced opinions were subsequently dropped from the case.
- Served as an expert witness regarding cost recovery for a former electronics manufacturing facility. The case was filed under CERCLA and heard in the California state court system. Analysis and opinion development focused on hydrogeologic factors that controlled both the duration of release to groundwater and the extent of subsequent off-site migration. The case settled before any testimony was given.
- Served as a consultant regarding a CERCLA claim for damages related to a release of contamination into a San Francisco Bay Area aquifer that serves a large population of individual well owners (residential and agricultural). The case, filed by a class of plaintiffs, involves releases from a single industrial parcel where multiple RPs operated over time and was heard in the federal court system. Consultation has included document review, quantitative analysis related to the extent of contamination and potential cleanup timeframe, mediation brief preparation, development of computer animation visual aids for mediation discussions, and presentation at mediation.
- Provided consultation for mediation of cleanup cost allocation for petroleum-impacted groundwater and soil at the San Francisco International Airport. The project involved research and strategy development focused on supporting negotiations with some twenty responsible parties.
- Provided consultation for legal defense against a claim concerning financial responsibility for contamination of residential and agricultural water supplies and soil. The case involved two adjacent parcels in northern California, was filed under CERCLA, and heard in the federal court system. Data analysis and discussions with attorneys focused on the plausibility of claims made by the plaintiff with respect to source area locations, site hydrogeology and migration potential of the constituents, and differences in signature assemblages of constituents present at each of the two sites. The case settled before any testimony was given.
- Provided consultation for legal defense against a claim concerning financial responsibility for petroleum and heavy metals present in soil and groundwater. The case involved two adjacent industrial parcels in northern California, was filed under CERCLA and heard in the federal court system. Data analysis and development of arguments focused on the plausibility of claims made by the plaintiff with respect to source area locations, site hydrogeology and migration potential of the constituents, and differences in signature assemblages of constituents present at each of the two sites. The arguments prepared supported successful opposition to motions made by the plaintiff for widespread inspection of the defendant's property, settlement discussions, and the defendant's motion for summary judgment. Prior to a settlement being reached, Mr. Gailey participated in settlement discussions and preparing the expert witness for trial.
- Provided consultation for legal defense against a claim concerning financial responsibility for petroleum contamination at two adjacent retail/industrial parcels in northern California. Data analysis and development of arguments focused upon the adequacy of previously implemented remedial actions for which the plaintiff sought compensation. The technical merits of written arguments developed for the defense resulted in the plaintiff's claim being rescinded prior to the case being heard in court.

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Project Experience – *Litigation Support (cont.)*

- Served as an expert witness for a defendant regarding a cost recovery claim concerning petroleum and chlorinated VOCs present in soil and groundwater. The case was filed under CERCLA and heard in the federal court system. It involved a single property in northern California, an initial owner-operator (the plaintiff), and a subsequent series of occupants (the codefendants). Data analysis and development of written arguments focused on both changes in the chemical composition of materials used for automotive fueling and repair between the 1940s and the 1980s, and the appropriate allocation of cost for site cleanup among the involved parties. Estimation of total cost for the cleanup was also performed. 1,2-Dichloroethane (DCA) was identified as a signature compound for releases to the environment that occurred before the codefendants occupied the site. Data collected by the plaintiff demonstrated that DCA was present across the property and supported arguments that the plaintiff was also responsible for the cleanup. The case settled before any testimony was given.
- Provided consultation in support of a class action suit against the state of California concerning a levee failure. Three-dimensional transient groundwater flow and soil mechanical processes were modeled to show that departure from guidelines for levee maintenance could have caused the failure. Mr. Gailey defended the modeling work in deposition. This work supported testimony of the expert witness.

Insurance Analysis Support

- Conducted a comprehensive assessment and estimation of future remediation costs in support of insurance premium pricing for a cost cap policy on two sites. Annual costs over the life of the policy were developed for three possible scenarios (high, medium, and low costs) based on detailed review and consideration of project characteristics. These characteristics included technical (engineering and science), regulatory and logistical issues. The results were presented and discussed during negotiations between the insurance company and insurance brokers over premium price.
- Conducted several assessments of remediation projects in support of insurance claims analyses. The overall approach and effectiveness of remedial actions were evaluated. In addition, costs incurred were identified and categorized with respect to policy coverage and exclusion categories. General projections of future costs and timelines were also prepared.

Education

MBA, University of California, Berkeley, 2003.
MS, Applied Hydrogeology, Stanford University, 1991.
BS, Geology/Biology, Brown University, 1985.

