

HYDRO VISIONS

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GROUNDWATER RESOURCES ASSOCIATION
OF CALIFORNIA

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Developing, Managing, and Sustaining California's Groundwater Resources

BY T.N. NARASIMHAN AND VICKI KRETSINGER

The application of groundwater science to water resources management is in a state of transition. For a variety of reasons, including continued population growth, climatic vagaries, and the uncertainty of surface water allocations, reliance on groundwater resources is increasing. At the same time, these factors can also reduce groundwater availability. Attention is shifting from exploration and development of new sources of groundwater to the efficient management of groundwater as a renewable but finite resource that is a component of the natural resources system. A White Paper has been prepared on behalf of the Groundwater Resources Association of California (GRA) as an outcome of information and views presented at the September 2002 GRA Annual Meeting, "Sustaining Groundwater

Resources: The Critical Vision." Key elements of the Paper include: a discussion of groundwater as a component of the natural resources system; the dilemma of private and public expectations for water; the role of science, sustainability, governance and economics in water management; and recommendations for ensuring sustainable development of the State's water resources. The complete Paper is posted on GRA's web site.

Attention is shifting from exploration and development of new sources of groundwater to the efficient management of groundwater as a renewable but finite resource that is a component of the natural resources system.

Scientific Understanding

California is blessed with abundant groundwater resources in diverse settings that play a vital role in the State's sustenance and prosperity. Under natural hydrogeologic conditions without human intervention, a balance exists among the components of the natural resources system that include groundwater, surface water, soils, and ecosystems. If this balance is perturbed, these interacting components will adjust themselves to attain a new physical/chemical equilibrium compatible with the perturbations.

The dynamics of a basin where extensive groundwater development has occurred invariably change due to causes

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such as deep percolation of irrigation water, pumping that intercepts regional recharge, and diversions that redistribute or reduce recharge. When natural discharge mechanisms are disrupted in closed or partly open basins, soil and groundwater salinization may result, particularly in irrigated lands in the lower parts of valleys such as the San Joaquin and Imperial Valleys. In many parts of California, water transported via aqueducts is used to recharge groundwater basins. Such imported water can constitute an important part of the basin hydrologic budget. Since the imported water is generally much higher in dissolved salts than the local rainwater, long-term water quality implications are likely. In addition, groundwater contamination due to agricultural and industrial effluent is widespread throughout the State, and

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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 JIM CARTER

I am excited to start the second year of my term as your President. Last year was an incredibly productive and successful year for GRA, and I want to thank all of you for your support. We are on track to achieve my goal of 1000 members by the end of this year, and I ask you to convince your colleges to join what I consider the finest groundwater related association.

GRA will continue to focus on high quality symposia and workshops. Tom Mohr, GRA Director and Seminar Committee Chair, is busy planning the year's activities. Please check our web site (www.grac.org) regularly for updated information.

This year GRA unveils our new on-line Membership Management System that now allows you to renew your membership online, update your membership information if it changes, and view the membership directory. You are invited to explore our new system and give us your feedback.

Keep your eyes open for GRA's activities as we push forward on our legislative and advocacy mission. I strongly encourage you review GRA's draft Legislative Guidelines on the website and to attend the Lobby Day on May 20th. I guarantee you will find it interesting and rewarding. We are making a concerted effort to establish

GRA as the non-biased technical resource for our California Legislature, and our efforts are being recognized thanks to Tim Parker, Legislative Committee Chair, Chris Frahm, Jennifer Carbuccia and the rest of his committee.

GRA remains financially strong, with healthy reserves. Last year we had so much to tell of our activities, that our *Hydrovisions* publications were the biggest that we have ever produced. Rather than cutting back, the Board decided to go over budget on the publications. We also moved forward to fund the programming for our Membership Management System. These two items resulted in a net loss for the year. I am disappointed, but feel that these items are both important for the advancement of the association and are investments in our future. That said, I will make a real effort to recoup these expenditures in 2003.

I am excited to be serving a second term and I hope you find it is an especially rewarding time to be a GRA member. I appreciate your support of GRA as we continue to grow the total membership, maintain the large number of GRA sponsored activities, and expand the areas of GRA's influence. Thanks! ♣

Jim Carter
GRA President

EPA Region 9 Newsletter Available

Each quarter, the US Environmental Protection Agency's Region 9 office (San Francisco) produces a newsletter concentrating on the technical aspects of cleanup issues in the Superfund and RCRA programs. It contains links to many new technical documents, websites, a listing of upcoming agency and industry conferences and workshops, as well as occasional short articles on local (Region 9) technology demonstrations, new tools, and other issues pertaining to waste site cleanups. If you are interested in receiving this email newsletter or in seeing a past issue, please send a request to Mike Gill at gill.michael@epa.gov. The next newsletter is scheduled for mid-April, 2003. ♣

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Upcoming Events

BY TOM MOHR

GRA has scheduled two workshops and a one-day seminar for the end of April. Topics include the status of artificial recharge in California (San Jose), the use of PEST, a program for groundwater-surface water model calibration (San Francisco), and uncertainty analysis in groundwater modeling (Sacramento). Please go to www.grac.org for agendas and registration details.

“Artificial Recharge in California: Technical and Policy Challenges” will be presented jointly by GRA with the U.S. Geological Survey and California Department of Water Resources, in cooperation with the International Association of Hydrogeologists. This two-day workshop is planned for April 30 - May 1, 2003 in San Jose. GRA is also planning an optional May 2nd field trip in conjunction with the workshop that will include a tour of Santa Clara Valley Water District artificial recharge facilities.

California faces many challenges to meet the future water demands from continued population growth. These include reduction of the Colorado River water allotment as well as water quality issues related to further contamination, analytical technology improvements, and potential lowering of water quality standards. Of the tools California has to manage the challenges, artificial groundwater recharge will continue to be important and will grow in application over the next decade. This workshop will provide presentations on the status of artificial recharge in California, including the intricacies and challenges faced to implement and manage artificial recharge projects, case histories, and the political and policy issues.

The following specific topics are planned:

- *Overview of current and planned artificial recharge in California* - inventory and categorization of current activities, the role of artificial recharge in long-term water-resource planning for the state, status of grant programs and other mechanisms for

funding/facilitating artificial recharge programs.

- *Hydrologic challenges* - saturated and unsaturated flow considerations (including facility design and operation), use of models (simulation and optimization) to evaluate project benefits and potential impacts, surface water/groundwater interaction, variability and uncertainty in surface water supplies, and monitoring design and instrumentation.

- *Water quality challenges* - organic and inorganic chemistry issues, changed environmental conditions and potential for mobilization of natural or man-made contaminants, use of tracers to evaluate disposition and effects of recharge operations, disinfection byproducts, reclaimed water quality issues, role of emerging contaminants.

- *Microbial challenges* - evaluating and monitoring bacteria and viruses, including transport of viruses and bacteria, new analytical methods, and design and operation issues.

- *Policy challenges* - water rights, funding (federal, state, local, private), economics (cost-benefit analysis), water transfers, public perception, legislation.

“Model Calibration and Predictive Uncertainty Analysis using PEST”, co-sponsored by GRA and Watermark Numerical Computing, in cooperation with IAH, will be held from April 29 through May 1, 2003, in San Francisco. The instructor, Dr. John Doherty, is the author of PEST.

This short course will focus upon the use of PEST, the most advanced available technology for groundwater water and surface water model calibration and uncertainty analysis. Using PEST you can:

1. Apply advanced regularization techniques for improved numerical stability;
2. Undertake nonlinear predictive uncertainty analysis of key model outputs;
3. Simultaneously parameterize one or a number of models on the basis of multiple datasets, including heads, flows and contaminant concentrations;
4. Accommodate geological heterogeneity using advanced spatial parameterization methods;
5. Combine PEST with the use of stochastic field generation to explore model parameter uncertainty in heterogeneous systems;
6. Parallelize model runs across PC or UNIX networks;
7. Convert a MODFLOW-2000 parameter estimation dataset to a PEST dataset by typing a simple command.

The course will provide attendees with a foundation for parameter estimation theory and PEST’s implementation of the theory, followed by demonstrations and computer lab exercises from a variety of environmental disciplines, principally focused on groundwater modeling applications. Contingent upon the level of interest from the modeling community, an additional fourth day of PEST may be added at minimal additional cost, devoted to detailed discussion and demonstration of the use of PEST in the participants’ models. For more information, or to register for the PEST course, please visit <http://www.grac.org/pest.html>. PEST has been freeware since February 2001, and is available for download together with all its accompanying utility software and news updates, from <http://www.sspa.com/PEST>

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New Developments in Groundwater Contamination Law:

“Passive Migration” of Chemicals Under Prop 65 and the Setting of Public Health Goals for Perchlorate in Drinking Water

BY C. WESLEY STRICKLAND

In the final days of 2002, California courts issued decisions in two important cases related to groundwater contamination. The first was a decision by a California Court of Appeal holding that under Proposition 65 the “passive migration” or “continued presence” of contamination in the soil does not constitute a discharge or release of contaminants into sources of drinking water. The second was an order from the Superior Court for the County of Los Angeles concerning the procedures for setting of a public health goal for perchlorate in drinking water by the Office of Environmental Health Hazard Assessment. Perchlorate is widely seen as a serious threat to drinking water supplies throughout the state, and especially in southern California.

Prop 65 and Hazardous Substances in Soil

On December 17, 2002, the Court of Appeal, Second District issued its decision in the case of Consumer Advocacy Group, Inc. v. Exxon Mobil Corporation. The decision interpreted provisions of the Safe Drinking Water and Toxic Enforcement Act of 1986, commonly known as Proposition 65 (“Prop 65”). The plaintiff in the action, Consumer Advocacy Group, sued Exxon

Mobil Corporation (“Exxon”) and four other defendants based on their ownership and operation of 21 gas stations in August 1999, alleging that chemicals present in the soil¹ beneath the stations constituted the discharge or release of prohibited chemicals into sources of drinking water in violation of Prop 65. Exxon had not operated any of its gas stations since July of 1995, meaning that the only theory by which it could have been sued within the four-year statute of limitations² was that the “continued presence” of the chemicals in the soil, or their “passive migration” into groundwater, constituted a discharge or release under Prop 65.

The plaintiff argued that the chemicals present in the soil beneath Exxon’s former gas stations were continually discharging or releasing contaminants due to their movement through the soil and into groundwater, and would do so each day “until no amount of the chemicals remains in soil and/or groundwater at the site.” The Court of Appeal rejected this argument partly based on the common dictionary meanings of the

“Does the continued presence of chemicals in soil constitute a release under Prop 65?”

words “discharge” and “release,” which it considered to collectively denote “movement from a place of confinement to another place where there is no confinement” through some action by a party. The Court also relied on the explanatory material contained in the ballot pamphlet published for the initiative election for Prop 65. The Court expressly rejected plaintiff’s argument that definitions of “discharge” and “release” used in either the Water Code or the federal Comprehensive Environmental Response, Compensation, and Liability Act (the so-called “Superfund” law, which governs clean-up of hazardous substances) should apply to Prop 65.

The decision was significant because of the results if the plaintiff’s arguments had been accepted. Prop 65 provides for civil penalties of up to \$2,500 per day for discharges or releases of prohibited chemicals, which, under the plaintiff’s theory, a discharger could have incurred on a daily basis until complete removal of all prohibited chemicals from the soil and groundwater at a site. A single initial discharge of chemicals could very quickly result in a large liability for the discharger under this scheme. Prop 65 would thereby provide a strong incentive for clean-up as well as a disincentive for the initial discharge or release. If it had been adopted by the Court, the plaintiff’s argument would also have prevented the statute of limitations from barring a lawsuit as long as contamination remained. These results would have significantly broadened the scope of Prop 65, but were stopped by the decision of the Court of Appeal.

