

# HYDROVISIONS



Volume 10, No. 3

GROUNDWATER RESOURCES ASSOCIATION  
OF CALIFORNIA

Fall 2001

## Arsenic in Groundwater - October 3, 2001 in Sacramento

The Groundwater Resources Association of California presents the 3rd Symposium in its Series on Groundwater Contaminants: Arsenic in Groundwater. This one-day Symposium is planned to bring the scientific community, regulators, water purveyors, attorneys, and political representatives up-to-date on the current issues surrounding arsenic in groundwater. The Symposium will have four sessions:

1. Arsenic Characteristics, Geochemistry & Distribution;
2. Risk/Toxicology and Regulations;
3. Treatment & Remediation;
4. Social & Political Impacts and Legal Issues.

**Arsenic is Ubiquitous.** Arsenic, in addition to hazardous waste hot spots, occurs naturally in the environment. The distribution of arsenic in soil, groundwater and surface water has been extensively investigated during the past two decades. The USGS has collected and analyzed arsenic in potable water from over 18,000 wells in nearly 600 counties across the US,

which Alan Welch of the USGS will summarize in Session One. While arsenic is ubiquitous and generally detectable at some concentration, the issue of focus is to what extent are detections of arsenic significant with regard to protecting water supplies and public health.

**Regulatory Process Delayed.** For centuries, arsenic has been recognized as a toxic element. In 1999, the National Research Council (NRC) reported on historical toxicological studies relating to arsenic and its contribution to a variety of cancers. Further, the NRC recommended that the present maximum contaminant level (MCL) for arsenic in drinking water of 50 ug/l be lowered. After decades of scientific study, followed by the USEPA regulatory process of public review and comment, the USEPA in January 2001 announced that the standard would be lowered to 10 ug/l. In March 2001, with the entrance of the new political administration and a new head of the USEPA, the implementation of the lower standard was delayed. The reasons cited were a lack of "clear proof" of the health risk, the need to allow for independent reviews of the science behind the studies and estimates of implementation costs.

**Health Issues Reexamined.** A new Public Health Goal (PHG) for arsenic in groundwater is expected to be released just prior to the Symposium, which Dr. Robert Howd, Cal/EPA OEHHA will discuss. In addition, Dr. Bruce MacIer, US EPA Region 9, will provide the federal perspective on

### INSIDE

President's Message	2
Highlights of Second Symposium	3
Chemist's Corner	4
Salute to HydroVisions Chair	5
Legislative/Regulatory Corner	6
Principles of Groundwater Flow	8
Well Completion Reports	14

the toxicology of arsenic. Dr. David Spath, Drinking Water Chief, Department of Health Services, has also been invited to speak on the implementation of the PHG and the Future of Drinking Water Standards. Like previous Symposiums in the Series, included is a session on the latest treatment and remediation technologies and costs, and an open panel to discuss the social, political, and legal issues of lower regulatory levels for arsenic in groundwater.

**Arsenic Symposium.** While the extensive and prolonged process of reevaluating the arsenic MCL had reached a tentative milestone early this year, the delay has caused intense focus on the regulatory process of developing or changing drinking water standards.

For Symposium details and registration information, please visit the GRA Web site at [www.grac.org](http://www.grac.org). If you or your organization is interested in exhibitor or sponsorship opportunities at this Symposium, please contact Kathy Snelson, GRA's Executive Director at (916) 446-3626.

*The Groundwater Resources Association of California is dedicated to resource management that protects and improves groundwater through education and technical leadership.*



# President's Message

BY TIM PARKER

As we approach Fall and well into our third quarter of 2001 of our tenth year, I believe GRA continues to perform fantastically! We are indeed having a successful and action-packed year, a year in which we are going to surpass all previous years in terms of activities. Our organization continues to demonstrate not only its viability and sustainability, but also that GRA is the premiere California organization of groundwater professionals.

GRA had two tremendously successful events this past three months:

1. Second in the Series on Groundwater Contaminants "Characterization & Remediation of Emerging & Recalcitrant Contaminants", in San Jose, June 14 & 15, 2001. 250 attended the Symposium.

2. "Geostatistics for Hydrogeological and Environmental Applications" training course at San Jose State University, California, July 31 & August 1, 2001. 60 attended the Course.

I want to extend a special thanks to Tom Mohr, Chair of the Recalcitrant Contaminants Symposium, who spearheaded this highly successful event. (Tom is a recently appointed GRA Director.) Hats-off to Tom, Jim Crowley, their employer and Symposium co-sponsor, Santa Clara Valley Water District, the speakers and all the San Francisco Bay Branch and other volunteers who put this tremendously successful event on.

A big special thanks also to Vicki Kretsinger who helped Steve Carle pull together the Geostatistics for Hydrogeological and Environmental Applications workshop in San Jose. For those of you who don't know, Vicki is a powerhouse, a key asset, and is involved in so many of GRA's activities and decisions behind-the-scenes. She does so much for the organization - thank you Vicki!

I want to once again personally thank all of you for the continued and new support we are receiving - we need your support to keep going as the dues cover

less than half the income to support our activities. I also want to extend my sincere thanks to our volunteers including our Branch Officers, Statewide Officers and Board of Directors.

Our committees are charging ahead with lots to report. And even though we have lots to report, I urge you to please contact any GRA Director or Statewide Officer if you are interested in participating in any of the committees - we can always use more help and more ideas.

The Seminar Committee is planning one additional symposium in the Series on Groundwater Contaminants this year, two early next year, with four training classes on the horizon:

## Training Classes

- Groundwater Modeling - CSU Sacramento, September 18, 19, & 20, 2001
- Applied Environmental Statistics - location to be determined, First Quarter 2002
- Groundwater Management - location to be determined, First Quarter 2002
- Drinking Water Source Assessments - locations and dates to be determined

## Series on Groundwater Contaminants

- Arsenic - Radisson Hotel, Sacramento, October 3, 2001
- Perchlorate - Southern California, First Quarter 2002
- Hexavalent Chromium Update - Sacramento, First or Second Quarter 2002

The Annual Meeting Committee continues to work on our event this year - "Managing California's Groundwater: The Challenges of Quality and Quantity, which

**HYDROVISIONS** is the official publication of the Groundwater Resources Association of California (GRA). GRA's mailing address is 915 L Street, Suite 1000, Sacramento, CA 95814. Any questions or comments concerning this publication should be directed to the newsletter editor at [editor@grac.org](mailto:editor@grac.org) or faxed to (916) 442-0382.

### EXECUTIVE OFFICERS

**President, Tim Parker**  
California Department of Water Resources  
Tel: (916)651-9224 Email: [tkparker@jps.net](mailto:tkparker@jps.net)

**Vice President, Tony Ward**  
Montgomery Watson Harza  
Tel: (626) 796-9141 - Email: [tony.ward@mw.com](mailto:tony.ward@mw.com)

**Treasurer, David Von Aspern**  
Wallace - Kuhl & Associates  
Tel: (916) 372-1434  
Email: [dvonaspern@wallace-kuhl.com](mailto:dvonaspern@wallace-kuhl.com)

**Secretary, Jim Carter**  
EMAX Labs  
Tel: (310) 618-8889  
Email: [jcarter@emaxlabs.com](mailto:jcarter@emaxlabs.com)

### DIRECTORS

**David Abbott**  
Todd Engineers  
Tel: 510-595-2120  
Email: [jorysue@msn.com](mailto:jorysue@msn.com)

**Judy L. Bloom**  
U.S. Environmental Protection Agency  
Tel: 415-744-1829  
Email: [bloom.judy@epamail.epa.gov](mailto:bloom.judy@epamail.epa.gov)

**Paul Dorey**  
Vista Irrigation District  
Tel: 760-597-3140  
Email: [wn6k@cts.com](mailto:wn6k@cts.com)

**Susan Garcia**  
Colin L. Powell Academy  
Tel: 310-631-8794  
Email: [ssgarciaa55@cs.com](mailto:ssgarciaa55@cs.com)

**Vicki Kretsinger Grabert**  
Luhdorff & Scalmanini  
Tel: 530-661-0109  
Email: [Vkretsinger@lsce.com](mailto:Vkretsinger@lsce.com)

**Jim Jacobs**  
FAST-TEK  
Tel: 510-232-2728, ext. 222  
Email: [augerpro@jps.net](mailto:augerpro@jps.net)

**Thomas M. Johnson**  
LFR Levine Fricke  
Phone: 510-652-4500  
Email: [tom.johnson@lfr.com](mailto:tom.johnson@lfr.com)

**Brian Lewis**  
Cal/EPA, Dept. of Toxic Substances Control  
Tel: 916-255-6532  
Email: [blewis@dtsc.ca.gov](mailto:blewis@dtsc.ca.gov)

**Tom Mohr**  
Santa Clara Valley Water District  
Tel: 408-265-2607  
Email: [tommoehr@scvwd.dst.ca.us](mailto:tommoehr@scvwd.dst.ca.us)

**Scott Slater**  
Hatch and Parent  
Tel: 805-963-7000  
Email: [sslater@hatchparent.com](mailto:sslater@hatchparent.com)

**Martin Steinpress**  
Montgomery Watson Harza  
Tel: 925-975-3476  
Email: [martin.g.steinpress@mwhglobal.com](mailto:martin.g.steinpress@mwhglobal.com)

**Robert A. Van Valer**  
Roscoe Moss Company  
Tel: 323-263-4111  
Email: [rvanvaler@earthlink.net](mailto:rvanvaler@earthlink.net)

### EXECUTIVE DIRECTOR

**Kathy Snelson**  
Groundwater Resources Association  
(916) 446-3626 - e-mail: [execdir@grac.org](mailto:execdir@grac.org)

**Editor, Floyd Flood**  
Email: [editor@grac.org](mailto:editor@grac.org)

*Continued on page 5*

# 23rd Biennial Groundwater Conference and 10th Annual Meeting of the Groundwater Resources Association of California

---

**"Managing California's Groundwater: The Challenges of Quality and Quantity"**  
**October 30-31, 2001, Sacramento, California**

## **Sponsors**

University of California  
California Department of Water  
Resources  
California State Water Resources  
Control Board  
Groundwater Resources Association  
of California  
Water Education Foundation  
U.S. Geological Survey

## **ABOUT THIS CONFERENCE**

For 46 years, the Biennial Groundwater Conference has served as the venue to provide policy-makers statewide the opportunity to learn about the current issues affecting the use of groundwater in California. This Conference provides a continuing forum for educators, researchers and practitioners to discuss issues critical to the management of groundwater in California, and to preview

*Continued on page 19*

## **Cooperating Organizations**

International Association of  
Hydrogeologists  
Association of California Water Agencies  
California Groundwater Association  
National Ground Water Association  
Natural Resources Section -  
California State Bar

---

## **Second Symposium in the "Series on Groundwater Contaminants" is a Success!**

GRA offered the Second Symposium in its "Series on Groundwater Contaminants" on the Characterization and Remediation of Recalcitrant and Emerging Contaminants. Over 250 groundwater and environmental professionals, regulators and members from private industry attended the Symposium on June 14 and 15, 2001 in San Jose, CA. The Santa Clara Valley Water District (SCVWD) co-produced the two-day Symposium.