Professional Certifications and Registrations

Professional Geologist, California No. 5338
Certified Hydrogeologist, California No. 259
40-Hour OSHA HAZWOPER Safety Training
8-Hour OSHA HAZWOPER Refresher/Respirator Fit Test
8-Hour OSHA Site Supervisor Certification
First Aid/CPR Training

Continued Education

Isotope Methods for Groundwater Investigation, Groundwater Resources Association of California, 2007
Endangered Species Acts: Meeting the Challenges, Association of California Water Agencies, 1999
Groundwater Use and Management, University of California at Berkeley Extension, 1998
Drinking Water Regulation, University of California at Berkeley Extension, 1998
Water Supply and Fish in the Sacramento-San Joaquin Delta, University of California at Berkeley Extension, 1997
Managing Groundwater into the 21st Century, Association of California Water Agencies, 1997
Watershed Management and Source Water Protection: The First Barrier, American Water Works Association, 1997
Aquifer Storage and Recovery, American Water Works Association, 1997
Graduate Study in Environmental Engineering, Stanford University, 1990
Surveying, Wentworth Institute of Technology, 1986

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Professional Memberships and Activities

Association of Ground Water Scientists and Engineers
Groundwater Resources Association of California
Technical reviewer for various journals

Publications

- Gailey, R.M. 2000. Application of Mixed-Integer Linear Programming Techniques for Water Supply Wellfield Management and Plume Containment at a California EPA Site. Proceedings of the International Symposium On Integrated Water Resources Management, International Association of Hydrological Sciences.
- Gailey, R.M. 1999. Application of Mixed-Integer Linear Programming Techniques for Water Supply Wellfield Management and Plume Containment at a California EPA site. Proceedings of the 26th Annual Conference on Water Resources Planning and Management, American Society of Civil Engineers. (Published on compact disc.)
- Gailey, R.M. and M. Eisen. 1997. An Optimization-based Evaluation for Groundwater Plume Containment and Water Supply Management at a California EPA Site. p. 138. In: proceedings of XXVIIth IAHR Congress, Water for a Changing Global Community, Theme C: Groundwater An Endangered Resource.
- Brogan, S.D. and R.M. Gailey. 1995. A method for estimating field-scale mass transfer rate parameters and assessing aquifer clean-up times. Ground Water 33 (6) 997-1009.
- Gailey, R.M. and S.M. Gorelick. 1993. Optimal, reliable plume capture schemes: application to The Gloucester Landfill groundwater contamination problem. Ground Water 31 (1) 107-114.
- Gailey, R.M., A.S. Crowe, and S.M. Gorelick. 1991. Coupled process parameter estimation and prediction uncertainty using hydraulic head and concentration data. Advances in Water Resources 14 (5) 301-314.
- Gailey, R.M. and D.E. Jones. 1987. The use of sediment permeability variations in the performance of petroleum recovery from glacial sediments. p. 515. In: Proc. of the Focus on Eastern Regional Groundwater Issues, National Water Well Association.

Presentations

- A Case for Alternative Groundwater Monitoring under CASGEM in Northeastern California. Session Speaker, Groundwater Resources Association of California, 21st Annual Meeting and Conference, California Groundwater: Data, Planning and Opportunities, October 4 and 5, 2012, Rohnert Park, California.
- Water Supply Well Rehabilitation Methods: Alternatives and Successes. Invited Speaker, Groundwater Resources Association of California Managing Wells in California and Protecting Groundwater Resources Symposium, August 22 and 29, 2012, Sacramento, California.
- Factors Affecting Nitrate Concentrations in Water Supply Wells. 28th Biennial Groundwater Conference and 20th Annual Meeting of the Groundwater Resources Association of California, California's Water's Future Goes Underground, October 5-6, 2011, Sacramento, California.
- Identifying the Sources of Nitrate to a Deep Municipal Water Supply Well Using Stable Isotopes of Nitrate, Groundwater Age Dating and Depth-Specific Sampling. Copresenter with Brad Esser, Groundwater Resources Association of California Environmental Forensics Symposium, April 12, 2011, Irvine, California.
- Reducing Arsenic Concentrations from a Municipal Supply Well through Well Screen Modification. Invited Speaker, Arsenic Symposium: Treatment Alternatives and Case Studies, December 8-10, 2009, Bakersfield, Barstow and Ontario, California.
- Simulating Flow and Transport Uncertainty Associated with Water Supply Well Modification Based upon Well Profiling and Pumping Test Data. Coauthor with Grace Su, 2010 National Groundwater Association Groundwater Summit, April 12-14, 2010, Denver, Colorado.
- Reducing Arsenic Concentrations from a Municipal Supply Well through Well Screen Modification. Invited Speaker, Arsenic Symposium: Treatment Alternatives and Case Studies, December 8-10, 2009, Bakersfield, Barstow and Ontario, California.