Perchlorate PHG Delayed

In the second decision, issued on December 3, 2002, in the case of Lockheed Martin Corporation v. Office of Environmental Health Hazard Assessment, Case No. BS077063, the Superior Court for the County of Los Angeles ordered the state Office of Environmental Health Hazard Assessment (“OEHHA”) to submit its revised report related to the public health goal (“PHG”) for perchlorate in drinking water to the public for a new 45-day comment period and to the University of California for peer review. The plaintiffs in the case, Lockheed Martin Corporation (“Lockheed”) and Kerr-McGee Chemical LLC (“Kerr-McGee”), had alleged various deficiencies in the process used to arrive at the PHG as proposed by OEHHA.

The result of this case is a delay in the setting of a PHG for perchlorate by OEHHA. The California Legislature had

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Nitrate in Groundwater Symposium - Problems and Solutions

BY BILL PIPES

Over 200 people attended GRA's sixth symposium in the Series on Groundwater Contaminants on November 12 and 13 in Fresno. Speakers representing a wide range of interests converged on this agricultural city in the beautiful San Joaquin Valley to discuss the nature of the widespread nitrate problem and solutions for its remedy.

Nitrate is one of California's most widely recognized groundwater contaminants. Consumption of water with elevated levels of nitrate can cause methemoglobinemia (blue baby syndrome), and recent studies indicate other possible health impacts from nitrate in drinking water, even at levels below the current MCL. Based on a recent study, the USGS found that 24 percent of domestic wells in the eastern San Joaquin Valley exceeded the MCL of nitrate. Although it is not clear whether



GRA President Jim Carter (right) presents GRA's Special Recognition Award to Senator Jim Costa

this study is an indication of what could be found in other areas of California, we need to be prepared, considering the volume of nitrogen that is applied to

croplands, golf courses, and suburban yards, and percolates from on-site septic systems, wastewater treatment recharge, and animal feeding operations.

Groundwater will play an ever-increasing and important role in California's future water supply. Currently, up to 60% of the population of California in any given year relies on municipal water that is comprised of groundwater or a blend of surface and ground waters. Another half million Californians utilize water from their own private drinking water well. And the population of California is expected to double in the next 40 years.

Therefore, landowners, growers, waste water treatment plant operators, ranchers and planners are becoming increasingly aware of the role of urban wastewater management and agricultural land use practices in contributing to successful nitrate management. Innovative programs in land use planning, outreach to encourage pro-active agricultural practices, and increasing awareness among users of groundwater have made inroads to addressing the nitrate problem. Improvements in nitrate source identification techniques applying stable isotopes of nitrogen, hydrogen and oxygen, together with new analytical chemistry techniques to identify chemicals associated with different nitrate sources, lend a new level of sophistication to sorting out groundwater contamination by nitrates.

However, despite many success stories, factions have become polarized on the issues, and the cooperation and coordination needed to solve problems on a regional basis may

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not be proceeding. Politics, shaped by litigation, may be playing a stronger role in identifying issues than thoughtful discourse and sound science. This is what GRA can provide, and is the goal of our contaminant series—to provide a forum for thoughtful discourse and sound science on groundwater contaminants.

“the USGS found that 24 percent of domestic wells in the eastern San Joaquin Valley exceeded the MCL of nitrate”

For the Nitrate in Groundwater Symposium, collaborators from the agricultural, public water supply, urban waste water, academic, consultant and regulatory fields of California joined together in a neutral, non-partisan environment within which the most recent advances and knowledge were shared and the state of the situation accurately defined.

The symposium started off with a session on the legal/regulatory framework in which we discussed the role of federal authorities, the state's role, via Porter Cologne and basin planning, and how nitrate impacts are managed under CEQA. The second session dealt with nitrate's impacts on the beneficial use of groundwater and on public health. This session compared nitrate with other groundwater contaminants, the impact nitrate is having on rural water systems, and EPA's review of the nitrate standard. The last session of the first day looked at the chemistry of nitrogen including its sources and the use of isotope analysis for source characterization, nitrogen cycling, and denitrification in aquifers.

The second day started with a continental breakfast and a keynote presentation by Brian Haddix, the Undersecretary of the California Environmental Protection Agency. The first session of the day was on the occurrence of nitrate in groundwater.

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GRA DRAFT Policy Principles and Legislative Guidelines

BY TIM PARKER

GRA has drafted Legislative Guidelines (Guidelines) to reflect policy positions adopted by GRA's Board of Directors and Legislative Committee. The Guidelines guide GRA's legislative advocates and committee when they evaluate proposed legislation that may affect GRA and/or its members. Legislation that meets or fails to meet the principles set forth in the Guidelines may be supported or opposed by the GRA Legislative Committee, accordingly. Legislation that does not appear to meet the principles set forth in the Guidelines or that has complex or varied implications will continue to be presented to GRA's Board of Directors and membership in advance of any position being taken.

GRA is dedicated to resource management that protects and improves groundwater through education and technical leadership. GRA in general supports legislation that:

1. Promotes professional development of scientists, engineers, and others involved in the assessment, development, quality and management of the state's groundwater resources.
2. Encourages the formulation of statewide policy on the development, management and protection of the state's groundwater resources, soil and groundwater remediation, and environmental assessments.
3. Develops and funds scientific educational programs that promote the understanding and implementation of groundwater assessment, protection, and management.

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California Legislative Corner

Proposition 50 Implementation Update

BY TIM PARKER, GRA LEGISLATIVE COMMITTEE CHAIR

Last fall, the people of the state of California passed Proposition 50: the Clean Water and Coastal Protection Bond of 2002. With an estimated \$30 billion state budget shortfall, many water and groundwater programs are a moving target for budget cuts. Proposition 50 will help maintain the balance on these necessary programs. With our population growing roughly 2/3 of a million people per year, we have no time to waste to secure our water resources, better protect our source water, clean up our water, increase our water supply reliability, and conserve, conserve, conserve. As a first for the organization, the GRA membership was surveyed via email on whether to support Proposition 50 as a group, and a vast majority of those responding indicated support of the bond measure.

State Senator Michael Machado, D - District 5 and Chair of the Senate Committee on Agriculture and Water Resources, has taken the legislative lead on developing implementation language for Proposition 50. At an initial public meeting in early February, interested parties (including representatives from GRA) were invited by Senator Machado to participate in working groups on the following topics:

- ◆ Desalination
- ◆ Water Security, Drinking Water Programs, Water Quality Programs
- ◆ Regional Program
- ◆ Integrating Coastal Protection
- ◆ Interim Water Supply Reliability, CalFed
- ◆ River Parkways

Senator Machado plans to introduce Proposition 50 implementation language in Senate Bill SB21 in mid-March. The

working groups have been asked to review the proposition and agency's corresponding proposed program for implementation responses (fiscal year 2003-2004 budget change proposals), and make any suggestions or recommendations to the Senator by mid-March for incorporation into SB21.

The initial meetings have included review of the proposition elements, overview of the proposition by Joe Caves, and summaries of the agency program responses and budgets. Members of the working groups have provided initial comments on any potential issues or clarification requests regarding proposition principles.

Members of the GRA Legislative Committee have attended many of the working group meetings where potential groundwater program funding is involved. Our hope is to protect and enhance funding for groundwater funding through the Proposition 50 working group process, in conformance with the language of the proposition. The summary Proposition 50 budget is provided below – more information is available at the GRA website at www.grac.org.

1. Water Quality	\$955 million
A. Water Security	\$50 million
B. Safe Drinking Water	\$435 million
C. Clean Water and Water Quality	\$370 million
D. Contaminant and Salt Removal Technologies	\$100 million
2. CALFED Bay-Delta Program	\$825 million
3. Regional Projects:	\$710 million
A. Integrated Regional Water Management	\$640 million
B. Colorado River	\$70 million
4. Coastal Protection	\$950 million
TOTAL	\$3.44 billion

Groundwater Quality Monitoring Act of 2001:

Draft Report completed and additional legislation drafted for AB 599

BY TIM PARKER,
GRA DIRECTOR AND LEGISLATIVE
COMMITTEE CHAIR

It's been a long road, going on two years since GRA testified on AB599, and over a year since the first meeting was conducted. GRA has participated in nearly all the meetings, and we believe we have made a difference on this one!

Assembly Bill AB599, signed by the Governor in October 2001, required the State Water Resources Control Board to establish an interagency task force (ITF), and convene a public advisory committee (PAC) to work together to develop a comprehensive statewide groundwater monitoring program. Under the law, the monitoring program is to integrate existing programs and design new programs as necessary in order to provide assessments of all state groundwater basins. The law also requires that SWRCB, the ITF, and the PAC identify measures that would increase coordination among state and federal agencies that collect groundwater data. On or before March 1, 2003 the state board, in consultation with the ITF, is required to submit a report to the Governor and the Legislature that describes the comprehensive groundwater monitoring, identifies funding, and makes recommendations for increasing coordination among state and federal agencies.

Presented in the report are the following main elements:

- Background on groundwater monitoring and groundwater in California
- Goals for the comprehensive groundwater monitoring program

California Legislative Corner

- Summary of existing groundwater monitoring and assessment programs in California
- Interagency coordination for groundwater monitoring programs
- Data management needs for a comprehensive groundwater monitoring program
- Basin prioritization approach and basin assessment methodology
- Findings & recommendations for the AB 599 process and comprehensive groundwater monitoring program.

The report should be on the Governor's desk as this article goes to press, and should also be available for viewing at www.swrcb.ca.gov.

Implementation of the groundwater monitoring program is currently funded under Proposition 50, for a maximum of \$50 million dollars over a several year period. Implementation language is currently being drafted, and may be introduced as a Senate or Assembly bill by the time you read this article. Two bills have already been introduced in the California Assembly to support development of statewide groundwater data standards under AB599:

AB1107 Liu – modifies AB599 to include requiring development of uniform groundwater data standards, including, but not limited to, uniform data collection, data management, and data transfer standards. The bill language is available at: http://www.leginfo.ca.gov/pub/bill/asm/mab_11011150/ab_1107_bill_20030221_introduced.pdf

AB1159 Liu – Groundwater Data Standards Act of 2003. The bill would require the state board, in consultation with a technical work group to be convened by the state board and other responsible agencies, to 1) determine what constitutes core groundwater data, 2) define structures and standards for core groundwater data, 3) identify groundwater

data collection standards, 4) evaluate existing structures and standards for groundwater data, as well as user and custodian requirements, and 5) propose standards for the storage and transfer of core groundwater data for comment by the public and the scientific community. On or before May 1, 2004, the state board, in consultation with the technical work group, is required to prepare and submit to the Governor and the Legislature a report that includes recommendations for groundwater database standards and for the collection and transfer of groundwater data. The bill language is available at: http://www.leginfo.ca.gov/pub/bill/asm/ab_11511200/ab_1159_bill_20030221_introduced.pdf.

Save the Date

GRA's Legislative Symposium
and Lobby Day

All Day At the Capitol

Tuesday, May 20, 2002

Agenda will include:

- Briefings on important current legislative issues of interest to groundwater professionals
- Lunch Keynote to be delivered by a California Legislator
- Dialogue with key legislators on the future of California groundwater
- Visits with legislators and decision makers, including your local representatives to educate them on the concerns and technical expertise of GRA members
- Legislative Reception with legislators, key staff, and water agency officials.

Contact Kathy Snelson (executive_director@grac.org) or (916) 446-3626 for further information or to register.