Tim Parker, GRA President, opened the Symposium with an overview of the program and recent activities of the Association. SCVWD Board Chairman Tony Estremera followed with a short retrospective on groundwater management in the Santa Clara Valley. The opening technical session, lead by Keith Roberson

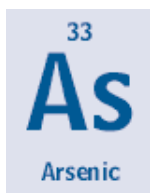
of the Regional Water Quality Control Board and Scott Seyfried of LFR Levine Fricke, contrasted successes and failures in innovative in-situ cleanup technologies for chlorinated solvent release sites, including injection of potassium permanganate, polylactate esters and molasses. Active discussion among practitioners, regulators and attendees followed, which helped to clear the air on the acceptability and value of these new technologies.

On Day One, the luncheon keynote speaker was Jim Goodrich, Chair of the National Association of Ground Water Scientists and Engineers, and former Executive Director of the San Gabriel Valley Water Quality Authority. His speech was a colorful and provocative treatment of "groundwater, technology and politics".



The afternoon session, headed by Anthony Brown of Komex, focused on the solvent stabilizer 1,4-dioxane. Session talks included the physicochemical properties, distribution, fate and transport, and treatment and toxicology of solvent stabilizers. The afternoon concluded with a roundtable discussion led by Vicki

*Continued on page 7*



## Arsenic Analysis

BY BART SIMMONS

## Chemist's Corner

The mass poisonings in Bangladesh and India had already raised the level of international concern for arsenic contamination, and the George W. Bush administration has inadvertently raised arsenic contamination to a high level of interest nationally as well. Arsenic chemistry is complicated because of environmental cycling, but the risk assessment for arsenic is demanding better understanding of the environmental behavior of arsenic.

In May, a workshop sponsored by the U.S. EPA Office of Research and Development and the Office of Solid Waste was held in Denver to review the current knowledge of arsenic chemistry, treatment, and disposal.

### Arsenic in Water

The infamous proposed drinking water standard of 10 ug/L can be measured with graphite furnace atomic absorption spectroscopy (GFAA) or inductively-coupled plasma-mass spectroscopy (ICP-MS). There are a limited number of labs that are accredited to use ICP-MS, which becomes an issue for low level (< 3ug/L) analysis.

### Speciation

The behavior of arsenic in the environment depends on its form, which is determined primarily by pH, redox environment, and biological activity. Arsenic is more soluble at low

pH (< 2) or high (> 8.5) pH. The solubility at high pH creates problems with traditional treatment methods with alkaline materials. Arsenite, As(III), which is formed under reducing conditions, is more mobile than monomethylarsonic acid (MMAA) or dimethylarsinic acid (DMAA), which are in turn more mobile than arsenate, As(V). Several species of microorganisms can catalyze the reduction of arsenic to methylated forms. Because remedial technologies may depend on the form of arsenic, speciation of environmental samples is considered essential for some remedial activities. The behavior of arsenic is linked to redox sensitive elements, including iron, sulfur, and nitrogen.

Methods used in arsenic speciation include U.S. EPA Method 1632 with selective hydride generation, and ion chromatography coupled with inductively coupled mass spectrometry (IC-ICP-MS). IC-ICP-MS has the ability to separate the major arsenic species, although sample collection and preservation protocols need refinement, since no single method of preservation is appropriate for all sample matrices.

### Arsenic Extraction Tests

Batch extraction tests are usually used to identify wastes and other solids that have the potential to contaminate groundwater. U.S. EPA uses the Toxicity Characteristic Leaching Procedure (TCLP) for hazardous waste identification and waste treatment standards, although it poorly predicts the availability of arsenic,

particularly if the waste is exposed to alkaline leachate. To better assess the leaching potential, extraction should be done over the range of pH of the in situ environment. Availability tests that extract at the California Waste Extraction Test (WET) predicts more accurately than the TCLP. As a result, some wastes, including water treatment wastes, may be hazardous in California but non-hazardous elsewhere in the U.S.

Recent analysis for total arsenic has provided considerable data on the distribution in groundwater, surface water, and drinking water. Understanding arsenic behavior will require arsenic speciation as well as measurements to understand local redox, pH, and biological activity.

Bart Simmons is the Chief of the Department of Toxic Substances Control's Hazardous Materials Laboratory and can be reached at [bsimmons@dtsc.ca.gov](mailto:bsimmons@dtsc.ca.gov). He will speak on Sampling and Analysis of Arsenic and Arsenic Speciation at GRA's "Arsenic in Groundwater" Symposium on October 3, 2001 in Sacramento. See cover story for details. 💧



# HydroVisions Committee Chair

## Brian Lewis Turns Over the Reins

BY TIM PARKER



**B**rian Lewis is stepping down from his position as Chair of the HydroVisions Committee.

Many of you may not know this, but Brian Lewis has been chairing the HydroVisions Committee for several years. HydroVisions, GRA's quarterly newsletter, is one of the fundamental elements of our organization, an element that distinguishes GRA because of its consistent high quality and rich, practical technical content. I believe this success is owed largely to Brian Lewis who has been driving the process for so many years. He has continuously searched out authors and bird-dogged these writers to assemble initial pieces, and expended the time and effort to edit the newsletter content to ensure it meets GRA's goals to communicate news and information to members. I want to thank Brian on behalf of GRA and all the readers touched by HydroVisions for his incredible efforts and endurance over the years, and for making HydroVisions what it is today. Brian, we are going to miss you at the helm of HydroVisions!

When Brian called me several months ago to tell me he couldn't do HydroVisions anymore, I understood, because I have an idea of how much time he has put in each quarter over the years, and one ultimately needs to funnel their never-ending energy elsewhere. I then panicked as I realized what GRA was losing. Fortunately, GRA has many talented, dedicated people who have stepped in to aid the transition of the production of HydroVisions. Through the efforts of Martin Steinpress, GRA Director and E-Communications Committee Chair, we anticipate we will be able to continue the tradition of HydroVisions as a quarterly newsletter of high quality and the applied technical content continued by Brian Lewis.

We are dedicating this issue of HydroVisions to Brian Lewis, GRA Founding Member, GRA Director, GRA Past President, GRA Past Chair of HydroVisions and GRA Board's only sailboat captain. 🌊

## President's Message

Continued from page 2

is a joint event with the 23rd Biennial Groundwater Conference" - October 30 & 31, 2001 in Sacramento at the Radisson. The program and list of speakers will arrive soon via mail and email, as well as calls for assistance. Visit our Web site at [www.grac.org](http://www.grac.org). Also please note that GRA will have a special tenth year anniversary event at the Annual Meeting.

The Legislative/Regulatory Committee, Chaired by Scott Slater, GRA Director, continues to provide support to keep our membership apprised on the highly fluid groundwater legislation and regulations. Scott has also enabled GRA to sponsor a bill this year (AB791), thanks to the generous lobbying support of his firm Hatch & Parent. Another bill on the GRA radar is AB599, the Groundwater Monitoring Act of 2001. Find more information on these bills in the Legislative/Regulatory Corner of this issue of HydroVisions.

The HydroVisions Committee continues to bring quarterly issues to our membership in a high quality package packed with timely and excellent technical content. One news flash is that Brian Lewis has turned over the reins to Martin Steinpress as Chair. The committee includes David Abbott, David Von Aspern, and our editor Floyd Flood. Remember that HydroVisions is always looking for excellent technical articles and sponsors.

The Membership Committee, chaired by Paul Dorey GRA Director, is pleased to report that GRA is currently at 696 members, a new high! We currently project that we will exceed well over 700 members in 2001.

Best Regards to all of you and yours. I hope to see you at the upcoming Annual Meeting, symposiums, courses and Branch meetings. Looks like we're through the energy "crisis" for the moment, although energy conservation is still smart living, and water shortages continue. Conservation mindedness appears to be a requirement for future living! 🌊

Tim.

## Drinking Water Standards: Arsenic, SB 463 introduced by Senator Don Perata.

This bill, as amended in the State Assembly July 17, 2001, would require the development of a public health goal and a new California standard for arsenic in drinking water. Specifically, the bill would require the Office of Environmental Health Hazard Assessment (OEHHA) to develop a public health goal (PHG) for arsenic in drinking water by March 31, 2002. The bill also directs OEHHA to develop language, by March 31, 2002, to be included in consumer confidence reports (CCRs) on the health effects of ingesting arsenic in drinking water. After July 1, 2002, this language would be included in the CCRs that are sent to customers in water systems that measure arsenic in their finished water at levels of detection or PHGs, whichever is higher. The bill also would require the state Department of Health Services (DHS) to begin revising the process for revising the primary drinking water standard for arsenic by January 1, 2002 and directs DHS to adopt a revised standard by January 1, 2003. It also states that in setting the new standard, DHS shall consider emerging technologies that may cost-effectively reduce exposure to arsenic in drinking water. The bill has passed through the Senate, been read one time in the Assembly, referred to the Assembly Committee on Environmental Safety And Toxic Materials, and given a do-pass as amended. At press time, the bill had been referred to the Senate Committee on Appropriations.