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Presentations (cont.)

- Considering the Consumption of Energy and Other Resources during Pumping at the Well and Wellfield Scales. Invited Speaker, 27th Biennial Groundwater Conference and 18th Annual Meeting of the Groundwater Resources Association of California, Water Crisis and Uncertainty: Shaping Groundwater's Future, October 6-7, 2009, Sacramento, California.
- Planning Combined Municipal Use of Groundwater and Surface Water: Technical and General Results from a Case Study. Session Speaker, Groundwater Protection Council Annual Forum 2009, Water/Energy Sustainability Symposium – Water and Energy Policy in the 21st Century, September 13-16, 2009, Salt Lake City, Utah.
- Optimal Conjunctive Use of Surface Water and Groundwater Resources: A Tale of Two Cities. Session Speaker and Symposium Co-Chair, Applications of Optimization Techniques to Groundwater, a Groundwater Resources Association of California Symposium, October 16, 2008, Sacramento, California.
- Details of Optimization and Applications to Groundwater Projects. Course Instructor and Co-Chair, a Groundwater Resources Association of California Short Course, October 15, 2008, Sacramento, California.
- Application of a Simulation-Optimization Approach for Water Supply Wellfield Management and Plume Containment. Session Speaker, Groundwater Resources Association of California, 13th Annual Meeting and Conference, Managing Aquifers for Sustainability – Protection, Restoration, Replenishment, and Water Reuse, September 23-24, 2004, Rohnert Park, California.
- Application of Mixed-Integer Linear Programming Techniques for Water Supply Wellfield Management and Plume Containment at a California EPA site. Session Speaker, International Association of Hydrological Sciences, International Symposium On Integrated Water Resources Management, April 9-12, 2000, Davis, California.
- Application of Mixed-Integer Linear Programming Techniques for Water Supply Well Fixed Management and Plume Containment at a California EPA site. Session Moderator and Speaker, American Society of Civil Engineers Water Resources Planning and Management Division Annual Conference, June 6-9, 1999, Tempe, Arizona.
- Wellfield Optimization: A Case Study. Session speaker, American Water Works Association, California-Nevada Section, Fall Conference, October 6-9, 1998, Reno, Nevada.
- A Linear Programming Application for Water Resource Management at a Mining Operation. Session speaker, 25th Annual Conference on Water Resources Planning and Management, American Society of Civil Engineers, June 7-10, 1998, Chicago, Illinois.
- Water Disposal Concerns with a Well Rehabilitation Project. Invited Speaker, American Water Works Association, California-Nevada Section, Water Well Monitoring and Rehabilitation Seminar, May 20-21, 1998, Stockton, California.
- Quantifying Rate-Limited Mass Transfer Effects in the Field: Challenges Faced by Environmental Science Practitioners. Session speaker, American Geophysical Union Fall Meeting, December 8-12, 1997, San Francisco, California.
- An optimization-based evaluation for groundwater plume containment and water supply management at a California EPA site. Session speaker, American Water Resources Association Annual Conference and Symposium on Conjunctive Use of Water Resources: Aquifer Storage and Recovery, October 19-23, 1997, Long Beach, California.
- An optimization-based evaluation for groundwater plume containment and water supply management at a California EPA site. Session speaker, XXVII in IAHR Congress, Water For A Changing Global Community, August 10-15, 1997, San Francisco, California.
- A method for estimating field-scale mass transfer rate parameters and predicting aquifer clean-up times. Session speaker, 1994 Groundwater Modeling Conference, August 10-12, 1994, Fort Collins, Colorado.
- Design of optimal, reliable groundwater capture schemes. Session speaker, solving Ground Water Problems with Models, February 11-13, 1992, Dallas, Texas.
- Design of optimal, reliable groundwater capture schemes. Lecturer, National Research and Development Conference on the Control of Hazardous Materials, February 4-6, 1992, San Francisco, California.
- Design of optimal, reliable plume capture schemes: application to the Gloucester Landfill. Invited speaker, American Geophysical Union Fall Meeting, December 9-13, 1991, San Francisco, California.

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Presentations (cont.)

The use of sediment permeability variations in the performance of petroleum recovery from glacial sediments.
Session speaker, Focus on Eastern Regional Groundwater Issues, July 14-16, 1987, Burlington, Vermont.

Presentations on aspects of quantitative hydrogeology at the U.S. Geological Survey, Lawrence Berkeley National Laboratory, California Department of Water Resources, and universities (California State University at Sacramento, Harvard, Stanford, and the University of Illinois).