HIGHLIGHTS - California Council of Geoscience Organizations

An Advocate for the Profession in the Public Interest

BY JANE H. GILL, RG,
CCGO EXECUTIVE DIRECTOR

New Officers

Congratulations, and a sincere welcome to our 2003 CCGO officers. A short bio and/or email for each officer are posted at <http://www.ccco.org/officers>.

President: Sue Jagoda, California Earth Science Teachers Association

Vice Pres./President Elect: Rick Blake, American Association of Professional Geologists, Pacific Section

Secretary: David Abbott, Groundwater Resources Association of California

Treasurer: Anne Cavazos, Association for Women Geoscientists

Past President: Jim Jacobs, California Section of the American Institute of Professional Geologists

CCGO Legislative Drive, March 4

The Fourth Annual Sacramento Legislative Drive-In will be held on March 4, 2003. This is an all-day event; CCGO participants will meet in person with several elected legislators and administrators in their Sacramento offices and discuss upcoming legislation and other subjects of concern. Among the officials on our schedule are John Parrish of CGS, Paul Sweeney of BGG, the Secretary of Education's Policy Analyst Shawn Miller, Assembly member Joe Nation, and Marc Grisby from the

California Regulatory Corner

Governor's Office of Appointments; other appointments are tentatively scheduled, pending confirmation. PLEASE JOIN US by contacting Jim Jacobs (augerpro@jps.net), former CCGO President and organizer of the event.

Planned Events:

May 12, Monday – Southern California Fundraiser: Hosted by AEG SoCal, at Steven's Steak House in Commerce. The speaker will be Dr. Chester F. "Skip" Watts, 2003 AEG-GSA Richard H. Jahns Distinguished Lecturer; Congressional Science Fellow; University Distinguished Professor, Radford University; and Director of Institute for Engineering Geosciences. Topic: "Rockslides in Yosemite National Park." Please contact Betsy Mathieson (emathieson@exponent.com) for details.

May 13, Tuesday – Northern California Fundraiser: Hosted by AEG SF Section, at Old Spaghetti Factory, Jack London Square, Oakland. The speaker will be Dr. Chester F. "Skip" Watts (as above). Please contact Betsy Mathieson (emathieson@exponent.com) for details.

Announcements

CCGO is now a Regional Associate Member of American Geological Institute (AGI) as of January 2003. We look forward to our affiliation with this respected association representing more than 100,000 earth scientists. More information is available at their website, <http://www.agiweb.org/>.

Endorsement of J.C. Isham for SMGB

CCGO recently endorsed the application of Julian C. Isham for appointment to the State Mining and Geology Board. Geologists throughout the state know Mr. Isham for his familiarity with legislative issues pertinent to California's geologic resources and hazards, and his professional work on prevention and

remediation of soil and groundwater contamination.

Monthly progress reports will be emailed to CCGO members on record, as well as others who want to stay informed of our activities. Our latest report (2/1/03) is posted at <http://www.ccco.org/reports/monthlyreport.html> Please contact CCGO Executive Director Jane Gill (JaneHGill@aol.com) to be added to our mailing list. ♣

IGSM2: A New Version of IGSM Now Available

BY TARIQ KADIR,
SENIOR ENGINEER, DWR

The California Department of Water Resources has released the first version of IGSM2 (Integrated Groundwater – Surface Water Model 2). IGSM is an integrated hydrological model, where surface water, groundwater, and the surface water–groundwater interaction are modeled simultaneously. On December 17, 2002 the Department held a public meeting on the release of IGSM2, followed by a three-day hands-on training workshop. The public workshop was sponsored through the California Water and Environment Modeling Forum (CWEMF), formerly the Bay-Delta Modeling Forum.

The original IGSM was developed as a purely ground water flow model in 1976 at UCLA by Dr. Young Yoon. The model evolved during the 1980's through

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ACWA Task Force Addresses the Question: "What Constitutes a Good Groundwater Management Plan?"

BY VICKI KRETSINGER,
ACWA TASK FORCE MEMBER
AND GRA BOARD MEMBER

In 1999, the California Budget Act directed the Department of Water Resources (DWR) to develop criteria for evaluating groundwater management plans and also to develop a model groundwater management ordinance. Subsequently in 2002, groundwater management legislation, specifically SB 1938 (Machado), was enacted. This bill incorporated some of the preliminary language developed by DWR in response to the Budget Act. SB 1938 (Machado, 2002) amends Water Code Section 10750, or AB 3030—the first Groundwater Management Act.

The amended code led to discussion by the Association of California Water Agency's (ACWA) Groundwater Committee about what constitutes a "good" groundwater management plan. The Committee was particularly interested in what criteria DWR would use to determine whether groundwater management plans submitted under the amended code meet the requirements to be eligible for funds administered by DWR for construction of groundwater projects or groundwater quality projects. The Committee's discussions led to the formation of a Task Force that would develop a plan guideline that would include: 1) those elements of a groundwater management plan that are now required in order to meet the new

SB 1938 requirements, and 2) other recommended plan elements that should be included in a "good" plan.

The Task Force held a kick-off workshop on October 3, 2002. Efforts during this first workshop were focused on the required elements for those plans being prepared for the purpose of qualifying for funding under SB 1938. Recommended components for groundwater management plans were also identified, while recognizing that management programs may vary significantly due to regional differences, other factors that define management objectives, and the desired local management objectives.

Following the first Task Force workshop, the draft groundwater management plan elements were transmitted to DWR for its review. As a follow up to that transmittal, DWR shared the "model" groundwater management plan components under development in response to the 1999 directive and as part of its "California Groundwater, Bulletin 118" update. The update is scheduled to be available to the public as a review draft the end of March 2003. DWR also offered to work with ACWA in a joint effort to produce a document that outlines the recommended plan components. These recommended components would serve as a "model," that would provide the elements of a "good" groundwater management plan.

The general content of the DWR and Task Force draft management plan summaries were quite similar. As a result, at the second joint workshop in November 2002, the DWR version was used for further discussion as part of the cooperative effort to develop one model. The draft model was then provided to the full Groundwater Committee for discussion at its business meeting at the Fall ACWA Conference. Very few comments were received from the

Groundwater Committee. The Task Force held a subsequent workshop in December 2002, and further improvements were made to the model. Following that workshop, a final draft of the plan model summary, "Required (by SB 1938) and Recommended Components of Local Groundwater Management Plans," was circulated to the Groundwater Committee on January 8, 2003. The draft summary is posted at DWR's web site at <http://www.waterplan.water.ca.gov/groundwater/118index.htm>.

ACWA plans to use these elements to promote development of better groundwater management plans and become more proactive in groundwater management in general. DWR is using the plan model as the basis for an expanded discussion of the required and recommended components of local groundwater management plans in the forthcoming Bulletin 118 update. Questions or comments can be emailed to John Woodling at jwoodlin@water.ca.gov.

Use NEMI First

BY BART SIMMONS

Ever need a water test method? Regardless of what project planning process is used, someone must choose environmental sampling and test methods. Standardized test methods have been published by:

- ◆ U.S. Environmental Protection Agency (EPA) programs
- ◆ EPA regional offices
- ◆ US Geological Survey (USGS)
- ◆ American Society for Testing and Materials (ASTM)
- ◆ Standard Methods for the Examination of Water and Wastewater (“Standard Methods”)
- ◆ Association of Official Analytical Chemists (AOAC)
- ◆ State, Regional, and Local agencies
- ◆ Many others

Deciding among several methods that use the same technique, e.g., gas chromatography-mass spectrometry (GC-MS), can be confusing. Many EPA programs have published their own methods that are similar to, if not identical to, methods from other EPA programs, and method validation and actual performance data for published methods varies. To assist the decision-maker, a list of test methods has been compiled as the National Environmental Methods Index (NEMI). NEMI can be found at www.nemi.gov.

Chemist's Corner

As an example of using NEMI, I searched “arsenic” on-line and found 22 methods. The sources were:

◆ US EPA programs:	11
◆ Standard Methods:	3
◆ AOAC:	1
◆ ASTM:	2
◆ Hach Corporation:	1
◆ USGS:	4

How do they compare?

These methods range from a relatively inexpensive Hach field test to an expensive arsenic speciation method (EPA 1632). The methods are compared by:

- ◆ Detection Level
- ◆ Accuracy
- ◆ Percent False +/-
- ◆ Precision
- ◆ Relative Cost
- ◆ Instrumentation

Links are available to the source of the methods, where many can be downloaded and printed.

NEMI is a product of the Methods and Data Comparability Board (<http://wi.water.usgs.gov/pmethods/index.html>). The NEMI workgroup, led by Larry Keith, created the NEMI database to assist in the choice of the proper method for the matrix of concern. One goal of the Methods Board is to make data more comparable, and NEMI helps

by providing performance data up front for the project manager or other professional. With the transition to performance-based measurement, NEMI provides a variety of methods, with their associated performance data, to help meet the needs of a particular project. If there is a particular regulatory requirement, e.g., the Safe Drinking Water Act, NEMI can be searched by analyte and regulatory program to find approved methods. The primary scope of NEMI is water testing, but other matrices are included; biological methods are being added to NEMI to further expand the scope of sampling and field methods.

In October 2002, the EPA Office of Solid Waste proposed deleting some required use of EPA methods as part of the Methods Innovation Rule. The Office of Solid Waste is moving toward the use of “any reliable method,” with a few exceptions, such as the Toxicity Characteristic Leaching Procedure, which has no comparable applications for hazardous waste applications.

As the environmental community moves more toward a performance basis, tools like NEMI help identify the test methods that help optimize the collection of reliable data.

Bart Simmons, Ph.D., is the Chief of the Hazardous Materials Laboratory in the California Department of Toxic Substances Control. He can be reached at bsimmons@dtsc.ca.gov. ◆

National Ground Water Educational Foundation, Inc.

BY KEVIN MCCRAY,
CAE, EXECUTIVE DIRECTOR

Established in 1994, the National Ground Water Educational Foundation (NGWEF) is operated by the National Ground Water Association (NGWA) as a 501 (c) (3) public charitable foundation. The NGWEF mission is clear: “Conduct educational, research and other charitable activities to enhance the future effectiveness of the ground water professions and to maximize the impact of ground water for society.”

NGWEF works closely with the NGWA to use the Foundation’s resources to fund leading-edge programming that creates and stimulates new knowledge, information, programs and products to help address future trends in the ground water community and to maximize ground water’s impact for society.

NGWEF works to widen service to the ground water professions; create very focused, high-quality programming; enhance the image and public’s awareness of the ground water professions and practices; and expand the ground water industry’s service to the public. The Foundation seeks participation from a broad cross-section of those committed to the future of the ground water industry—members, corporations, and foundations. Contributions broaden our awareness and understanding of ground water; aid in the future of the ground water industry; are recognized and appreciated; and are tax-deductible to the fullest extent of the law as the Foundation is a 501 (c) (3) charitable organization. Contributions do not support NGWA operations; pay NGWA staff payroll; or reimburse volunteers.

Education Corner

Leadership of the Foundation is made up of four elected officers, four elected divisional leaders, and one additional director from NGWA (whose staff manages the Foundation). Successful fund raising helps provide support for Foundation programs that today rely heavily upon grants from the Association. Foundation activities supported by NGWA are described below:

- ◆ To foster interest and excellence in ground water science and technology, the Henry Darcy Distinguished Lecture Series was established in 1986. The Series, which has reached more than 50,000 ground water students, faculty members and professionals, honors Henry Darcy for his scientific discoveries of 1858. Darcy’s investigations established the physical basis upon which ground water hydrology has been studied ever since. Since its inception, seventeen outstanding scientists and engineers have contributed time traveling nationally and internationally through the lecture series.
- ◆ To promote professional excellence in water well technology for the ultimate purpose of protecting the world’s ground water resources for their productive use by mankind, the William A. McEllhiney Distinguished Lecturer in Water Well Technology supports efforts to enhance the skills and credibility of all ground water professionals and to develop and exchange industry knowledge. The lecture series honors William A. McEllhiney, the founding president of NGWA.