## Groundwater Contamination: Monitoring Program. AB 599, as amended 8/20/01, by Assembly Member Liu.

Requires that the State Water Resources Control Board implement a comprehensive groundwater monitoring program to examine and take samples from every groundwater basin in the State; creates an interagency task force to design and implement a system to increase coordination among State and federal agencies that collect data about

California groundwater contamination; and conduct appropriate research to determine maximum contaminant levels for additional contaminants. The SWRCB, with task force participants, will prepare a report for the Governor and the Legislature by January 1, 2002. GRA provided a letter in support of this bill, albeit this is not the end-all-bill for groundwater monitoring, but the action of putting together an integrated monitoring approach is the right first step in the process. AB599 has been re-referred to the Senate Committee on Appropriations.

## Spring Water. AB791, introduced 2/22/01 by Assembly Member Chavez.

This bill would require a certification report from a California registered geologist be submitted in support of an application for a license for bottled water supporting the purported water type set forth on the label, and be utilized by DHS in support of decisions regarding approval and/or denial of such applications. The bill would also require fees be submitted to support DHS for the review of the application. The GRA Board of Directors provided a letter of support for this bill, and the GRA President testified at the last Committee hearing. The current status of the bill is that it has been put over until next session.

## The California Council of Geoscience Organizations [CCGO] and SB 136.

Revisions to the Geologists and Geophysicists Act. CA Senate Bill (SB) 136 (Figueroa) is an omnibus bill that includes proposed revisions to the Geologists and Geophysicists Act, which governs the licensure of geologists and geophysicists in California. After the act was highly amended in early August, CCGO withdrew support for the act to revise the State Board for Geologists and Geophysicists (BGG) regulatory powers, stating that the act would weaken the profession and should be withdrawn. Read a summary and the latest news on-line at [www.grac.org](http://www.grac.org) or the full text

# Legislative/Regulatory Corner

BY GRA LEGISLATIVE/REGULATORY COMMITTEE

at [www.leginfo.ca.gov](http://www.leginfo.ca.gov). Please address your comments to BGG Executive Officer Paul Sweeney at (916) 263-2113 or [paul\\_sweeney@dca.ca.gov](mailto:paul_sweeney@dca.ca.gov), or to CCGO President Jim Jacobs at (510) 232-2728 x222 or [AugerPro@jps.net](mailto:AugerPro@jps.net).

CCGO is an organization that represents a dozen organizations, including GRA, AEG, AIPG, and AWG, as well as business members and donors. As an advocate for the geologic profession in the public interest, CCGO represents thousands of geologists in legislative areas, public outreach and other areas. For an update of CCGO's other activities, which include an annual drive-in to meet with California legislators on key issues, go to the CCGO Web site at [www.ccgog.org](http://www.ccgog.org).

## GRA Supports Full Funding for USGS/NAQWA

GRA joined NGWA and a coalition of several other interested organizations in signing a joint letter encouraging U.S. legislators to restore USGS/NAQWA funding to a level of \$900 million in year 2002.

At press time the Interior and Related Agencies Appropriations Bill for FY 2002 (H.R. 2217) has been passed by the House of Representatives and the Senate. The House Committee has proposed funding of \$900,489,000 while the Senate Committee has proposed \$892,474,000. Both amounts exceed the President's original proposal of \$813 million. The bill is awaiting "conference" between the House and Senate (agreement by a Conference Committee consisting of House and Senate members to resolve their differences).

For detailed and current information or to comment on these or other bills relating to groundwater, including links to the actual bill language and legislative analysis, please visit the GRA website at [www.grac.org](http://www.grac.org)

## Second Symposium is a Success!

Continued from page 3

Kretsinger Grabert of Luhdorff and Scalmanini and Jim Crowley of SCVWD, on “Strategies for Managing Emerging Contaminants in the Absence of Clear Regulatory Guidance”. Audience participation in this roundtable discussion generated much debate.

Rula Deeb of Malcolm Pirnie and George Cook from the SCVWD Leaking Underground Storage Tank Program chaired Day Two’s morning session on advances in MtBE remediation. This session featured six leading experts in the United States who presented innovative technical work on bioremediation and other opportunities for more effective MtBE treatment and removal as well as presentations on establishing MtBE clean-up levels.

Anthony Brown and Jim Crowley chaired a lively panel session on MtBE legal issues, featuring three attorneys in private practice representing water purveyors against oil companies and one attorney from the U.S. Environmental Protection Agency who is working on the Santa Monica cases. The audience once again debated the issues with great enthusiasm and candor.

Day Two’s luncheon keynote speaker was David Beckman, senior attorney with the Natural Resources Defense Council (NRDC) who spoke on the recent NRDC report, “California’s Contaminated Groundwater — Is the State Minding the Store?” The final session, chaired by David Abbott of Todd Engineers and Dave Andersen of San Jose State University was devoted to hydrostratigraphy, sequence stratigraphy and detailed site characterization. The session featured the latest developments from the U.S. Geological Survey and Lawrence Livermore Laboratories on geostatistical models of aquifer heterogeneity, and process-based systems analysis of aquifer interconnectedness.

The entire program offered balance between technical presentations by local and national experts with policy discussions and spontaneous floor debates among attendees, and it provided the opportunity for open discussion among parties who might otherwise be in opposing positions and not inclined to share their views on issues relating to groundwater quality protection. The relative importance of toxic contaminants

versus nitrate was discussed, and the limitations of current regulatory implementation of toxicology and risk assessment were brought to the floor. Based on highly positive feedback from the attendees, the Symposium was a tremendous success.

Symposium materials, which are available for a minimal cost through GRA’s Web site, contain high quality technical presentations and articles provided by the speakers. Included is a 50-page article on solvent stabilizers by Tom Mohr, Associate Engineering Geologist, in the Solvents Program of SCVWD’s Water Supply Division, which discusses how these chemical additives to chlorinated solvents are in many instances more problematic than the solvents themselves but have been overlooked at most solvent clean-up sites.

The goals of the “Contaminants In Groundwater Series”, are to provide reliable technical information on new and emerging contaminants and also to have a discourse on the regulatory, social, political and legal aspects of these often-times unregulated contaminants. These goals were successfully achieved by this Symposium.


Tom Mohr, past President of GRA’s Sacramento Branch and new GRA Director, chaired the Symposium. GRA extends its sincere appreciation to Tom Mohr and to the Symposium Co-Sponsors: Applied Process Technology, E.S. Babcock & Sons, Geomatrix Consultants, Hatch & Parent, Pulsar UV Technologies, Komex, Malcolm Pirnie, MICROSEEPS, Onion Enterprises and Weston Benshoof; Lunch Co-Sponsors: ATC Associates and SECOR International, Inc.; Reception Sponsor: Hatch & Parent; Refreshment Co-Sponsors: Environmental Process Systems, Inc., IT Group and LFR Levine Fricke; and Student Sponsors: Crawford Consulting, Inc., Groundworks Environmental and Skyline Ridge, Inc. 

## Employment Opportunities

### Need a job?

Check out the job announcements at GRAC.org. Several positions are listed and new ones appear each month, so watch the Web site for the latest openings.

### Have an opening?

You can post a job announcement on-line with a few clicks of your mouse. Enter the job description and contact information, and your opening will instantly be made available to all of GRA’s members (and others) through GRAC.org. 

# Principles of Groundwater Flow and Transport Modeling

September 18-20, 2001

California State University, Sacramento

The “Principles of Groundwater Flow and Transport Modeling” is a course sponsored by GRA in conjunction with the Geology Department, California State University, Sacramento, the International Association of Hydrogeologists, and organized by the University of California Cooperative Extension Groundwater Hydrology Program.

## Course Description

The use of computer modeling tools has become a standard practice in many groundwater investigations. Groundwater resources evaluation, groundwater quality assessment, contamination site assessment and remediation, environmental impact review, and other groundwater-related activities increasingly rely on computer models as a means of understanding groundwater flow and the fate of contaminants in the subsurface. This course introduces the conceptual principles and practical aspects of groundwater modeling in an intuitive yet comprehensive manner. The course objective is to demystify the use of groundwater models by providing solid understanding of the principles, methods, assumptions, and limitations of groundwater models, as well as hands-on experience with the planning, preparation, execution, presentation, and review of a modeling project.

The first half of the course reviews the concepts of groundwater flow and transport, and of finite difference and finite element methods. It provides an overview of various software programs for groundwater flow and transport modeling and accompanying pre- and post-processing programs. The second half of the course features hands-on exercises based on the USGS MODFLOW flow model and transport model MT3D. Exercises include site-specific models as well as basin/watershed-wide models. The course is taught by experienced instructors familiar with in-

depth knowledge of basic and advanced principles of modeling as well as California hydrogeology. At the end of the course, participants should be able to understand and actively engage in planning, supervision, and/or review of groundwater modeling projects.

## Who Should Attend

The short-course is intended for professional consultants, technical personnel in engineering/geology firms and irrigation/water districts, regulatory agency specialists and managers, and those in the legal community specializing in groundwater issues. Participants should have a working knowledge of the principles of groundwater hydrology and be familiar with the PC Windows 95 (or Windows 2000) environment. No formal training in computer programming is necessary.

## Instructors

Graham E. Fogg, Ph.D., is a professor of hydrogeology with the Hydrology Program of the Department of Land, Air, and Water Resources, University of California, Davis. He received a B.S. in hydrology at the University of New Hampshire, a M.S. in hydrology from the University of Arizona, and a Ph.D. in geology from the University of Texas at Austin. He teaches undergraduate and graduate courses in groundwater hydrology and groundwater modeling. His research interests include geologic-geostatistical characterization of subsurface heterogeneity, mass transport in heterogeneous porous media, numerical modeling of ground-water systems, and regional hydrogeology. Fogg has 20 years experience characterizing and analyzing groundwater under a diversity of conditions in the southwest and western United States. Dr. Fogg has been selected as the Geological Society of America 2002 Birdsall-Dreiss lecturer. See page 13.