For more than 18 years, the Foundation and NGWA have been major participants in the International Science and Engineering Fair, an event that demonstrates the scientific accomplishments of young people. Every year, the Foundation provides cash awards to the first place, second place, and third place winners—students who take on water-

related projects and who compete against each other. In addition to these cash awards, the winning students’ schools receive a ground water science library. By acknowledging excellence of potential ground water professionals, NGWEF is able to enhance the skills and credibility of all ground water professionals. In publishing these award winning project abstracts in *Ground Water* developing and exchanging industry knowledge is furthered, while public relations efforts in conjunction with the fair promote the ground water industry and understanding of ground water resources.

In 2002, the Foundation established a scholarship fund named in honor of Leonard Assante, a recent past president of NGWA respected for his commitment to the industry and to education. A fundraising auction at the 2002 Ground Water Expo raised \$48,000 for this fund, which will make awards in 2003.

As international organizations, the Foundation and NGWA, working with such organizations as Wells for Life, Lifewater, God’s Drill Team, and many others, can bring member resources to bear on the population of more than 1.5 billion people worldwide who lack access to clean water.

To learn more, please contact me at 614-898-7791 or kmccray@ngwa.org. ◆

National Ground Water Association: An Eventful Ground Water Awareness Week

BY JULIE SHAW

The National Ground Water Association's annual Ground Water Awareness Week observance falls on March 16-22, a particularly auspicious week for ground water not only because of Awareness Week, but also the many ground water-related activities occurring on that same time period. This convergence of events may be an indicator of the growing importance people around the globe are placing on ground water resources, and should certainly help to raise the resource's profile among the general public, the scientific community, and policy-makers.

Through media campaigns and enlisting members to participate in awareness-raising activities in their communities, the National Ground Water Association (NGWA) uses Ground Water Awareness Week to put the spotlight on ground water's role in ecosystems and human activity.

Perhaps the premier event taking place during the week is the Third World Water Forum, which will be held March 16-23 in Kyoto, Shiga, and Osaka, Japan. The Forum will focus on improved access to safe water and better management of water resources, for the first time devoting significant attention to ground-water issues. NGWA will be represented at the Forum by Stephen Ragone, NGWA's science and technology director, and Michael Campana, professor and director of the water resources program at the University of

Alliance Corner

New Mexico, and chair of the AGWSE membership division of NGWA. Both will serve as speakers in the session devoted to ground water, entitled, "Intensive Groundwater Use: the Silent Revolution." The session responds to a growing concern about the need to improve both the recognition of the important role ground water plays in society and the need to manage it for

future generations. Campana will address ground water quality concerns, and Ragone will focus on the management lessons learned from studies of the major regional aquifer systems in the United States.

Another significant upcoming event for ground water professionals is the

Continued on page 22

A Letter to the GRA Membership From Judy Bloom

January 3, 2003

Kathy Snelson, Executive Director
Groundwater Resources Association of California
915 L Street, Suite 1000
Sacramento, CA 95814

Re: GRA Board Position

Dear Kathy, Members of the GRA Board and the GRA Membership:

I very much regret to inform you that I must resign from my position on the GRA Board, effective immediately. My family and I have decided to relocate to Denver. While we look forward to new opportunities, I am very sad about the ones I am leaving behind, especially this one. You and all the Members of the Board have been wonderful to work with and my experiences have all been positive. I want to thank the GRA membership and the Board for having given me the opportunity to participate as a Board member.

I look forward to talking with you before we move (end of February) and hope to see you in Denver. Please call me when in town and if you are looking for a "relaxing" place to stay with 2 young kids, we would love to have you stay with us.

This organization is so important to California. Your presence is increasingly vital in a time when the resources and attention of our agencies are diverted to other matters. Groundwater is the Resource! and you are the voice that must keep California focused.

I will forward information as it becomes available. Officially, I can now be located at the US EPA, Region 8 office in Denver.

Take care,
Judy L. Bloom

Regulator Training and Well Discharges

BY MIKE MORTENSSON, CGA
EXECUTIVE DIRECTOR

California Groundwater Association (CGA) will be conducting a one-day training session on Basic Water Well Construction for regulatory agency personnel on April 1 in Napa. The free session is a pre-conference workshop at the California Environmental Health Association (CEHA) Annual Education Symposium, and is a result of joint efforts with CEHA and the California Conference of Directors of Environmental Health. CGA received a contract with US EPA to do two of these training sessions and to plan additional sessions on Annular Seals and Well Destruction. The second Water Well Construction session will be held in southern California in the fall. Both well construction sessions will include segments on CA well standards and laws, geology and groundwater location, geophysical logs, drilling methods, drill cutting samples, casing and screen installation, sand and gravel packs, well development and annular and surface seals.

CGA is also working with NGWA and ACWA in regard to NPDES and Stormwater permits that may affect well discharges. Various Regional Water Quality Control Boards are revising and adopting new general permits for low threat groundwater discharges. The State Water Resources Control Board is also considering a statewide general permit for well development and pump and aquifer testing discharges. CGA has established a NPDES Task Force to focus on discharges and to promote the development of Best Management Practices and permit standards to minimize the impacts to well owners. We'd like to talk with GRA members who have had experience with NPDES permit development and application. Give us a call at 707-578-4408, fax to 707-546-4906 or email welguy@groundh2o.org.

Alliance Corner

3rd World Water Forum

BY LENNY KONIKOW, IAH

The groundwater theme will be presented during two days (March 18-19, 2003) of the 3rd World Water forum in Japan. The International Association of Hydrogeologists is one of the theme coordinators, and Andrew Skinner (Executive Director, IAH) will be a Master of Ceremony for the Opening Session. The groundwater theme and its various sessions will lead to a declaration to be presented to the Ministerial Conference.

A detailed briefing note has been prepared by IAH. Highlights and major points of the document, which is aimed at managers, policy makers, and high-level governmental officials, include:

- From early times man has obtained much of his basic needs for good quality water from subterranean sources.
- Groundwater is the world's most extracted raw material.
- The understanding of groundwater flow in complex aquifer systems is not precise.
- Aquifers have much more storage than all the world's surface reservoirs.
- For users, groundwater levels are usually more important than volumes.
- Groundwater use often brings larger economic benefits per unit volume.
- Overall dependency of urban areas upon groundwater is intensifying.
- Agriculture now obtains over 30% of its water supply from groundwater.
- Aquifer residence times can be counted in centuries and millennia.

- Some largely uncontrolled withdrawal of non-renewable aquifer reserves is occurring in various aquifers.
- Groundwater extraction can seriously reduce natural aquifer discharge to the aquatic environment.
- Some groundwater contains trace elements that limit its fitness for potable use.
- There are significant areas where serious groundwater salinization has developed.
- Aquifer contamination is likely to be persistent and difficult to remediate.
- Too little of the enormous benefits of groundwater development have been re-invested in improved management.
- A major challenge is to stabilize aquifers exhibiting hydraulic imbalance.
- Pollution protection requires making groundwater more visible to stakeholders and the broader public.
- The role of government should be transformed from a focus on supply-development to a role as resource-custodian and information-provider.

Full details on the World Water Forum Program are obtainable from the web site (<http://www.worldwaterforum.org/>).

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Organizational Corner



Message From the Executive Director

BY KATHY SNELSON

Exercising Too Much Caution Can Stifle Your Swing and Cause You to Miss the Homerun Pitch

What does exercising too much caution have to do GRA and groundwater?

During this time period of great uncertainty initiated by the threat of war, an erratic economy, and increasing fear and violence, it is natural for all of us to want to shrink our sphere of travel, spending, learning and communicating.

If you are considering not renewing your GRA membership, not attending a GRA program or not being a GRA program exhibitor or sponsor this year, first consider what is the worst thing that could happen if you do? I believe you will find out that the risk and downside are not catastrophic, and in fact, is the proper approach to staying connected with the leaders in groundwater resources in California, customers who utilize your expertise and services, and prospective customers who need your

services. Participating will also create opportunities for you to experience additional (and new) perspectives on the existing marketplace and how current circumstances are affecting (and may affect) the groundwater resources industry and its ability to manage and protect groundwater in California.

As Robert Kriegel and David Brandt state in their book, *Sacred Cows Make the Best Burgers*, “Worrying – not baseball is really the national pastime.” Let’s keep baseball as the national pastime by learning from Hank Aaron, Major League Baseball’s all-time home run leader, who was quoted as saying, “My motto was always to keep swinging. Whether I was in a slump or feeling badly or having trouble off the field, the only thing to do was keep swinging.”

Look fear in the eye and renew your membership today or budget for attending a GRA program. A homerun pitch is out there waiting for you to hit it! The ultimate outcome will be the protection of groundwater resources in California. 💧

Call For Seminar Volunteers

GRA has a full slate of seminars scheduled in 2003. The seminars are highly successful because of the volunteers who lend their expertise and time to each program. Please see GRA’s calendar on the back page of this *HydroVisions*, and contact Tom Mohr, Seminar Committee Chair, at tmohr@valleywater.org about which programs you can help develop and coordinate. Thank You!

GRA Director Awarded Fulbright Senior Specialist Award

Jim Jacobs, a member of the GRA Board of Directors, was recently awarded a Fulbright Senior Specialists Award for 2003 from the J. William Fulbright Scholarship Board.

The Fulbright Program is designed to “increase mutual understanding between the people of the United States and the people of other countries...” It has provided more than 250,000 participants—chosen for their academic merit and leadership potential—with the opportunity to study and teach in each other’s countries, exchange ideas, and develop joint solutions to address shared concerns. The Program was founded in 1946 by the U.S. government.

Beginning in mid-March 2003, Jim will be working with the University of the West Indies and presenting several days of workshops related to assessment and remediation of metals, hydrocarbons and solvents. The remainder of the two week appointment will focus on assisting Dr. Jasminko Karanjac, Professor and Chair in Water Resources Management, in developing a MSc program in Water Resources Management.

Jacobs is a certified hydrogeologist with Environmental Bio-Systems, Inc. 

Organizational Corner


Continue the Benefits of GRA Membership: Renew Online - It's Fast, Easy and Secure

To continue to receive all of the benefits of GRA membership in 2003, please renew NOW! You can renew online by going to <http://www.grac.org/members>.

Renewing your membership keeps you connected with the leaders in groundwater resources in California, customers who utilize your expertise and services, and prospective customers who need your services. And, it creates opportunities for you to experience additional (and new) perspectives on the existing marketplace and how current circumstances are affecting (and may affect) the groundwater resources industry and its ability to manage and protect groundwater in California.

2003 Director Election Results

The election for GRA’s 2003 Board of Directors has been officially completed. Board incumbents Jim Carter, Vicki Kretsinger and Brian Lewis were re-elected, and Bill Pipes was elected as a new member of the Board. They will serve three-year terms ending in 2005 (the term was inadvertently stated as two years on the ballot).

As a result of Judy Bloom’s resignation from the Board of Directors, which became effective January 3, 2003, Jim Strandberg was appointed by the Board to complete the remaining time of the term. Strandberg's term will expire at the end of 2003. 