Thomas Harter, Ph.D., received a B.S. in hydrology from the University of Freiburg, Germany and a M.S. in hydrology from the University of Stuttgart, Germany. He received his Ph.D. in hydrology (with emphasis on subsurface hydrology) at the University of Arizona, where he became the 1991 Harshbarger fellow for outstanding research in subsurface flow and transport modeling. In 1995, he joined the faculty at the Department of Land, Air, and Water Resources, University of California, Davis. Harter has been instrumental in developing the University of California Cooperative Extension Groundwater Hydrology Program. His research focuses on nonpoint-source pollution of groundwater, groundwater resources evaluation under uncertainty, groundwater modeling, and contaminant transport. Dr. Harter has done extensive modeling of heterogeneous aquifer/vadose zone systems.

Peter Schwartzman received a B.A. in geology and environmental studies from University of Pennsylvania and a M.S. in hydrology from the University of Arizona. He currently provides hydrogeologic consulting as an associate at Pacific Groundwater Group in Seattle, Washington. Schwartzman has had extensive experience in hydrogeologic characterization and groundwater flow modeling. He has contributed to development of groundwater modeling software and is experienced with a variety of models and modeling interfaces. He is interested in modeling regional flow systems, stream-aquifer interactions, and contaminant transport simulation.

## Course Benefits

At the end of the course, participants should have:

- a well-founded knowledge of the principles of groundwater flow and transport modeling;

*Continued on page 19*



# 2000 Statement of Activity - Unaudited

## Changes in Unrestricted Net Assets

### REVENUES:

Program Fees .....	\$25,248
Membership Dues .....	32,925
Contributions .....	1,735
Other Income:	
Interest .....	\$ 1,579
Advertising .....	300
Special Activity	
Lapel Pins .....	16
Reimbursed	
Expenses .....	185
Total Other Income .....	<u>2,080</u>

Total Unrestricted Revenues.. \$61,988

### EXPENSES:

Printing and Reproduction ....	\$26,615
Program Expense (Seminars) .	21,971
Executive Director .....	11,755
Professional Fees .....	6,330
Travel and Entertainment .....	2,377
Association Promotion/	
Development .....	1,437
Dues and Subscriptions .....	1,190
Insurance .....	2,010
Bank Charges .....	406
Utilities .....	202
Supplies .....	116
Licenses and Permits .....	20
Miscellaneous .....	<u>90</u>

Total Expenses .....

\$74,519

Decrease in Unrestricted  
Net Assets .....

(\$12,531)

### Changes in Permanently Restricted Net Assets

Member Contributions \$8,650

Increase in Permanently  
Restricted Net Assets

\$ 8,650

Decrease in Net Assets

( \$ 3,881)

### BEGINNING

NET ASSETS (CASH) \$44,127

ENDING NET ASSETS (CASH) \$40,246

# 2001 Awards Program-CALL FOR NOMINATIONS

## GOAL

The purpose of the 2001 GRA Awards Program is to recognize noteworthy projects and unique individual contributions related to the protection and management of groundwater in California.

## OBJECTIVES

The objectives of the 2001 GRA Awards Program are:

1. To provide recognition to individuals who have demonstrated leadership and continuous dedication in the field of groundwater management;
2. To provide recognition for unique contributions to the field of groundwater management in 2001; and,
3. To provide recognition to GRA (as an organization) whose mission is dedicated to resource management that protects and improves groundwater through education and technical leadership.

## AWARDS

The Award categories are:

**LIFETIME ACHIEVEMENT AWARD:** presented to individuals for their exemplary contributions to the groundwater industry, contributions that have been in the spirit of GRA's mission and organization objectives. Individuals that receive the Lifetime Achievement Award have dedicated their lives to the groundwater industry and have been pioneers in their field of expertise.

**KEVIN J. NEESE AWARD:** recognizes significant accomplishment by a person or entity within the most recent 12-month period that fosters the understanding, development, protection and management of groundwater.

## SUBMITTING A NOMINATION

To submit a nomination, please provide the following information:

- ▲ Name of entity/project/individual being nominated;
- ▲ Contact name, address, telephone, fax, email;
- ▲ Award category for nomination;
- ▲ A brief description of entity/project/individual contribution and reason(s) for qualifications;
- ▲ Your name, address, telephone, fax, email.

Nominations must be submitted on or before September 14, 2001 to:

Groundwater Resources Association  
915 L Street, Suite 1000  
Sacramento, CA 95814  
(916) 446-3626 (phone)  
(916) 442-0382 (fax)  
execdir@grac.org

## SELECTION

Nominations received will be reviewed by the Awards Committee. The Committee will recommend the proposed awards to the Board of Directors. In the event nominations are not received or the Awards Committee does not select a recipient for a particular category, the award for that category will not be recommended.

## PRESENTATION

Awards will be formally presented to all recipients at the GRA Annual Meeting, which is scheduled for October 30 & 31, 2001. ▲

## Call For Nominations — GRA Directors

The Association is now soliciting nominations for candidates to fill multiple openings on the Board of Directors in January 2002.

To declare your desire to be nominated, please submit a statement of interest, a brief biography and your contact information via e-mail to Kathy Snelson at [execdir@grac.org](mailto:execdir@grac.org) by October 12, 2001. To nominate someone other than yourself, please email the nominee's name, title, organization and contact information by the same date.

Should you have any questions about the Director Call for Nominations, please contact Kathy Snelson at [execdir@grac.org](mailto:execdir@grac.org) or (916) 446-3626.

# GRA Welcomes the Following New Members

Alfred Andrade  
 Marc Ashcroft  
 Brian Aubry  
 Jim Babcock  
 Eileen Baliff  
 Thomas Ballard  
 David Bean  
 Douglas Bleakly  
 Charlie Blumenstein  
 Michael Bonkowski  
 Gil Borboa  
 Chuck Borg  
 Michael Bower  
 Tim Boyd  
 Miriam Cardenas  
 Elizabeth Cargay  
 Chuck Carmel  
 Les Chau  
 Tony Choi  
 Lawrence Chrystal  
 Gary Cook  
 George Cook  
 Aubrey Cool  
 Dave Corder  
 Mark Cotter  
 Jim Crowley  
 Steve Cusenza  
 David Danks  
 Rula Deeb  
 Rebecca Dell Sheehan  
 Paul Dinkmeyer  
 R. Lee Dooley  
 William Drake  
 Leslie Driver  
 Tracy Drouin  
 Gilberte Duerig  
 Dr. Robert Ellgas  
 James Elliot  
 John Elliot, IID.  
 Dennis England, PhD  
 Melanie Enman  
 Julie Erickson  
 Jurgen Exner  
 John Farr, PhD  
 David Foley  
 Penny Fottrell  
 Corey Fulton  
 Michael Gjerde  
 Marie Graham  
 Bruce Graves  
 Nicholas Hagen  
 Lisa Hall  
 Shapoor Hamid  
 Charles Hamilton  
 Calvin Hardcastle

Campbell Geo, Inc.  
 Fast-Tek Engineering Support Services  
 Geologica Inc.  
 Malcolm Pirnie, Inc.  
 Geomatrix Consultants, Inc.  
 GHH Engineering, Inc.  
 Geomatrix Consultants, Inc.  
 Enterprise Strategies  
 CH2M Hill  
 Bonkowsi & Associates, Inc.  
 City of Santa Monica / Utilities Division  
 Applied Process Technology, Inc.  
 Camp Dresser & McKee, Inc.  
 Gregg Drilling & Testing, Inc.  
 City of Santa Monica / Water Division  
 Winzler & Kelly  
 bp/ARCO  
 Geomatrix Consultants, Inc.  
 Foster Wheeler Environmental  
 Edward S. Babcock & Sons, Inc.  
 STL ChromaLab  
 Santa Clara Valley Water District  
 Cambria Environmental Technology, Inc.  
 QED Environmental Systems, Inc.  
 California Rural Water Association  
 Santa Clara Valley Water District  
 City of Pleasanton  
 Conor Pacific  
 Malcolm Pirnie, Inc.  
 California Farm Bureau Federation  
 IT Corporation  
 KHM Environmental Management, Inc.  
 Tetra Tech, Inc.  
 Geomatrix Consultants, Inc.  
 Wallace-Kuhl & Associates, Inc.  
 Wendel Rosen Black & Dean  
 IT Corporation  
 Tetra Tech, Inc.  
 Henshaw Associates, Inc.  
 England Geosystem, Inc.  
 Montgomery Watson Harza  
 IT Corporation  
 JHE Technology Systems, Inc.  
 Farr Associates  
 IT Group  
 Geomatrix Consultants, Inc.  
 ENSR International  
 State Water Resources Control Board  
 City of Davis Public Works  
 Best Sulfur Products  
 Taylor-Hunter Associates  
 Montgomery Watson Harza  
 URS  
 Carpinteria Valley Water District  
 Geomatrix Consultants, Inc.

Roy Hardison  
 Chuck Headlee  
 Tarrah Henrie  
 Steven Hoch  
 Don Holbrook  
 Ann Holbrow  
 Kim Holland  
 Robert Holmer  
 Jim Honniball  
 Jackie House  
 Jim Ingle  
 Margaret Irish  
 Glenn Jaffe  
 Barbara Jakub  
 Kimberly Jolitz  
 Kasey Jones  
 Jacquelyn Jones  
 Thomas Judy  
 Allen Just  
 David Kaminski  
 Kenyon Kemp  
 Molander Kevin  
 Brian King  
 Mike Koza

Susanne Kraemer  
 Gary Kramer  
 Matthew La Force  
 Dennis Laduzinsky  
 James Leist  
 Ron Liebert  
 Kelley List  
 Brad Loewen  
 David Lunn  
 Allison Mackenzie  
 Carol Mahoney  
 Chin Man Mok  
 Todd Manley  
 David Mark  
 Roy Marroquin  
 Christian Marsh  
 Anjanette Martin  
 Abbas Masjedi  
 Richard McCartney  
 Bob McDonald  
 Russell McGlothlin  
 Glenn McPherson

Christine Mead  
 Mohsen Mehran, PhD  
 Cyndi Moore  
 Dale Myers  
 Jason Nedlo  
 Mike Ng  
 Adam Norris