Southwest Hydrology Now By Subscription Only

Beginning with the May/June issue, Southwest Hydrology, the trade magazine for hydrologists and water professional across the Southwest, will be available by paid subscription only. Subscriptions for one year (6 issues) cost \$35 by check, or \$37 by credit card. Visit www.swhydro.com for more information. Upcoming features include desalination, approaches to surface water and groundwater management, remote monitoring techniques and applications, organic wastewater contaminants in our waters, the Colorado River Delta, water as a commodity, and GIS applications in hydrology. Sign up now so you don't miss an issue!

Organizational Corner

GRA Welcomes the Following New Members

NOVEMBER 9, 2002 - FEBRUARY 3, 2003

Walt Pachucki	TEAM Engineering & Management, Inc.	Orlando Carreno	Basin Water, Inc.
Andrew Zdon	TEAM Engineering & Management, Inc.	Tatyana Pak	The Auger Group, Inc.
Richard Bell	Irvine Ranch Water District	Brian Pierskalla	Pierskalla Services
Kevin Calcagno	Sequoia Analytical Laboratories	Steven Bolman	US Filter / Whittier Inc.
Jeff Metteer	Columbia Analytical Service	Brett Bardsley	Delta Environmental Consultants, Inc.
Anita Teo	Tetra Tech EM, Inc.	Will Slowik	Delta Environmental Consultants, Inc.
Naomi Jensen	TEAM Engineering & Management, Inc.	Todd Del Frate	Delta Environmental Consultants, Inc.
Robert Beggs	Brown & Caldwell	Janine Weber Band	Geotechnical Consultants, Inc.
Randall Von Wedel	CytoCulture International, Inc.	Thomas Deane	Tetra Tech, Inc.
David Klemme	Environmental Resolutions, Inc.	Gary Ottoson	Haight Brown & Bonesteel, LLP
Martin McIntyre	City of Fresno	Anna Willett	Regenesis
Peter Halpin	Caltest Analytical Laboratory	Bryan Vigue	Regenesis
Joseph Zilles	Kleinfelder, Inc.	Stephen Koenigsberg	Regenesis
James Burton	Psomas	William Hunt	TRC
Matthew Earnshaw	EBA Engineering	Robert Manriquez	Haley & Aldrich, Inc.
Jeffory Scharff	Law Offices of Jeffory J. Scharff	Susan Skoe	GeoSyntec Consultants
Regina Bussard	Shaw Environmental, Inc.	Laura Frost	GRA Associates, Inc.
Chris Savage	E&J Gallo Winery	David Herzog	Shaw Environmental
Jenny Lee	CH2M Hill	Richard Booth	Lahontan Regional Water Quality
Victoria Taylor	Kinder Morgan Energy Partners	Christer Loftenius	Los Angeles Unified School District
Scott Martin	LFR Levine-Fricke	Donald Bills	U.S. Geological Survey - WRD
Ailsa Le May	Kodiak Consulting, LLC	Maureen Wan	Weiss Associates
Jan Lee		Dan Wynne	Shaw Environmental
Mark Lafferty	Chevron Texaco	Eric LaBolle	University of California
Richard Kelly	Clear Creek Tech, Inc.	Celina Hernandez	Mojave Water Agency
Debra Moser		Stiles Seth	Treadwell & Rollo, Inc.
Jill Henes	Veridian Environmental	Jane Doe	AAA Engineering (test company)
Karen Synowiec	Chevron Energy Research & Tech Co.	Dan Schueler	Roscoe Moss Manufacturing Company
Scott Palmer	Earth Tech, Inc.	Tom Herring	Roscoe Moss Manufacturing Company
Lee Paprocki	Komex	Jerry Garcia	GD Productions
Julie Nico	S.S. Papadopoulos & Associates, Inc.	Marianne Gibbons	Treadwell & Rollo, Inc.
Alexis Hillman	ENVIRON International	Patrick Hubbard	Treadwell & Rollo, Inc.
Warren Morgan	SCWC	Edana Fruciano	Alpha Analytical, Inc.
William Guarini	ENVIROGEN, Inc.	Tambrey Tosk	LEE & RO, Inc.
John Copeland	AQUA International Consultants	Kristen Stevens	ARCADIS Geraghty & Miller, Inc.
Jeffrey Hamilton	Environmental Resources Management, Inc.	Dawn Zemo	Zemo & Associates LLC
Amer Hussain			
Thomas Dibblee	University of California, Santa Barbara		
Margaret Bloisa	CDM		
Mary Mecartney			
John Bird	Magellan Environmental, Inc.		
James Schwartz	Magellan Environmental, Inc.		
John Constan	Magellan Environmental, Inc.		
Brad Cross	LFR Levine-Fricke		

naturally occurring constituents that may not be of contemporary concern in the regional groundwater flow system may change naturally, or through human influence, thereby becoming a concern. Other important potential consequences of excessive pumping include overdraft, seawater intrusion in coastal aquifers, and land subsidence.

Even though we succeed in manipulating groundwater resources through artificial recharge, extraction, and other ways, nature's laws ultimately control the interactions of groundwater with the atmosphere, streams, lakes, wetlands, the soil, and the ecosystem. Groundwater systems are very difficult or even impossible to restore to a pristine or background condition once they are degraded. Therefore, as groundwater use increases, it must be accompanied by flexible and timely management approaches that recognize the functioning of the hydrologic cycle as an integrated system. These approaches are otherwise known as adaptive management. Neglecting to do so will eventually lead to a decline in the availability and quality of groundwater, and probable impairment of ecosystems.

Human Side of California's Water

Groundwater use in California is linked to historically divergent paths that stem from two English common law traditions. One such tradition bestowed on landowners an absolute ownership of all groundwater beneath the surface of the land owned. The other, known as public trust, is rooted in Roman law traditions dating back to the sixth century A. D. The Romans determined that certain resources such as air, running water, the sea and the lands adjoining the sea were essential for all subjects and no one could be denied access to these resources. This doctrine of public trust has become part of the constitutions of many of the states of the United States, including California. As a consequence, the State holds all water, including surface water and groundwater, in trust for the people. Further, it has the responsibility to assure that all water is put to beneficial use and that wasteful use is prevented. Legally,

public trust is applied only to navigable waters and tidelands. There has been general consensus, however, that surface water resources fall within the scope of public trust in California. Philosophically, and also through declarations in 1911 and 1921 which later formed Water Code Sections 102 and 104, groundwater is within the realm of public trust if not within its legal fold.

The public trust responsibilities of the State include protection of both groundwater quantity and quality. Presently, legislative actions have moved toward requiring groundwater management that considers groundwater in the context of all water resources in a basin. Efforts are also underway by the California Department of Water Resources (DWR) and others to develop guidance on the essential and required components of local groundwater management plans. For groundwater to be managed in a sustainable way within a complex and dynamic hydrologic system, it must be managed efficiently by local agencies, in coordination with other local entities, on a basin-wide level. Actions by local entities statewide to improve groundwater

the means necessary to protect the long-term public benefit of all water resources could ultimately be applied through the legislature. In advance of any future impetus that results in legislative action, judicial resolution of disputes will continue.

Nearly 80 percent of California's developed water resources support agricultural needs. Simultaneously, municipal water institutions have devoted attention to supplying water for urban growth. With the exception of some agencies that have employed comprehensive groundwater management programs for decades, it is only in recent years, particularly as a result of emerging and persistent contaminants, that the present and long-term costs of treatment, monitoring or other related measures have received attention in the economic analyses of water management. Economic analyses should also consider the long-term cost savings achieved by conducting monitoring and mitigating the need for future treatment.

Science and Sustainable Water Management in California

California has shifted to more efficient water management that recognizes that economic growth must be based on present beneficial use of natural resources without unacceptable consequences to the resources system. The groundwater system is subject to the immutable

laws of nature, including climatic forces that are unpredictable either on an annual basis, or on a time scale of centuries. In contrast to the laws of nature, public values that drive economics can change with time. Ultimately, there must be a balance between human endeavors and nature's laws so that groundwater resources are used sustainably.

During the 1880s, John Wesley Powell of the U. S. Geological Survey (USGS) argued for the use of basins as the unit of

“Sustainability is the condition of beneficially using groundwater in such a way that it supports the present generation, while simultaneously ensuring that the resource is not unacceptably damaged by such a beneficial use.”

management and monitoring are being implemented with recently enacted legislation such as AB 599 and SB 221, 610, 1938, and 1672. Notably, SB 1938 amends Water Code Section 10750, more commonly known as AB 3030, which was the first Groundwater Management Act in California. If these efforts fall short of legislative directives as applicable, or State or other guidelines for implementing groundwater management are not considered, groundwater basin management approaches may be inadequate to achieve sustainability, and

Continued on page 18

water management, particularly in the arid lands of the American West. His suggestion went unheeded at that time. While a limited number of groundwater management plans have recognized the intrinsic relationship of the components of the natural resources system, newly enacted legislation, including SB 1938 and 1672, now formally directs attention to basin-wide, integrated management.

Recommendations for Achieving Sustainability

Sustainability, as approached herein, is based on physical laws that govern the behavior of Earth systems, and may be defined as follows:

“Sustainability is the condition of beneficially using groundwater in such a way that it supports the present generation, while simultaneously ensuring that the resource is not unacceptably damaged by such a beneficial use.”

Natural changes are inevitable; however, change due to human action must be managed to avoid undesirable results. A significant challenge lies in defining “acceptable change.”

With a century and a half of California traditions, customary practices, and institutions in place, the transition from an historical, economically based water use to an integrated, adaptive water management policy poses major challenges. These entail change at all levels of society, from the individual, to educational institutions, to commerce, to the profession, to government, the legislature, and the judiciary. The recommendations for sustainability presented below are based on the following premises.

- Surface water and groundwater constitute a single resource. Groundwater is a finite resource that is a component of a larger natural resources system.
- Development of groundwater resources for beneficial use can affect other components of the natural resources system.
- Periodic renewal of groundwater resources is subject to climate variability and natural and enhanced recharge

processes. Consequently, groundwater resource development must be adaptable to the capacity for replenishment of the system to occur.

- Since the integrity of the natural resources system as a whole is vital, groundwater beneficial use must be so managed that the rights of others to share the resource are recognized, and the resource itself is not unacceptably impaired during the process of beneficial use.

The recommendations listed below have in part been formalized with recent California legislation that demonstrates a statutory shift to integrated and sustainable water resources management approaches. For some water entities, these approaches are not new and simply confirm the vision and wisdom of giving attention to integrated water resources management.

1. **Groundwater basins and watersheds as units of management:** Legislation is beginning to more directly recognize basins and watersheds as official groundwater management units. Although legislation such as SB 221 directly requires, for its specific purpose, consideration of the groundwater basin information compiled by DWR, there are more current data and reports not yet assimilated by DWR. DWR is actively seeking this information for the forthcoming Bulletin 118 update “California’s Ground Water.” Even with current data, much remains to be done to expand our understanding of basin heterogeneity and important basin recharge and discharge processes. It is recommended that local entities and others involved in groundwater resources investigations and studies provide DWR with updated groundwater information, including: surface and subsurface geologic information that has been developed to better understand physical basin

boundaries and subsurface hydrogeological conditions; updated evaluations of groundwater storage, including variable storage under different hydrologic conditions; current and projected water use; present and probable future availability of supplemental water supplies; and existing or potential issues of concern such as water quality degradation, persistent groundwater depletion, subsidence, soil salinization, or other significant environmental impacts. Additionally, funding is needed in order for DWR to adequately carry out the directives that groundwater data be updated by the Department and made publicly available.

2. **Hierarchical objectives:** Sustainable management of groundwater resources must consider the needs of individual users as well as the needs of the community and the environment. To this end, a hierarchy of institutions, from the local level to the State, needs to coordinate activities so that each agency is cognizant of its own role within the larger context. Cooperative efforts among local entities within a basin or watershed are critical to establish clear management objectives for the basin as well as objectives that may be specific to the areas directly under the purview of a single entity. Importantly, all objectives should be developed within the overall premise of achieving sustainability.
3. **Monitoring, an essential part of management:** Because climate is unpredictable, and components of the natural resources system interact in complex ways, ongoing systematic monitoring must become an integral part of resource management. The goal of integrated monitoring of surface water and groundwater, and other components of the natural resources system as appropriate, is to regularly assess the data and detect, in a timely fashion, any unacceptable changes so as

For some water entities, these approaches are not new and simply confirm the vision and wisdom of giving attention to integrated water resources management.

to initiate mitigative measures. An expanded statewide program is needed for the collection, storage, and dissemination of groundwater-related data that will facilitate evaluation of the State's groundwater resources for future planning and management programs and activities. It is recommended that consistent and uniform standards be developed to facilitate coordinated basin-wide monitoring among local entities, and the transfer of local groundwater data to the State.

4. **Supporting Research:** The fundamental goal of achieving sustainability is complex and initiates many new questions that require further research, which in turn requires multi-disciplinary collaboration and funding. The research, investigation, and educational programs would be performed by academia and public agencies; for example, the development of improved methods and technology for quantifying individual processes of the hydrologic system, the interrelationship of multiple-system processes, and the development of methodologies for sustainable development, conservation, recycling, and reuse. In addition, the goal requires continuing evolution of the tools used for gathering field data used to assess management approaches. Systems such as the Imperial Valley and the San Joaquin Valley have shown the result of being over-stressed to support present levels of economic productivity. The supporting research would immeasurably benefit such systems.

5. **Economics:** Economic analyses applied to future water management must consider the institutional and management tools necessary to achieve sustainability within the constraints of the physical and chemical attributes of the natural resource system. With increasing awareness of the State's public trust responsibilities in the beneficial use of water resources, novel tools and methods for economic analyses need to be developed that can better account for future interests in the integrity of the natural resources system. The economic consequences of alternative management programs, including programs that constrain

groundwater development, should also be considered. Other economic considerations include the costs and benefits attached to a desired level of certainty for attaining sustainability. There is a balance in the level of monitoring and evaluation that is reasonable and necessary as compared to an excessive amount that provides no further assurance of a sustained water supply. While the White Paper highlights the present need in most basins for more comprehensive monitoring and evaluation, it is not intended to create a quagmire of potentially meaningless data at exorbitant cost that are then ignored.

6. **Education:** The future of sustainable water management depends very much on the water literacy of the general public, as well as well-rounded education and training of surface and groundwater management professionals. The importance of science education and the application of earth sciences, including hydrology and hydrogeology, and engineering in sustaining groundwater resources must be recognized. Public outreach programs on water education need to be supported and expanded; society's understanding of the need for creative management programs, including conjunctive management, water transfers, recycled water use, efficient

water use and potential long-term costs, will become increasingly important.

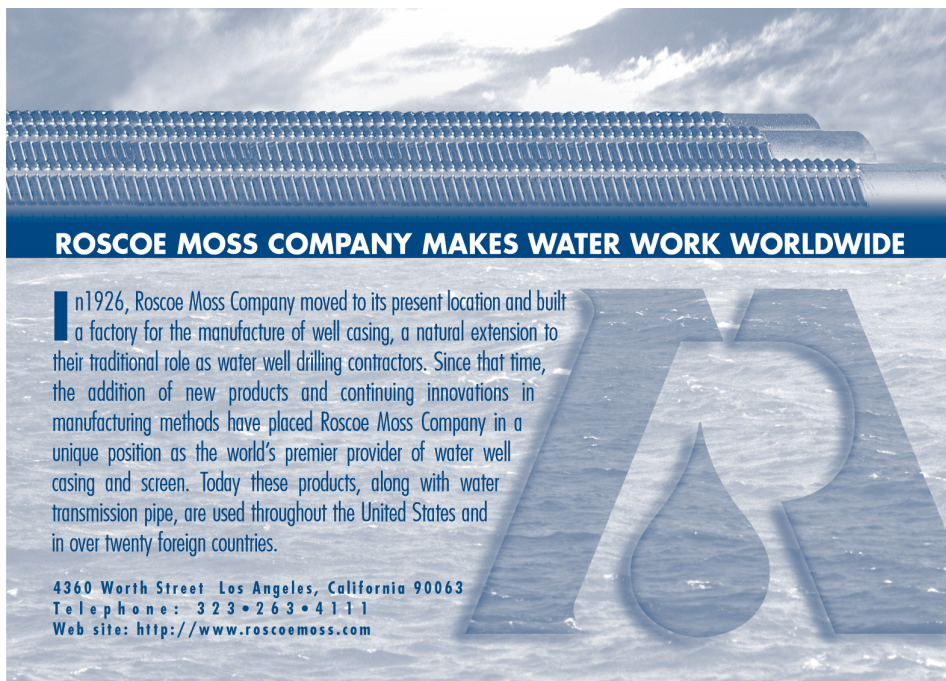
Acknowledgements

In preparing the White Paper, comments and criticisms were solicited from a number of peers from academia, the government and the industry, with expertise in scientific, societal, and legal aspects of groundwater management. Their insights have been most invaluable in finalizing this work, and those individuals are acknowledged in the complete version of this White Paper at www.grac.org.

Editor's note: The views expressed are those of the authors and do not necessarily represent those of GRA. Letters to the HydroVisions editor are always welcome and should be sent to editor@grac.org.

T.N. Narasimhan, Professor of the Department of Environmental Science, Policy & Management, Univ. of California, Berkeley and Senior Scientist of the Earth Science Division Lawrence Berkeley National Laboratory.

Vicki Kretsinger, Director of GRA and Principal Hydrologist at Luhdorff and Scalmanini, Consulting Engineers, Woodland, CA. ♪



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New Developments in Groundwater Contamination Law – Continued from Page 4

led the nation by passing a statute requiring the setting of a PHG by January 1, 2003, and the adoption of a maximum contaminant level (“MCL”) for perchlorate in drinking water by January 1, 2004. The court-ordered public comment period expired on January 24, 2003, but the peer review still remains to be completed. The final PHG will likely be published within 90 days of the delivery of the request for peer review to the University of California, or as early as the end of April 2003.

Following adoption of a PHG for perchlorate, which is based strictly on scientific evaluation of the health risks imposed by the chemical, the Legislature has mandated the adoption of an MCL for perchlorate. The delay in promulgation of the PHG will likely result in a similar delay for setting the MCL for perchlorate past January 1, 2004. MCLs must be chosen based on a number of factors beyond health information, such as available technologies for and economic costs of water treatment. Those parties who opposed OEHHHA’s setting of the PHG on procedural grounds are likely to offer even greater resistance to the adoption of an MCL.

The plaintiffs in the Los Angeles Superior Court action both face huge potential liabilities related to perchlorate. Lockheed has already been sued based on its operation of a former rocket fuel plant located in Mentone in San Bernardino County by local residents who claim various health problems due to perchlorate exposure. Kerr-McGee is one of two companies that produced perchlorate outside of Henderson, Nevada for years. Surface run-off and a plume of perchlorate-contaminated groundwater emanating from the Kerr-McGee facility have been alleged to have caused the presence of perchlorate discovered downstream in the Colorado River. Perchlorate in the river has then been diverted by the Metropolitan Water District of Southern California for use in its drinking water supplies, which are distributed to residents throughout southern California. Liability for dischargers of perchlorate to drinking water purveyors, in particular, would be impacted by the MCL eventually set, since purveyors can seek damages for increased water treatment costs and a lower MCL would mean more expensive treatment.

With extremely dry conditions throughout California and the southwestern United States, and the ever-increasing value of water due to development pressures, one can expect that legal actions concerning perchlorate in California groundwater will multiply in number and increase in ferocity in the immediate future.

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¹ The chemicals of concern in the action were benzene, lead, and toluene, each of which has been determined to cause cancer or reproductive toxicity as required by Prop 65.

² The parties did not agree on, and the court did not decide, the statute of limitations that would apply to causes of action under Prop 65, but four years was the longest period that could apply to any of the plaintiff’s claims. 💧

IGSM2: A New Version of IGSM Now Available – Continued from Page 8

contracts with the State Water Resources Control Board, the Bureau of Reclamation, DWR, and others. During the 1990’s several versions of IGSM were developed by different groups, with new features added to fit specific needs; different versions of IGSM have been applied to regional studies throughout the United States. Key drawbacks to IGSM were the lack of adequate documentation, complex programming structure, and some theoretical concerns of the model. Some examples of these drawbacks can be viewed in the recently published report by CWEMF at www.CWEMF.org/pubs.

With the support of key IGSM developers and many users of IGSM, the Modeling Support Branch of the DWR’s Bay-Delta Office developed the newly released IGSM2.

The two-year project included an extensive review of the previous IGSM code and of the theoretical bases of the different processes simulated within IGSM. The newly released IGSM2 includes extensive modifications and enhancements to the previous model, as well as a “Theoretical Documentation” report and a “User’s Manual.”

DWR is in the process of developing a webpage for IGSM2 on the Modeling Support Branch’s website at <http://modeling.water.ca.gov>. Both IGSM2 and the associated documentation will be available for downloading under a GNU General Public License (www.gnu.org) or GPL agreement. The Modeling Support Branch will continue to provide technical support, although users of IGSM2 are solely responsible for their applications of

the model. Future workshops for IGSM2 will be held as needed through the sponsorship of CWEMF.

For any questions on availability or use of IGSM2 please contact Tariq Kadir, Senior Engineer, at (916) 653-3513 or kadir@water.ca.gov. 💧

This session looked at nitrate trends in shallow groundwater in both the San Joaquin Valley and the Santa Clara Valley, groundwater monitoring at dairies, and how to properly build supply wells in areas where nitrate is a concern. The session on source controls and treatment strategies consisted of presentations on nitrate in shallow groundwater, the use of phytoremediation, and how to minimize groundwater impact from manure applications at dairies and wastewater from food processing. The final technical session was on collaborative approaches to solving the nitrate problem and included presentations on collaborative approaches being used by the dairy and the fertilizer industries statewide and specific approaches being used in Monterey County, the Chino Basin, and in the Chico urban area.

The symposium concluded with a panel discussion that took up the topic, “A Manageable Threat or a Looming Disaster – Where Do We Go from Here?” The consensus of the group seemed to be that while nitrate certainly represents an impact to the state’s precious groundwater resource, more work needs to be done in determining the problem’s exact nature and extent. The group agreed that we have some very smart people representing all interests and that these people are committed to finding solutions—a combination that will make proper management of the threat achievable.

The luncheon speaker on day two was Senator Jim Costa, a native of Fresno whose family has farmed in the San Joaquin Valley since the turn of the 20th century. He has served as a distinguished state legislator for 24 years—first as a member of the Assembly representing the 30th District and since 1994, as a member of the Senate representing the 16th District. He has served as the Chairman of the Agriculture and Water Resources Committee and has been the author of numerous pieces of legislation in support of sound groundwater management and in advancement of California’s long term water needs. Senator Costa spoke on the role of groundwater in the state’s water supply and the need to protect its quality for future generations. At

the luncheon, GRA President Jim Carter presented GRA’s Special Recognition Award to Senator Costa for demonstrated leadership and dedication to the principles of groundwater resource protection and management in California (see photo on page 5).