Best Sulfur Products  
 San Francisco Bay RWQCB  
 California Water Service Company  
 Hatch & Parent  
 Best Sulfur Products  
 Geomatrix Consultants, Inc.  
 Geomatrix Consultants, Inc.  
 NOA Engineering  
 Geomatrix Consultants, Inc.  
 ENSR International  
 Alameda County Water District  
 Hatch & Parent  
 Montgomery Watson Harza  
 Cambria Environmental Technology, Inc.  
 Montgomery Watson Harza  
 Apex Envirotech, Inc.  
 Cambria Environmental Technology, Inc.  
 QED Environmental Systems, Inc.  
 Gannett Fleming, Inc.  
 QED Environmental Systems, Inc.  
 Geo-Hydro-Data Inc.  
 Fusion Staffing Services  
 Carpinteria Valley Water District  
 Sacramento County Waste Mngt. & Recycling Div.  
 IT Corporation  
 Geomatrix Consultants, Inc.  
 San Francisco State University  
 Henshaw Associates  
 Environmental Eng. & Contracting, Inc.  
 California Farm Bureau Federation

Geomatrix Consultants, Inc.  
 Zone 7 Water Agency  
 Edward S. Babcock & Sons, Inc.  
 Zone 7 Water Agency  
 Geomatrix Consultants, Inc.  
 No. Calif. Water Association  
 CH2M Hill  
 Environmental Eng. & Contracting, Inc.  
 Washburn, Briscoe & McCarthy  
 No. Calif. Water Association  
 City of Pleasanton  
 ENTRIX, Inc.  
 Carpinteria Valley Water District  
 Hatch & Parent  
 Saracino-Kirby-Snow, a Schlumberger Company  
 D&M/Terratech  
 England Geosystem, Inc.  
 Edward S. Babcock & Sons, Inc.  
 Zone 7 Water Agency  
 Fast-Tek Engineering Support Services  
 ZymaX Envirotechnology, inc.  
 Montgomery Watson Harza

*Continued on page 11*

## GRA Welcomes the Following New Members

Continued from page 10

Aaron O'Brien	Tamalpais Environmental Consultants
William O'Brien	Science Applications International Corp.
Joe Odencrantz, PhD	PE Tri-S Environmental
Robert O'Laskey	Malcolm Pirnie, Inc.
Charlie O'Neill	Camp Dresser & McKee, Inc.
Susan Panttaja	Harding ESE
Duane Paul	Geomatrix Consultants, Inc.
Bill Pipes	Geomatrix Consultants, Inc.
Robert Pirkle	Microseeps, Inc.
Craig Prunier	Malcolm Pirnie, Inc.
Barry Pulver	Regional Water Quality Control Board
Jeff Pyle	Geomatrix Consultants, Inc.
Laurie Racca	Kleinfelder, Inc.
Ramkishore Rao	LFR Levine Fricke
Michael Rendina	England Geosystem, Inc.
Matthew Ringier	Montgomery Watson Harza
Phil Ross	Geomatrix Consultants, Inc.
Bill Ross	SK-CSD
Todd Royer	Holland Horizon International
Robert Ruscitto	IT Corporation
Scott Santala	ZymaX Envirotechnology, Inc.
Kent Screechfield	Lowney Associates
Mike Sgourakis	Apex Envirotech, Inc.
Keith Sheets	CH2M Hill
Michael Siembieda	ETI Professionals
Larry Silva	Montgomery Watson Harza
Rexford Smith	Horizon Environmental, Inc.
Mark Smolley	Conor Pacific
Marty Spongberg	Geomatrix Consultants, Inc.
Cindy Starzyk	Sampson Engineering
Christy Swindling	LFR Levine Fricke
Grace Tang	LFR Levine Fricke
Rick Thompson	City of Davis Public Works
Jake Torrens	Malcolm Pirnie, Inc.
Carolyn Trokey	Hatch & Parent - Los Angeles Office
Thomas Vandenberg	Hatch & Parent
Tom Vercoutere	Conor Pacific
Douglas Watson	Beylik Drilling, Inc.
Peter Weiler	LFR Levine Fricke
David Welch	NOA Engineering
Jennifer Wiley	Montgomery Watson Harza
Derrick Williams	Derrick Williams, R.G.
Donald Winglewich	Precision Sampling, Inc.
Edward Wosika	SWRCB
Alborz Wozniak	Weiss Associates
Charmaine Yambao	City of Santa Monica / Utilities Division
Frank Yeamans	Consultant
Yonathan Yoseph	Remediation Sciences, Inc.
Howard Young	Camp Dresser & McKee, Inc.

## Technical Review by IETEG

The Independent Environmental Technical Evaluation Group (IETEG) has agreed to provide technical review of selected HydroVision articles prior to publication. IETEG, founded in 1997 by Jim Jacobs and Bill Motzer, is a multi-disciplinary group that collaborated on the publication entitled "MTBE: Effects on Soil and Groundwater Resources" (Lewis Publishers, 2000). The group is currently working on a new book on Hexavalent Chromium due to be published in 2002. The HydroVisions editor will arrange for IETEG review of technical articles when requested or deemed appropriate.💧

## Discussion Forum

If you haven't done so, please check out GRA's discussion forum that was rolled out in April for GRA members to comment on legislative or regulatory updates, or any other topics related to groundwater resources. You can add your comments to existing discussions or add a topic of your own. Enter your email address if you want to be contacted with a reply, or add your comments anonymously if you prefer. 💧

Encourage your colleagues to join the  
growing list of new GRA members.  
Send them to [www.grac.org](http://www.grac.org) to join!





# Geostatistics for Hydrogeological and Environmental Applications

BY VICKI KRETSINGER GRABERT

Approximately 60 students attended the first GRA course offering “Geostatistics for Hydrogeological and Environmental Applications” on July 31 and August 1, 2001. The course, conducted at San Jose State University, was co-sponsored by the SJSU Geology Department and was also held in cooperation with the International Association of Hydrogeologists and the Association of Engineering Geologists. The course presented students with both the theory and applications of geostatistics. Dr. Steve Carle’s (the instructor) goals for the course included the following:

- Improve awareness for potential applications - estimation, quantification of spatial variability and uncertainty, upscaling, and simulation.
- Develop students’ appreciation for theoretical concepts, including equations and derivations that are useful for explaining the origin of the methods.
- Acquire an ability to interpret geostatistical parameters, so that geologic insight can be infused and plausibility can be checked.
- Gain conceptual understanding that is more lasting than memorization.
- Inspire interest in confronting subjects involving heterogeneity and uncertainty.
- Encourage integration of geologic and quantitative approaches to modeling.

For this course, Dr. Carle prepared a very detailed set of course notes with chapters devoted to the subjects of Bivariate Statistics, Measuring Spatial Variability, Modeling Spatial Variability, Kriging, Discrete Random Variables, Conditional Simulation, and Advanced Hydrogeological Applications. Participants were also presented with the theory underlying Dr. Carle’s groundbreaking work on transition probability simulation, which allows the constraint of facies sequence modeling with geologic rules for fining-upward sequences such as Walter’s law.

The comprehensive set of course notes

provides the central functions and equations needed to employ geostatistical methods, and narrative explanations of their application. The notes provide fundamental geostatistical training concepts in a textbook-style presentation, with thorough explanations. Dr. Carle is considering requests by several participants to enhance the notes and lectures with worked examples, using input/output screen shots and in-course software walk-throughs, such as those presented in the GSLIB book by Deutsch and Journel. The first offering of this course did not include software examples, as these are readily available off the web at no cost (e.g. <http://www.gslib.com>).

Dealing with the inherent heterogeneity of earth science is obviously challenging. We are always attempting to identify new ways to address it. Geostatistical methods are important additions to the geoscientist’s and engineer’s toolbox to quantitatively address the uncertainty associated with spatial data at varying scales. While a geostatistical approach alone may not be the only tool, it is certainly a valuable complement to other tools. As noted by Dr. Carle, “It merges the quantitative with the subjective, providing bridges between numerical models and geologic interpretation.”

The course accomplished a great deal in two days, condensing material usually occupying a semester long graduate course. As the subject of geostatistics involves material from linear

algebra, probability theory, and other branches of mathematics, the material can be overwhelming for some. Nevertheless, the concepts are inherently simple, and the computer codes for geostatistical analysis are freely available, averting the need for users to be expert mathematicians. On a difficulty scale, one participant viewed the underlying mathematics as simpler than the mathematics behind groundwater flow modeling.

Watch GRA’s web site for more information on geostatistical methods. Since geostatistical methods are gaining recognition in the context of environmental and hydrogeological applications, GRA plans to post related information to its web site. We are going to initiate the web site addition by posting references contained

*Continued on page 19*

## GSA BIRDSALL-DREISS DISTINGUISHED LECTURE

The Hydrogeology Division of the Geological Society of America has selected Dr. Graham E. Fogg to be the 2002 Birdsall-Dreiss Distinguished Lecturer. Graham is a Professor of Hydrogeology in the Department of Land, Air and Water Resources, at the University of California, Davis. He will be offering three Birdsall-Dreiss lectures around the country in 2002, as follows:

A. Plume Behavior in Heterogeneous Geologic Systems: Natural Attenuation, Remediation, and the Role of Diffusion.

B. Groundwater Vulnerability and the Meaning of Groundwater Age Dates.

C. A Geologic Approach to Simulation of Subsurface Hydrology.

Graham can be contacted at [gefogg@ucdavis.edu](mailto:gefogg@ucdavis.edu), or check his web page at <http://lawr.ucdavis.edu/faculty/fogg/> for further information. ♪

## International Association of Hydrogeologists

The International Association of Hydrogeologists (IAH) is a scientific and educational organization whose aims are to promote research into and understanding of the proper management and protection of groundwater for the common good throughout the world. IAH is a truly international organization for scientists and engineers working in the fields of hydrogeology and groundwater resource planning, management, and protection. IAH provides a valuable forum for those who have a broad interest in and an international or global perspective on groundwater resources and hydrogeological issues. It was founded in 1956 and now has over 3,500 members in 135 countries. To accomplish its goals, IAH:

♪ publishes a journal (Hydrogeology Journal), a book series, and a newsletter;

*Continued on page 18*

## Nashville Site for 2001 NGWA Ground Water Expo and AGWSE Conference

The National Ground Water Association's Ground Water Expo, featuring the Annual Meeting and Conference of the Association of Ground Water Scientists and Engineers (AGWSE), will take place December 7-9, 2001, in Nashville, Tennessee.

The AGWSE Annual Meeting and Conference will be held December 7-8, and additional AGWSE-sponsored workshops are scheduled for December 9. The conference, "Groundwaterdata.net-Ground Water Data: Collection, Reliability, Access, and Manipulation of Basic Data," features several sessions, including hydrogeology, geophysics, monitoring, GIS, and future directions (a full listing is available at [www.ngwa.org](http://www.ngwa.org)).

Among other highlights of the Ground Water Expo is the debut of the 2002 McEllhiney Lecturer, John Schnieders of Water Systems Engineering, Inc., who will present "Chemical Rehabilitation of Wells." Expo attendees also may select from several workshop options scheduled for December 7 and December 9. Workshop topics include "GMS: Conceptual Modeling and MODFLOW 2000," "Relational Management and Display of Site Environmental Data," "Ground Water Data Management with GIS," and "Using Internet Technologies for Enterprise Environmental Data." The workshop line-up is subject to change. For up-to-date Expo schedules and registration information, including convenient online registration, check NGWA's Web site at [www.ngwa.org](http://www.ngwa.org) (click on "Events") or call NGWA's customer service line at (800) 551-7379, or (614) 898-7791. ♪

# Why Are Well Completion Reports Confidential - Is This Statute Outdated?

## The First in a Series of Editorials on California's Water Code

BY FLOYD FLOOD, EDITOR

This is the first in a series of editorials on California's Water Code related to laws for water wells, monitoring wells, cathodic protection wells, and geothermal heat exchange wells. The focus of this first editorial is the confidentiality section relating to the water well drillers Well Completion Report.

In 1949, the California Legislature concluded that collecting information in newly constructed, modified or destroyed wells would be valuable in the event of underground pollution, and would also provide hydrogeologic information to better understand and manage California's groundwater resources. The Dickey Water Pollution Control Act of 1949 was passed requiring that a report of completion be filed with the State of California.

Several California Water Code Sections provide the requirements for water well driller licensing, construction, rehabilitation, abandonment and destruction, well completion reporting and confidentiality. The code sections are provided at the end of this article and can be obtained at [www.leginfo.ca.gov/calaw.html](http://www.leginfo.ca.gov/calaw.html). Additional information is available at the Department of Water Resources Web (DWR) site at [www.water.ca.gov](http://www.water.ca.gov).

California Water Code Sections 13700 and 13701 recognize that improperly constructed and abandoned wells can be a source of groundwater contamination and a threat to public health. California Water Code Section 13750.5 requires that any person working on a water well, monitoring well, cathodic protection well or geothermal heat exchange well have a C-57 license from the Contractors' State License Board. Section 13751 requires Water Well Contractors to file a Well Completion Report with the California Department of Water Resources upon completion of the work. That section also lists what must be included in the report.

California Water Code Section 13752 prohibits making well completion reports available for inspection by the public; however, it does make them available to government agencies for studies, to anyone who obtains written permission from the well owner, and to anyone performing an environmental cleanup study associated with unauthorized releases if the study is conducted under the order of a regulatory agency.

This means that if you are a well owner and wish to obtain a copy of the well completion report for your well, or you wish to release the report for inspection, you must complete a Well Completion Report Request - Owner Form and provide the completed form to DWR. If you are performing an environmental cleanup study associated with unauthorized releases conducted under the order of a regulatory agency, you must complete and submit to DWR a Well Completion Report Release Agreement - Agency Form. Government agencies needing well completion reports to conduct studies use the Well Completion Report Release Agreement - Agency Form. A regulatory agency or other government agency may also submit a request on its letterhead, but the letter must contain all the information required on the Well Completion Report Release Agreement - Agency form. Blank copies of both Release Agreements can be downloaded from DWR's Web site at [www.dpla.water.ca.gov/cgi-bin/supply/gw/main.pl](http://www.dpla.water.ca.gov/cgi-bin/supply/gw/main.pl).

The completed well completion request forms must be submitted to the appropriate DWR District office for processing. The District office then reviews and verifies the request, and provides copies of the well completion reports to the requestor. The requestor is required to maintain confidentiality of the well completion reports, and not make the reports available for inspection by the public without the written consent of the well owner. Additionally, the requestor may only use

the information from the well completion reports for the purpose of conducting the specific study requested. And, the requestor may not make information public that can be traced back to a specific well.

DWR District offices process requests for copies of well completion reports in the order in which they are received. Generally, copies of well logs may be provided within 30 days of the request. Unfortunately, DWR is sadly underfunded, and has not been able to keep pace with the number of new well completion reports coming in. These new well completion reports may not be available for copying, as they may not have yet been geographically located. For example, in Sacramento County, there is a 10-year backlog of geographically locating well completion.

The confidentiality of well logs has long been a burden to our industry. Ready access to these records would speed up the information flow in the event of a hazardous substance release and provide valuable information for many types of water resources, geotechnical and seismic studies. Finding each and every well owner, and obtaining their written permission is not only cumbersome and time consuming, it is next to impossible.

In 1994, GRA was a co-sponsor along with the Association of California Water Agencies on a piece of legislation (AB2530 - Assemblyman Bernie Richter) to attempt to change the law to allow greater access to well completion reports. The proposed law would have allowed access by public agencies, geologists, geophysicists, and civil engineers registered in the state of California, but would not have opened the well completion reports to public inspection. Also under the law proposed in 1994, public agencies would have been permitted to publish selected information from the well completion reports when the information was considered germane to the evaluation of water resources, water

quality, geologic hazards or seismic hazards. The bill made it through the Legislature and to the Governor's desk, but was vetoed by the Governor.

California is the only western state that keeps these well completion reports confidential. Perhaps it is time that GRA consider (once again) to develop legislation to change this portion of the water code that is antiquated and outdated. At a minimum, we should consider expanding the definition of a study to include more than contaminations, in order to more adequately protect human health and the environment.

## California Water Code Selected Sections:

**13700.** The Legislature finds that the greater portion of the water used in this state is obtained from underground sources and that those waters are subject to impairment in quality and purity, causing detriment to the health, safety and welfare of the people of the state. The Legislature therefore declares that the people of the state have a primary interest in the location, construction, maintenance, abandonment, and destruction of water wells, cathodic protection wells, groundwater monitoring wells, and geothermal heat exchange wells, which activities directly affect the quality and purity of underground waters.

**13701.** The Legislature finds and declares all of the following: (a) Improperly constructed and abandoned water wells, cathodic protection wells, groundwater monitoring wells, and geothermal heat exchange wells can allow contaminated water on the surface to flow down the well casing, thereby contaminating the usable groundwater. (b) Improperly constructed and abandoned water wells, cathodic protection wells, groundwater monitoring wells, and geothermal heat exchange wells

can allow unusable or low quality groundwater from one groundwater level to flow along the well casing to usable groundwater levels, thereby contaminating the usable groundwater. (c) Contamination of groundwater poses serious public health and economic problems for many areas of the state.

**13750.5.** No person shall undertake to dig, bore, or drill a water well, cathodic protection well, groundwater monitoring well, or geothermal heat exchange well, to deepen or re-perforate such a well, or to abandon or destroy such a well, unless the person responsible for that construction, alteration, destruction, or abandonment possesses a C-57 Water Well Contractor's License.

**13751.** (a) Every person who digs, bores, or drills a water well, cathodic protection well, groundwater monitoring well, or geothermal heat exchange well, abandons or destroys such a well, or deepens or perforates such a well, shall file with the department a report of completion of that well within 60 days from the date its construction, alteration, abandonment, or destruction is completed. (b) The report shall be made on forms furnished by the department and shall contain information as follows: (1) In the case of a water well, cathodic protection well, or groundwater monitoring well, the report shall contain information as required by the department, including, but not limited to all of the following information: (A) A description of the well site sufficiently exact to permit location and identification of the well. (B) A detailed log of the well. (C) A description of type of construction. (D) The details of perforation. (E) The methods used for sealing off surface or contaminated waters. (F) The methods used for preventing contaminated waters of one aquifer from mixing with the waters of another aquifer. (G) The signature of the well driller. (2) In the case of a geothermal heat exchange well, the report shall contain all of the

following information: (A) A description of the site that is sufficiently exact to permit the location and identification of the site and the number of geothermal heat exchange wells drilled on the same lot. (B) A description of borehole diameter and depth and the type of geothermal heat exchange system installed. (C) The methods and materials used to seal off surface or contaminated waters. (D) The methods used for preventing contaminated water in one aquifer from mixing with the water in another aquifer. (E) The signature of the well driller.

**13752.** Reports made in accordance with paragraph (1) of subdivision (b) of Section 13751 (water well drillers reports) shall not be made available for inspection by the public, but shall be made available to governmental agencies for use in making studies, or to any person who obtains written authorization from the owner of the well. However a report associated with a well located within two miles of an area affected or potentially affected by a known unauthorized release of a contaminant shall be made available to any person performing an environmental cleanup study associated with the unauthorized release, if the study is conducted under the order of a regulatory agency. A report released to a person conducting an environmental cleanup study shall not be used for any purpose other than for the purpose of conducting the study. 💧

**Want to voice your opinion?**  
Please go to the [www.grac.org](http://www.grac.org) Discussion page or send an email to [editor@grac.org](mailto:editor@grac.org) and let us know what you think on the subject of the current law on well confidentiality and whether GRA should develop legislation to change the existing law.



## Southern California Highlights

BY PAUL PARMENTIER, PRESIDENT

In June this year, the Southern California section of GRA held its annual in-the-field summer meeting at Roscoe Moss Company headquarters in Los Angeles. Attendees were provided with a tour of the company's facility and observed up-close the processes involved with the manufacture of water well casing and screens.

Bob Van Valer, Roscoe Moss Company President and new GRA Director, presented the group with an overview of the company's history. He explained how founder Roscoe Moss started his career in the well drilling industry in 1906 with S.A. Clampett and Company, became a partner by 1914 and in 1920 became sole owner. In 1926 Roscoe Moss established the company's manufacturing facilities in Los Angeles at 3240 Worth Street, the same location where they stand today. Roscoe Moss Company quickly established itself both as a premier well drilling contractor, building its own cable tool drill rigs and going on to drill thousands of wells in the United States and several foreign countries. It also manufactures high quality well casing. Today, the company focus is on the manufacture of well casing and screen, water transmission pipe, environmental products and industrial screens.