Many thanks to the co-sponsors of this event: U. S. EPA, Region 9; MWH; and Geomatrix Consultants. We are also grateful to the cooperators, which include the American Society of Agronomy, California Plant Health Association, California Rural Water Association, Center of Irrigation Technology, RWQCB - Central Valley Region, California Water Institute, International Association of Hydrogeologists, CDFA - Fertilizer Research and Education Program, and the National Ground Water Association.

On behalf of GRA and the Co-Chair of the symposium, Judy Bloom, we would also like to sincerely thank the session moderators and all of the speakers for their hard work and time commitment. Finally, we would like to thank our committee, without whom this would have been a lot harder, if not impossible: Paul Martin, Renee Pinel, Tracy Hemmeter, Clay Rodgers, Neil Dubrovsky, Mike McElhiney, Jeff Bold, Thomas Harter, Cindy Forbes, Denise Mullinax, Stephen Beam, and Sarah Raker.

William Pipes, of Geomatrix Consultants, is the President of GRA’s San Joaquin Valley Branch and was Co-Chair of the Nitrates in Groundwater Symposium. More information on nitrates can be found on GRA’s website at www.grac.org.

One-Day Seminar, Sacramento

A one-day seminar titled “**Identifying and Managing Uncertainty in Groundwater and Surface Water Models**” will be held in Sacramento, CA on Monday, April 28, 2003. This seminar will be geared towards anyone who makes decisions using, or based upon, models - including managers, legislators, non-modelers, and modelers who are unfamiliar with uncertainty analysis and the role of uncertainty in models.

GRA DRAFT Policy Principles and Legislative Guidelines - Continued from Page 6

4. Facilitates the development of alternative technologies and standardization of methods to advance assessment, restoration, management, and protection of California’s groundwater resources.

The draft legislative guidelines include the following elements and specific principle areas:

- Groundwater Management
- Basin Operations
- Groundwater Governance
- Groundwater Information Management
- Water Quality Protection
- Watershed Management
- Funding for Groundwater

The draft guidelines are posted on GRA’s webpage at www.grac.org. If you have questions or comments, please contact the GRA Legislative Committee Chair Tim Parker at tparker@water.ca.gov.

NGWA Fly-in, which will be held March 17-18. NGWA members will converge on Washington, D.C., to encourage legislators to focus on issues such as MTBE and underground storage tanks, Superfund, and rural drinking water. The Fly-in is part of NGWA's ongoing efforts to make sure legislators have access to the knowledge and perspectives of ground water professionals as they make decisions that may have long-term impact on the resource and those who work with it. GRA will be represented by its Legislative Committee Chair, Tim Parker.

Just after the Fly-in wraps up, NGWA's conference, "Pharmaceuticals and Endocrine Disrupting Chemicals in Water," will be held March 19-21 in Minneapolis, bringing together the top researchers from around the globe on these issues. With estrogen recently named a carcinogen by the U.S. government, new data on contamination of streams and ground


water, new treatment technologies, and new technologies for assessing impacts on humans and wildlife, the conference promises to elicit a wealth of information vital to assessing and addressing these problems.

The U.N.'s World Water Day, set for March 22, features the theme "Water for the Future," and is promoting "sustainable approaches to the use of water for the benefit of future generations," and the Groundwater Foundation's annual Children's Groundwater Festival in Grand Island, Nebraska, will be held March 18.

And all of these activities also fall under the umbrella of the Year of Freshwater, as the U.N. has designated 2003.

Considering all of this, and other related activities that may be taking place during the coming weeks (including Earth Day on April 22, with a focus on "Water for Life"), ground water professionals may

want to consider ways to join in efforts to raise awareness of ground water resources and related issues.

For further information on NGWA's Ground Water Awareness Week, conferences, or its Fly-in, visit the Association's Web site at www.NGWA.org, or call (800) 551-7379. Your involvement in these and other ground water-related activities can help build on momentum toward greater respect for the resource. 

SAVE THE DATES!

June 5 – 6, 2003

California State
University, Sacramento
College of Natural Sciences
and Mathematics

Organized by:

Bureau of Reclamation
CALFED Bay-Delta Program
California Department
of Fish & Game
California Department
of Water Resources
Floodplain Management
Association
National Oceanic and Atmospheric
Administration Fisheries
Sacramento Area Flood
Control Agency
Sacramento Region
Water Forum
Sierra College Natural
History Museum
US Fish and Wildlife Service
US Geological Survey
Water Resources Division

Lower American River Science Conference

The Lower American River is a unique resource of the Sacramento region, making important contributions to the economic, environmental and recreational quality of the region. It is the most heavily used recreational river in California, and many public and private agencies are concerned with its welfare. Factors affecting the health of the river include increased flood control requirements, population growth, rising pressure on water use, changing recreation patterns, new understanding of aquatic ecosystems, fish issues, flow management, and restoration projects.

The Lower American River Science Conference will build on existing information, provide a forum where interested parties can share information about ongoing projects and initiatives, and identify gaps in existing knowledge so that disparate groups can coordinate future research projects.

The three concurrent sessions will have the following themes:

- Fish session: Habitat, in-stream flow, fish biology and genetics effects of dams, and surface water quality.
- Groundwater session: Stream/aquifer interaction, contaminant plumes, ground water vs. surface water basins, and conjunctive use.
- Weather session: Forecasting extreme precipitation in the Sierra Nevada; implications for the American River Watershed. (Available Friday, June 6, 2003 ONLY!)

Who Should Attend: Members of federal, state, and local agencies with regulatory roles on the Lower American River; research agencies, consulting companies; members of the interested public; and academic institutions.

Cost: Pre-registration fee \$75/person, on-site registration fee \$110/person.

One day pre-registration fee \$40/person, one day on-site registration fee \$60/person.

Student rate will be available.

Look for a detailed registration brochure in the mail available March 2003, or on-line at www.cce.csus.edu/conferences. For registration questions or to register, please call (800) 858-7743 or (916) 278-4433. For technical/content questions, please visit appropriate link on conference web site at www.cce.csus.edu/conferences.

Central Coast Branch Highlights

BY TERRY FOREMAN, PRESIDENT

It is hard to believe that we are already well into 2003! How time flies!

The Central Coast Branch continues to see a great lineup of speakers. Speakers since the Branch's last report have included Bob Pierotti, Chris Frahm and Dr. Lorne G. Everett.

Mr. Pierotti is the California Department of Water Resources (DWR) Chief of the Southern District's Groundwater Section in Glendale. He provided a review of the near completed draft of Bulletin 118 and described how we could check our favorite basin's descriptions, boundaries, and other groundwater data. The revisions to Bulletin 118 began in 1999 with a series of informational public seminars and requests for basin data. He requested feedback from groundwater enthusiasts and explained the process for providing DWR comments. He briefed the group on what lies in the future program for DWR's groundwater and drought management planning, and he provided an overview of groundwater grant programs. We look forward to your next update Bob!

Ms. Frahm is Of Counsel, with the law firm of Hatch and Parent, located in the San Diego and Sacramento offices. Ms. Frahm is an attorney and lobbyist, specializing in legislative activities supporting the Firm's Water Law Practice Group. She is a former Chairwoman of the Board of the San Diego County Water Authority and a former Vice-Chairwoman of the Board of the Metropolitan Water District of Southern California. Among other clients, Ms. Frahm serves as the legislative advocate for the Groundwater Resources Association of California. Ms. Frahm provided an update on recently passed legislation and developing trends that directly or indirectly affect water and groundwater. She also discussed the impact of term limits on the legislative process and identified key State Assembly and Senate members who are taking an active role in water and groundwater issues. She enlightened us on the need for GRA's increasing role in helping shape California policy as it relates to groundwater.

Dr. Lorne G. Everett, Chief Scientist and Senior Vice President, Stone & Webster Consultants, Inc. made a presentation on "Laser Drilling and Analysis, the First Cleanup Order Based on Methane, Naturally Short BTEX Plume Cleanup, and other Recent Subsurface Characterization and Remediation Issues that Bear Heavily on Litigation, Regulations and Insurance Coverage."

Dr. Everett's presentation followed 3 themes: 1) a break-through laser drilling and analysis technology, which has progressed beyond proof of principle, as demonstrated with specific examples of laser drilling results, 2) an update on the Lawrence Livermore Hydrocarbon reports, with a focus on the emerging issues of methane risks from residual petroleum hydrocarbons, as well as demonstrating how the methane risks are covered by insurance and are of substantial litigation interest and, 3) failure modes associated with current characterization and remediation strategies.

Branch meetings for the remainder of 2003 are scheduled for April 2, June 4, August 6, October 1 and November 5, so mark your calendars. 💧

Sacramento Branch Highlights

DAVID ZUBER AND STEVE PHILLIPS

There has been a couple of issues since the last Sacramento Branch update, but the Branch has had some great speakers this year, and we are looking forward to another great line-up for 2003.

In March 2002, Rob Swartz presented a sneak preview of the Public Review Draft of California's Groundwater - Bulletin 118 Update 2002. Rob is a senior engineering geologist with DWR's Division of Planning and Local Assistance and is currently the statewide coordinator for DWR's update of Bulletin 118. Expectations have been high for this first major update to the Bulletin since 1975. Rob discussed some of these expectations and how the Bulletin will meet them. The update of Bulletin 118 will consist of a report on California's groundwater basins, creation of a revised

groundwater basin map in GIS compatible format, and creation of a Web site to make the groundwater information readily available now and in the future.

It was an honor at the May 2002 Branch meeting to have Eugene Luhdorff review the history of California's Confidentiality of Well Completion Reports as required by the State Water Code. Mr. Luhdorff has been a fixture in the Northern California groundwater business for over 40 years. He helped establish GRA and was the first recipient of the GRA Lifetime Achievement Award. Gene expanded on his comments published in previous issues of *HydroVisions* and offered comparisons between California's requirements for drilling reports to those of other Western States. This speaker topic was sparked when Floyd Flood, editor, included the article "Why are Well Completion Reports Confidential - Is This Statute Outdated?" in the Fall 2001 *HydroVisions*. Gene followed-up with a "Letter to the Editor" in the Winter 2001 edition of GRA's *HydroVisions*. Please review these back issues of *HydroVisions* for more information on the topic.

In June 2002, Tim Parker took the Sacramento Branch on a tour of DWR's recently updated Web site. The updated version allows water resource professionals access to more data and the ability to download and plot data. Tim Parker has over 20 years of experience in both environmental and water resources and has been president of both the GRA Sacramento Branch and the statewide Association. For the summer months in 2002, the Sacramento Branch went on to its typical bi-monthly schedule. The August speaker, Todd Thompson, gave a presentation on establishing statewide standards for onsite sewage treatment systems. Todd Thompson is the State Board's lead Water Resource Control Engineer for the effort to fulfill Assembly Bill (AB) 885's mandate. AB 885 requires the State Water Resources Control Board to establish standards or regulations for onsite sewage treatment systems using a stakeholder involvement process. Todd's presentation discussed the background, the bill, and the overall process, including a discussion on where the draft regulations are to date.

Continued on page 24

In September 2002, Perry H. Rahn gave a technical presentation on directional permeability caused by a variety of geologic conditions. Perry H. Rahn was designated as the 2002 Richard H. Jahns Distinguished Lecturer in Engineering Geology Award. This award was established in 1988 by the Association of Engineering Geologists in co-sponsorship with the Engineering Geology Division of the Geological Society of America. Perry's talk focused on aquifer anisotropy and its effects on groundwater pumping and contaminant transport. Perry showed how geologic mapping and an understanding of geology are required to effectively study groundwater flow. He gave examples that included the orientation of joints in a karst terrain that resulted in solution-enhanced openings, the orientation of fluvial sand lenses in the Cretaceous Dakota Sandstone that match the major transmissivity direction deduced from a pump test, and foliation and bedding of Precambrian phyllite that influences the direction of contaminant transport at Nemo, South Dakota.

The October 2002 speaker, Murray D. Einarson, R.G., C.H.G., reviewed recent data and interpretations on the impact of MTBE to South Lake Tahoe water supply wells. Murray is a contaminant hydrogeologist based in Palo Alto, California. In 1997, MTBE was detected in Arrowhead Supply Well #2, one of South Tahoe Public Utility District's drinking water supply wells. Gas stations near the Arrowhead well were immediately suspected of being the source; however, none of the stations are hydraulically upgradient. New data, careful examination of historical records, and review of gas station investigation data suggest that the MTBE detected in the Arrowhead well was not caused by a release from a gas station. Instead, the data indicates that the contamination was most likely the result of infiltration of dilute amounts of MTBE dissolved in surface water upgradient of the Arrowhead well. More than a dozen infiltration ponds exist upgradient of the Arrowhead well. These ponds collect snowmelt and runoff from Highway 50, a heavily traveled state highway, as well as from surrounding areas. The current interpretation suggests that when the snow melts, water containing dissolved MTBE recharges the shallow aquifer.

In November 2002, Roger C. Henderson, P.E., and Martin G. Steinpress, R.G., C.H.G., gave a presentation on hexavalent chromium. Roger Henderson is an Environmental Engineer for the Corps of Engineers Sacramento District and was involved in a study of hexavalent chromium at the Presidio of San Francisco. The suspected source of chromium was anthropogenic, but an investigation of the serpentine bedrock upgradient of the suspected source showed that the bedrock was a significant natural source of hexavalent chromium. Martin Steinpress is the Chief Hydrogeologist with Brown and Caldwell and a GRA Director. Martin presented an overview of the controversy surrounding hexavalent chromium, which started with the movie "Erin Brockovich." This movie spotlighted a real-life legal case involving a cancer cluster in an area contaminated with hexavalent chromium. The media attention surrounding the movie focused public concern on hexavalent chromium as a groundwater issue, which the California EPA responded with a Preliminary Health Goal (PHG) of 2.5 ug/l for total chromium, a large reduction from the MCL of 50 ug/l. Although the PHG is not legally enforceable, water purveyors were caught between the public demand for meeting the PHG and technical barriers and economic costs of doing so over an increasing number of groundwater basins discovered to contain relatively high levels of hexavalent chromium.

The December 2002 meeting was our annual joint affair with the Sacramento Chapter of AEG. We were delightfully entertained by Sarah Andrews, a geologist and successful author of 8 mystery novels. The protagonist in her mysteries is Em Hanson, a geologist that starts as a mudlogger in Wyoming and develops a knack for solving murders. The theme of Ms. Andrews' talk was the difficulties and rewarding qualities associated with the way geologists think, which is different than most. Most people tend to look at a problem in a linear fashion, working their way along a mental path from the beginning to the end, whereas a geologist picks up clues along the path in somewhat random order until a pattern suddenly reveals itself. This difference in thought process can make

it difficult for a geologist to work with an engineer (generally very linear folk), for example, but if their differences are recognized, or even embraced, such a pairing can be very productive. Look for Sarah Andrews' books at online and offline bookstores near you.

In January 2003, Toccoy Dudley, Chief of the Groundwater Section of DWR's Northern District Office, presented a new conceptualization of the aquifer system in the northern Sacramento Valley. The northern Sacramento Valley has long been considered a structural trough filled with a heterogeneous mixture of sediments that make up a single unconfined to semi-confined aquifer system. Recent interpretation of over 150 borehole resistivity logs was used to define 5 formations: the Upper Tuscan, Lower Tuscan, Tehama, Sutter, and upper alluvial. The primary irrigation and municipal wells tap the lower 4 formations, and many domestic wells draw from the upper alluvium. A review of water levels from selected dedicated monitoring wells suggests that the 5 formations are hydraulically somewhat independent, and they are therefore assumed to be 5 different aquifer systems. 💧

San Joaquin Valley Branch Highlights

BY BILL PIPES, PRESIDENT

Spring has come to the San Joaquin Valley, with sunshine, blue skies and blossoms. Everywhere there are blossoms - on the fruit and nut trees in vast orchards all over the valley and in the yards of many Valley residents. The fresh growth of Spring reminds us what the plants, trees, and animals depend on water—not only for these brief but beautiful displays, but for their very lives as well.

Groundwater issues continue to be on the forefront of public and private discourse in the San Joaquin Valley, as it becomes increasingly apparent that groundwater is a vital part of our future supply. The public is beginning to understand what we have long known—that groundwater, surface water, and aquatic ecosystems are interconnected; that

the health of the natural resource is dependent on the health of our groundwater systems; and that groundwater is a renewable but finite resource, subject to the whims of climate. The San Joaquin Valley Branch will continue to promote the protection and proper management of this wonderful resource, provide a forum for all stakeholders to discuss critical valley groundwater issues, and be a source of useful and accurate information to the lay community and Valley decision makers.

The San Joaquin Valley Branch enters its second year after a very successful inaugural year during which we expanded membership and became established locally. Our first year saw monthly meetings with excellent speakers, and the Branch also hosted the GRA Contaminant Series Symposium, "Nitrate in Groundwater: Sources, Impacts and Solutions." The founding officers of the Branch are: President - Bill Pipes, Geomatrix Consultants; Vice President - Tom Haslebacher, Kern County Water Agency; Treasurer - Chris Campbell, Baker, Manock & Jensen; and Secretary - Mary McClanahan, California Water Institute. These officers will continue to serve through the second year.

We started 2003 off by having Dave Bean, R.G., C.Hg., of Geomatrix Consultants speak at our January meeting. Dave presented Management and Optimization of Water Bank Recharge and Extraction Using Groundwater Models, based on a presentation he made at GRA's 2002 Annual Conference. Dave demonstrated the utility of numerical models for predicting an aquifer system's hydraulic response to artificial recharge via infiltration basins, the subsequent recovery of the banked water, and associated changes in water chemistry.

At the February 2003 meeting, we enjoyed a presentation by Jim Jacobs, R.G., C.Hg., of Environmental Bio-Systems, Inc. on Enhanced Bioremediation Using Super-Saturated Gas Infusion Technology. Jim admonished us with the words of Albert Einstein - "The significant problems we face cannot be solved at the same level of thinking we were at when we created them." It was an honor to have Jim at our meeting-he has been a long-time active GRA

member and supporter, having served as President, Past President/Advisor, Treasurer, Executive Officer and a member of the Technical Committee. Jim currently sits on GRA's Board of Directors.

Future meetings will continue to be held the third Thursday of each month. Please visit GRA's Web site for meeting announcements and other updates from the San Joaquin Valley Branch.

San Francisco Bay Branch Highlights

BY GARY FOOTE, PRESIDENT

The San Francisco Bay Branch had its first meeting of 2003 on January 22. The meeting was our annual update from the San Francisco Bay Regional Water Quality Control Board (RWQCB). Stephen Hill, Toxic Cleanup Division Chief, provided an overview of 2002 news and accomplishments and identified new issues that RWQCB is addressing in 2003. Sarah Raker, Engineering Geologist in the Groundwater Protection and Waste Containment Division, spoke about the Groundwater Monitoring and Assessment Program and Assembly Bill 599 (the Groundwater Quality Monitoring Act of 2001).

The Branch's next meeting will be March 12, 2003 at the Peony Restaurant in Oakland. The meeting will feature Mr. Dave Hanson, the National Ground Water Association McEIlhiney Distinguished Lecturer. The title of Mr. Hanson's presentation is, "Introduction to the Year of the Professional." His talk is slightly technical, slightly inspirational, and guaranteed to make you think! Visit GRA's Web site (www.grac.org) for more details.

The newly elected Branch officers are: President--Gary Foote, Geomatrix Consultants; Vice President-J.C. Isham, The Shaw Group; Treasurer-David Abbott, Todd Engineers; Secretary-Mary Morkin, Malcolm Pirnie; South Bay Coordinator-Mark Wheeler, Crawford Consulting; Technical Advisors-Bill Motzer, Todd Engineers; Jim Ulrick, Ulrick and Associates;

Bettina Longino, Geomatrix Consultants. The Branch officers are planning the program for the remainder of 2003, and they welcome any suggestions from members.

Southern California Branch Highlights

BY TONY MAGGIO, PRESIDENT

Some interesting meetings have taken place since the last Branch highlights were written in October 2002. In November 2002, our distinguished speaker was Mr. Robb Whitaker, P.E., of the Water Replenishment District of Southern California (WRD). The WRD is a regional groundwater agency that manages 40% of the total demand for water to nearly 4 million residents in southern Los Angeles County. Mr. Whitaker spoke about the various ongoing projects the WRD manages, including the diversion and spreading of water into ponds along the Rio Hondo and San Gabriel River spreading grounds, sea water intrusion programs in the West Basin, recycled water and stormwater runoff programs, and a bit about the ongoing litigation between the WRD and various pumpers in the basin over aquifer storage rights.

In January 2003, Mr. Rob Haney of Applied Process Technology spoke about the emerging contaminants TBA and 1,4-Dioxane. TBA is an oxygenate used as a gasoline additive and is also generated as a breakdown product of MTBE. The talk included the nature of these contaminants, including their occurrence, fate and transport as well as methods for treating them in groundwater. Several case examples were discussed. The turnout at this meeting was very good.

The next Branch meeting is planned for March 2003. Representatives from both the Los Angeles and Santa Ana Regional Water Quality Control Boards will be present to provide their perspectives about various emerging contaminants such as perchlorate and TBA. The Board's views towards these contaminants, the risks they pose to groundwater supplies, cleanup levels and acceptable ways to assess the risks will be discussed.

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GROUNDWATER RESOURCES ASSOCIATION OF CALIFORNIA
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Dates & Details

GRA MEETINGS AND KEY DATES

(Please see page 3 or visit www.grac.org for detailed information, updates, and registration unless noted)

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|---|---|---|--------------------------------------|
| GRA Board Meeting | April 5, 2003
Sacramento, CA | 24th Biennial
Groundwater Conference/
GRA 12th Annual Meeting | October 28-29, 2003
Ontario, CA |
| “Model Calibration &
Predictive Uncertainty
Analysis Using PEST” | April 29-May 1, 2003
San Francisco, CA | GRA Board Meeting | November 8, 2003
Sacramento, CA |
| “Artificial Recharge in
California - Technical &
Policy Challenges” &
Field Trip, Santa Clara
Valley Water District
Artificial Recharge Facilities | April 30-May 1, 2003
San Jose, CA

May 2, 2003
San Jose, CA | GRA 1, 4 Dioxane
Symposium* | December 3, 2003
Location TBD |
| GRA Lobby Day | May 20, 2003
Sacramento, CA | Other Key Dates <i>(programs in which GRA
is a Co-Sponsor or Cooperator)</i> | |
| GRA Perchlorate
Symposium* | June 11, 2003
Sacramento, CA | AGWA/WEF Ground Water
Quality + Ground Water
Quantity = One Issue
(www.agwa.org) | April 8-9, 2003
Ontario, CA |
| GRA Board Meeting | August 9, 2003
Point Richmond, CA | Lower American River
Conference
(coordinated by CSUS)
See page 22 or visit
www.cce.csus.edu/conferences/list.htm | June 2003
Sacramento, CA |
| GRA “Indoor Air”
Symposium* | September 30, 2003
Northern CA
October 2, 2003
Southern CA | API/NGWA Petroleum
Hydrocarbon Conference
(www.ngwa.org) | August 19-22, 2003
Costa Mesa, CA |

* Tentative Schedule



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