The tour moved on to the two mills that produce spiral-weld pipe from large steel coils, which can weigh up to 19,000 lbs each. The mills have the capability of producing pipe in sizes to suit a variety of applications from environmental monitoring to deep, large diameter municipal wells to larger diameter pipe used for water transmission. In its current configuration, the larger of the two mills can manufacture pipe up to 63 inches in diameter. The larger diameter pipe is used for water transmission purposes and is pressure tested on site to ensure compliance with AWWA C200 standards.

Roscoe Moss Company manufactures well casing and screen from five types of

steel: 316L and 304 stainless steel, High Strength, Low Alloy steel, Copper-Bearing steel and Mild steel. After the pipe sections are cut to specified length (20, 30 and 40-ft lengths are typical for wells), the ends are trimmed and welding collars are attached. The purpose of the welding collar is to ensure the alignment of the casing sections and to expedite welding during well casing and screen installation.

The group also observed the manufacture of two types of well screen: shutter screen and continuous slot screen. Shutter screen, known for its strength and durability, has been manufactured here for over 40 years and remains the most common screen used in deep, large diameter production wells typical of the southwestern United States. Continuous slot screen was being produced on machines that are now located in the original factory that has been recently renovated.

For those who attended, it was a unique educational experience combining historical perspective of the water well industry from the turn of the century and the latest manufacturing processes for the production of well casing and screen.

Readers are encouraged to contact the Roscoe Moss Company for additional information or for any technical assistance with regard to well casing and screen design.

## Sacramento Branch Highlights

BY DAVE ZUBER, BRANCH SECRETARY

Since our last update, the Sacramento Branch monthly meetings have featured a wide variety of great speakers and presentations. Speaker topics have ranged from recent CALFED developments to acid mine drainage.

In February, Mr. Mark Cowin updated our Branch on developments at CALFED since the August 2000 Record of Decision (ROD). The ROD lays out a long-term plan for providing water security to meet

California's growing needs, while at the same time restoring the California Bay-Delta ecosystem from decades of environmental degradation. Costs for the first seven years for implementing the plan are estimated at \$8.5 billion. The ROD concludes that expanding water storage capacity is critical to the successful implementation of all aspects of the CALFED Program. In addition to studying a limited set of surface storage opportunities, the ROD commits CALFED Agencies to facilitate and fund locally supported, managed and controlled groundwater and conjunctive use projects with a total of 500 TAF to 1 MAF of additional storage capacity by 2007. Mr. Cowin is the Assistant Director for the CALFED Bay-Delta Program, manages the organization's Water Management Planning Branch and is currently working on CALFED's integrated storage investigation and development of CALFED's water management strategy.

In March, Brian Bergamaschi, Roger Fujii, and Marianda Fram from the USGS California District reviewed the background for regulatory action regarding trihalomethanes and presented results from recent studies on trihalomethane formation. Recent work has included the study of trihalomethane formation in an assortment of situations including when finished drinking water is injected into an aquifer; over the annual water cycle in the Sacramento/San Joaquin Delta; and within a well confined watershed.

In April, Dr. Charlie Alpers of the USGS presented some fascinating acid mine drainage data and photographs from the Richmond Mine of the Iron Mountain copper deposit in Northern California. The Richmond Mine contains some of the most acid mine waters ever reported. Values of pH have been measured as low as -3.6, combined metal concentrations as high as 200 g/liter, and sulfate concentrations as high as 760 g/liter. Copious quantities of soluble metal sulfate salts such as melanterite, chalcantite, coquimbite, rhomboclase, voltaite, copiapite, and halotrichite have been identified, and some of these are forming from negative-pH mine waters. Mr. Alpers presented geochemical calculations to

show that, under a mine-plugging remediation scenario, these salts would dissolve and the resultant 600,000 m3 mine pool would have a pH of 1 or less and contain several grams of dissolved metals per liter, much like the current portal effluent water. In the absence of plugging or other at-source control, current weathering rates indicate that the portal effluent could continue for approximately 3,000 years. Mr. Alpers also brought some spectacular specimens of rare minerals collected from the Richmond Mine.

In May, hydrogeologist Dana Booth, Supervisor of Sacramento County's Site Assessment/Mitigation (SA/M) group, presented an update to the Sacramento County water well ordinance that includes new requirements on de-watering wells. Mr. Booth also raised some interesting questions regarding increased industrial and commercial development that is converting large holdings of agricultural land, and whether the supply wells that serviced the agricultural uses need to be destroyed under improved standards.

At our June meeting, Michael P. Hunerlach presented on the results of historical use of mercury in the late 19th and early 20th century gold mining and recovery that has led to widespread mercury contamination of water, sediment, and biota in the foothills of the northern Sierra Nevada. Mr. Hunerlach is a geologist with the USGS-Water Resources Division and is a 5th Generation gold miner/native Californian who has worked as a hardrock and placer miner. Mr. Hunerlach's presentation focussed on the Bear River and South Yuba River watersheds that were chosen for a pilot study by the USGS. Data presented came from water samples analyzed for HgT (total recoverable mercury) in filtered and unfiltered splits. Concentrations of HgT in filtered water samples generally were less by 1-2 orders of magnitude than those in unfiltered samples, indicating that most mercury is transported along with suspended particulate material. Mr. Hunerlach also presented bioaccumulation data that was collected from invertebrates, amphibians, and game fish. Based on these data, three counties have issued an interim public health notification recommending limited consumption of game fish from the Bear and Yuba watersheds; this is the first such

*Continued on page 18*

## B R A N C H C O N T A C T S

San Francisco Bay Branch  
e-mail: [sf.branch@grac.org](mailto:sf.branch@grac.org)

**President:** Linda Spencer  
[lindageo@earthlink.net](mailto:lindageo@earthlink.net)

**Vice-President:** Gary Foote  
Geomatrix Consultants  
(510) 663-4260  
[gfoote@geomatrix.com](mailto:gfoote@geomatrix.com)

**Secretary:** J.C. Isham  
The IT Group  
(925) 288-2381  
[julian.isham@theitgroup.com](mailto:julian.isham@theitgroup.com)

**Treasurer:** David Abbott  
Todd Engineers  
(510) 595-2120  
[jorysue@msn.com](mailto:jorysue@msn.com)

**Membership:** Bill Motzer  
Hydro-Environmental  
(510) 521-2684  
[billm@hydroenvironmental.com](mailto:billm@hydroenvironmental.com)

**Technical Chair:** Jim Ulrick  
Ulrick & Associates  
(510) 848-3721  
[julrick@ulrick.com](mailto:julrick@ulrick.com)

**South Bay Coordinator:**  
Mark Wheeler  
Crawford Consulting  
(408) 287-9934  
[mark@crawfordconsulting.com](mailto:mark@crawfordconsulting.com)

**Past President:** Clifton Davenport  
Waterstone Environmental  
(510) 533-6710  
[cdavenport@waterstone-env.com](mailto:cdavenport@waterstone-env.com)

Central Coast Branch  
e-mail: [cc.branch@grac.org](mailto:cc.branch@grac.org)

**President:** Terry Foreman  
CH2MHill  
(805) 371-7817, x 207  
[tforeman@ch2m.com](mailto:tforeman@ch2m.com)

**Vice President:**  
Stephanie Osler Hastings  
Hatch and Parent  
(805) 963-7000, x 415  
[shastings@hatchparent.com](mailto:shastings@hatchparent.com)

**Secretary:** Michael Burke  
Furgo West, Inc.  
(805) 650-7000  
[mburke@fugro.com](mailto:mburke@fugro.com)

**Treasurer:** Ryan Harding  
Tetra Tech, Inc.  
(805) 681-3100, x 114  
[ryan.harding@tetratech.com](mailto:ryan.harding@tetratech.com)

Southern California Branch  
e-mail: [socal.branch@grac.org](mailto:socal.branch@grac.org)

**President:** Paul Parmentier  
IT Corp  
(949) 660-7510  
[pparmentier@theitgroup.com](mailto:pparmentier@theitgroup.com)

**Vice President:** Tony Maggio  
(562) 857-1684  
[amaggio@scseng.com](mailto:amaggio@scseng.com)

**Treasurer:** Robert Ruscitto  
IT Corp  
(949) 660-7510  
[rruscitto@theitgroup.com](mailto:rruscitto@theitgroup.com)

**Secretary:** Carmen Guzman  
ARCADIS Geraghty & Miller  
(714) 278-0992  
e-mail: [cguzman@gmgw.com](mailto:cguzman@gmgw.com)

**Member At Large:** Steve Zigan  
Environmental Resolutions  
(949) 457-8952  
[szigan@eri-ug.com](mailto:szigan@eri-ug.com)

Sacramento Branch  
e-mail: [sac.branch@grac.org](mailto:sac.branch@grac.org)

**President:** Richard Shatz  
Bookman-Edmonston  
(916) 979-7871  
[rshatz@navigantconsulting.com](mailto:rshatz@navigantconsulting.com)

**Vice President:** Kelly Tilford  
Duke Engineering  
(916) 561-4598  
[krtilford@dukeengineering.com](mailto:krtilford@dukeengineering.com)

**Secretary:** Dave Zuber  
Brown & Caldwell  
(916) 854-5318  
[dzuber@brwnclald.com](mailto:dzuber@brwnclald.com)

**Treasurer:** David Von Aspern  
Wallace•Kuhl & Associates, Inc.  
(916) 372-1434  
[dvonaspern@wallace-kuhl.com](mailto:dvonaspern@wallace-kuhl.com)

**Member At Large:** Steve Phillips  
USGS  
(916) 278-3002  
[sphillip@usgs.gov](mailto:sphillip@usgs.gov)

**Member At Large:** Pat Dunn  
Jacobson Helgoth Consultants  
(916) 987-1658  
[pdunn@jhcinc.com](mailto:pdunn@jhcinc.com)

South San Joaquin Valley Branch  
e-mail: [ssjv.branch@grac.org](mailto:ssjv.branch@grac.org)

Gary Corbell  
Welenco, Inc.  
(805) 834-8100

## Sacramento Branch Highlights

Continued from page 17

advice from public agencies with regard to mercury levels in fish in the Sierra Nevada region.

At our most recent August meeting, Mike Woodal, the Sales Manager at California Surveying and Drafting Supply for the past 14 years gave a presentation on the evolution of GPS equipment over the last decade. GPS has developed into a reliable and relatively inexpensive method to provide accurate locations for a variety of field projects. As with all tools, GPS equipment has various levels of accuracy that is reflected in the cost of the equipment and labor to perform the surveys. Mr. Woodal presented information on different types of equipment, accuracy, calibration, data outputs, and what to specify when seeking surveying services, and provided GPS units for hands-on demonstrations and instruction.

## San Francisco Branch Highlights

BY J.C. ISHAM, BRANCH SECRETARY

Martin Steinpress, Montgomery Watson Harza and GRA Director, was the speaker at the San Francisco Bay Branch's May 16, 2001 meeting in Oakland. The topic of his presentation was Hexavalent Chromium in Groundwater: Natural Occurrences Versus the Erin Brockovich Effect. Mr. Steinpress, a founding member of GRA, has considerable experience in the natural occurrence of hexavalent chromium. He was a presenter at GRA's Symposium on hexavalent chromium, and he recently published an Editorial in Groundwater entitled, "The Scientific Process and Hollywood: The Case of Hexavalent Chromium".

Mr. Steinpress presented information that he has been gathering, which challenges the prevailing assumption that the widespread occurrence of hexavalent chromium in groundwater is only man-made. He described the conceptual model that has been developed at the Presidio of San Francisco relating to the oxidizing conditions present in the serpentine

bedrock, and how these conditions are favorable to the generation of hexavalent chromium. His studies have included bedrock and groundwater sampling, and leaching tests of pristine serpentine. The results indicated that hexavalent chromium present in serpentine, can be leached and/or oxidized into groundwater, and is present in oxidized groundwater above the California MCL of 50 micrograms per liter (ug/l) for total chromium.

The recent movie "Erin Brockovich" has thrust the hexavalent chromium issue into the public and political spotlight. The California EPA has developed a preliminary Public Health Goal (PHG) of 2.5 ug/l for total chromium. Unlike the MCL, the PHG is unenforceable, but strictly a risk-based advisory. Unfortunately, the PHG has become the de facto action level. This has caught many water purveyors between the public demanding cleanup to the lowest levels, and the economic realities of the high cost of treatment. In addition, the increased testing is revealing hexavalent chromium in numerous groundwater basins in California, and deep pockets will not provide fund cleanup of naturally occurring hexavalent chromium.

Ms. Dana Haasz, a Research Associate with the Pacific Institute, was the speaker at the San Francisco Branch's meeting in Oakland on August 15, 2001. Ms. Haasz's presentation was entitled "California's Water Resources: Demand Management Study". She described that one of the key pieces of information that has been missing from California's longstanding water resources debate is the following:

- ▲ A realistic estimate of how much water is being used;
- ▲ How much it is being used; and
- ▲ How much can be saved.

Ms. Haasz described that the "Demand Management Study" produced by the Pacific Institute is the first in a series of management studies that addresses the indoor and outdoor uses of residential water. The study quantifies the water saving achieved to date, the potential for future savings, and the costs associated with capturing this savings.

Her presentation highlighted the potential for improving the State's water-use efficiently. She stated that, to date, no

state agency has made a comprehensive effort to evaluate the potential for increasing the efficient use of water in California. Ms. Haasz presented historical data documenting the current conservation measures in the State. She also presented considerable information on additional residential use measures that could be employed to increase the efficiency of water use in the State. ▲

## International Association of Hydrogeologists

Continued from page 13

- ▲ promotes international cooperation among hydrogeologists and others with an interest in groundwater;
- ▲ encourages worldwide application of hydrogeological skills through education and technology transfer programs;
- ▲ sponsors international meetings, including an annual Congress; and
- ▲ cooperates with national and international scientific organizations.

Hydrogeology Journal is a peer-reviewed journal published six times a year, and a subscription is included with membership. The next annual IAH Congress will be held in Munich, Germany, in September. In 2002, it will be held in Argentina.

Because of common interests and goals among IAH and GRA members, the U.S. National Chapter of IAH has been cooperating with GRA this year in several GRA Symposium and short courses. We would like GRA members to know more about IAH. If interested, please go to the IAH Web site at [www.iah.org](http://www.iah.org) to find out more about international groundwater events, about the benefits of membership in IAH, how the Association is run, and about our activities. IAH welcomes all who support its objectives to join the Association. If you have any questions, please feel free to contact Lenny Konikow ([lkonikow@usgs.gov](mailto:lkonikow@usgs.gov)), Chairman of the U.S. National Chapter, or Colin Booth, Secretary-Treasurer ([colin@geol.niu.edu](mailto:colin@geol.niu.edu)). ▲

## 23rd Biennial Conference

Continued from page 3

emerging challenges. 48 speakers will be featured via concurrent policy and technical sessions.

At this year's conference, speakers will focus on the following issues and topics:

- ▲ Groundwater Quality
- ▲ Groundwater Quantity
- ▲ New Tools for Groundwater Management
- ▲ Watershed Effects on Groundwater
- ▲ Emerging Contaminants
- ▲ Development of Impaired Groundwater
- ▲ Groundwater Treatment and Remediation
- ▲ GIS For Hydrologic Applications

Co-chairs of the organizing committee for the 2001 Biennial Conference are Carl Hague, Chief Hydrogeologist for the California Department of Water Resources; Rita Schmidt Sudman, Executive Director of the Water Education Foundation; and Vicki Kretsinger, a Director of the Groundwater Resources Association of California.

### Conference Program

The complete program is available at these web sites: [www.grac.org](http://www.grac.org) and [www.waterresources.ucr.edu](http://www.waterresources.ucr.edu). Abstracts of the presentations will be available in the program distributed to registrants at the Conference. In addition to presentations, there will also be a reception on October 30, including exhibits and a poster session.

### Location

The conference will be held at the Radisson Hotel and Conference Center, 500 Leisure Lane, Sacramento. Parking is complimentary. For Supershuttle service from Sacramento International Airport, look for the kiosk at the airport or call 1-800-BLUE VAN. Car rental and taxi services also are available at the airport.

### Registration

The special early registration fee is \$195 for those registering by September 30. Late (after September 30) and on-site registration is \$250. There is a special \$100 rate for students. The fee includes lunch both days and a hosted reception with exhibits and poster presentations on October 30. Registration is available on-line at [www.grac.org](http://www.grac.org).

### Hotel Reservations

You may contact the Sacramento Radisson Hotel at (800) 333-3333 or (916) 922-2020. Until September 28, we have secured a special room rate of \$109, plus tax and surcharges, per night. Be sure to say you are attending the 23rd Biennial Groundwater Conference.

### For More Information

Visit these web sites: [www.grac.org](http://www.grac.org) and [www.waterresources.ucr.edu](http://www.waterresources.ucr.edu)

Or contact Cindy DeChaine at the UC Center for Water Resources, (909) 787-4327 or [CindyD@ucrac1.ucr.edu](mailto:CindyD@ucrac1.ucr.edu) ▲

## Geostatistics for Hydrogeological and Environmental Applications

Continued from page 12

in the course notes. Other information will follow. If you have any additional references (software, books, articles, applications, etc.) that you would like to share, please e-mail [admin@grac.org](mailto:admin@grac.org).

The next offering of "Geostatistics for Hydrogeological and Environmental Applications" is anticipated for early 2002, and may include an evening session to allow presentations of GRA-member applications of geostatistical methods, discussion, software demonstrations, and a social hour. Participants in the August 2001 course would be invited to attend the evening session, which may double as a special GRA Branch meeting. ▲

## Principles of Groundwater Flow and Transport Modeling

Continued from page 8

- ▲ familiarity with the major elements of groundwater modeling studies;
- ▲ hands-on experience in designing simple groundwater flow and transport studies with MODFLOW using popular groundwater modeling software;
- ▲ a fundamental understanding of the capabilities and limitations of groundwater modeling; and
- ▲ an understanding of the appropriate role of groundwater models in groundwater assessment and management.

### Dates and Times

- ▲ Tuesday, September 18, 2001  
8:00 am - 5:00 pm
- ▲ Wednesday, September 19, 2001  
8:00 am - 5:00 pm  
7:00 pm - 10:00 pm (lab)
- ▲ Thursday, September 20, 2001  
8:00 am - 5:00 pm

### Location

California State University, Sacramento  
6000 J Street  
Sacramento, CA 95819 ▲

**Don't miss GRA's Special Celebration of its  
10th Anniversary at the Conference Reception  
on October 30, 2001.**



# Dates & Details

## 2001 MEETINGS AND OTHER KEY DATES

Course	September 18-20, 2001 Groundwater Modeling Sacramento
Symposium	October 3, 2001 Arsenic in Groundwater Sacramento
Annual Meeting	October 30-31, 2001 Joint with Biennial Groundwater Conference Sacramento
Board Meeting	November 3, 2001 Wallace-Kuhl West Sacramento

ALL MEMBERS WELCOME

## NEW GRA DIRECTORS APPOINTED

The GRA Board of Directors is pleased to announce that four GRA members were nominated by the membership and appointed by the Board of Directors to fill newly created Director seats. Their terms will expire December 31, 2001, but they are eligible to participate in the annual Director election, which will occur in November 2001.

The new Directors are Judy L Bloom, an Environmental Protection Specialist with the U.S. Environmental Protection Agency; Thomas M. Johnson, Vice President and Director of Technical Services with LFR Levine Fricke; Tom Mohr, Associate Engineering Geologist with the Santa Clara Valley Water District; and Robert Van Valer, President of Roscoe Moss Company.

The Board welcomes each new Director, and it looks forward to the experience, knowledge and enthusiasm they bring to the Association's governing body. ♾



GROUNDWATER RESOURCES ASSOCIATION  
OF CALIFORNIA

915 L STREET, SUITE 1000  
SACRAMENTO, CALIFORNIA 95814

Presorted  
First Class Mail  
U.S. Postage Paid  
Sacramento, CA  
Permit No. 1277