

HYDRO VISIONS

Volume 14, No. 4

GROUNDWATER RESOURCES ASSOCIATION
OF CALIFORNIA

Winter 2005

Scientific and Legal Perspectives on Basin Yield and Overdraft — Workshop Highlights

BY TIM PARKER, SCHLUMBERGER WATER SERVICES

At last year's annual GRA meeting in Sonoma, John Bredehoeft received GRA's lifetime achievement award and presented a keynote address that challenged some commonly held assumptions regarding concepts of safe yield and a constant water budget. One year later, GRA continued and expanded the conversation on these topics by holding a 2-day interdisciplinary workshop on "Basin Yield and Overdraft: Scientific and Legal Perspectives." The workshop, co-sponsored by the Association of California Water Agencies, the U.S. Geological Survey, the California Department of Water Resources, and the Association of Ground Water Agencies was held in Pasadena on September 15-16 and was attended by nearly 200 people. Geohydrologists, engineers, water managers, regulators, and lawyers commonly use terms such as "safe yield"



Field trip participants observe a release channel in the Santa Fe Spreading Grounds from a diversion headworks structure on the San Gabriel River. Photo courtesy Robert Dick, Natural Resources and Mining, Queensland Government, Australia.

and basin "overdraft." However, there is little agreement on their definitions, or even the appropriateness of applying these terms. The goal of this workshop was to bring together technical, legal, and policy practitioners to better learn each other's language and identify common challenges.

Introductory session

The opening session provided an overview of how different disciplines address concepts of groundwater overdraft and safe yield. Tim Parker (Schlumberger Water Services) provided a compendium of definitions of "safe yield" as an introduction to the session. Carl Hauge (California Department of Water Resources, retired) gave an overview of groundwater myths and realities, with

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an international suite of examples of poor groundwater management, reminding us that groundwater and surface water are connected. Jim Markham (Richards, Watson, Gershon) presented a primer on the key California legal precedents relating to ground water. Dave Sunding (University of California, Berkeley) noted that ground water has long been a focus of economic research, with aspects of both renewable and exhaustible resources. Dr. Sunding described how economists define concepts such as optimal and sustainable yield of ground water, and cited examples where the stabilization (buffer) value of groundwater exceeds its direct supply value.

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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 TOM JOHNSON

Transitions

It has been two years since I was given the opportunity to serve GRA as President, and time for Tom Mohr, the next President, to take over leadership of this outstanding organization. The past two years have been extremely rewarding, giving me a chance to work with and meet exceptionally knowledgeable and dedicated groundwater professionals throughout California.

Prior to joining the GRA Board of Directors, I had spent many years volunteering much time and effort on committees and Boards of Directors for a national organization that represents groundwater scientists and engineers, and drilling contractors and manufacturers and suppliers throughout the U.S. That experience certainly was rewarding, as I had the opportunity to meet some of the most famous names in groundwater from around the world. However, something was missing. That something was the opportunity to focus on important issues closer to home. Sure, groundwater supply and quality issues are global issues, but as we know, things are different here in California.

When I accepted the position of GRA President, I had many goals. I wanted to learn more about the most important groundwater problems facing California. I wanted to work closer with those persons leading the way on critical groundwater supply and quality issues in the state. I wanted to build on past GRA successes to

help the organization become even more relevant to groundwater professionals, legislators, water purveyors, industry, regulatory agencies and the public. And I wanted to help initiate the changes needed so that well information in California was no longer confidential.

Looking back, I believe that I have been fortunate to have accomplished three of these four goals. I have certainly learned a great deal about groundwater problems and challenges in California. Attending GRA conferences on basin yield and water supply challenges has educated me on the tremendous challenges facing the state in protecting our groundwater resources and providing dependable water supplies. I have also been able to work with outstanding California groundwater professionals. The credit for GRA's continuing success is due to the efforts of those people, including our Executive Director and staff, GRA's outstanding Board of Directors and Committees, and the countless event leaders and volunteers.

The success of our efforts to increase the relevance of GRA is shown by the membership that has grown to over 1,200 members, by the outstanding attendance and participation at GRA's seminars and conferences on topics ranging from MtBE and perchlorate, to vapor intrusion, recharge, and basin yield that are relevant far beyond California. In fact, more than one attendee commented to me that GRA's events are more valuable than those of a national groundwater organization. The

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EXECUTIVE OFFICERS

President, Thomas M. Johnson
LFR Levine Fricke
Phone: 510-652-4500
Email: tom.johnson@lfr.com

Vice President, Tom Mohr
Santa Clara Valley Water District
Phone: 408-265-2607
Email: tmohr@valleywater.org

Treasurer, Robert A. Van Valer
Roscoe Moss Company
Phone: 323-263-4111
Email: rvanvaler@roscoemoss.com

Secretary, Jim Strandberg
Malcolm Pirnie, Inc.
Phone: 510-735-3020
Email: jstrandberg@pirnie.com

DIRECTORS

David Abbott, Todd Engineers
Phone: 510-595-2120
Email: jorysue@msn.com

Jim Carter, EMAX Laboratories, Inc.
Phone: 310-618-8889, ext. 105
Email: jcarter@emaxlabs.com

Susan Garcia, Colin L. Powell Academy
Phone: 310-631-8794
Email: ssgarcia55@verizon.net
sgarcia@lbusd.k12.ca.us

Stephanie Hastings, Hatch & Parent
Phone: 805-882-1415
Email: shastings@hatchparent.com

Vicki Kretsinger, Luhdorff & Scalmanini
Phone: 530-661-0109
Email: vkretsinger@lsce.com

Brian Lewis
Cal/EPA, Dept. of Toxic Substances Control
Phone: 916-255-6532
Email: blewis@dtsc.ca.gov

Tim Parker, Schlumberger Water Services
Phone: (916)329-9199
Email: tparker2@slb.com

Bill Pipes, Geomatrix Consultants, Inc.
Phone: 559-264-2535
Email: wpipes@geomatrix.com

Sarah Raker, San Francisco Bay Water Board
Phone: 510-622-2377
Email: sraker@waterboards.ca.gov

Eric Reichard, U.S. Geological Survey
Phone: 619-225-6134
Email: egreich@usgs.gov

Martin Steinpress, Brown & Caldwell
Phone: 925-937-9010
Email: msteinpress@brwnncald.com

EXECUTIVE DIRECTOR

Kathy Snelson
(916) 446-3626
Email: executive_director@grac.org

EDITOR

Floyd Flood
Email: editor@grac.org

WEB AND DATABASE MANAGER

Kevin Blatt, ihappi Web Design
Phone: (510) 845-9623
Email: kblatt@ihappi.com

Perchlorate 2006- Progress Toward Understanding and Cleanup

The 16th Symposium in
GRA's Series on Groundwater
Contaminants

JANUARY 6, 2006 - SANTA CLARA

GRA will hold its 4th Perchlorate Symposium on January 26th at the Hyatt Hotel (formally Westin) in Santa Clara. Perchlorate continues to attract serious attention from regulators, policy makers, industry, water utilities, and water consumers. Each of GRA's past three perchlorate events has been memorable for new findings heard first at the conference. *Perchlorate 2006* will feature new data on perchlorate in our diets, as measured in a large-scale survey involving analysis of thousands of urine samples. The dynamic research at Texas Tech University continues, with new data on the natural occurrence of perchlorate. Speakers will explain new analytical methods that are now becoming available, and investigators will present new data from application of innovative forensic techniques, first presented at GRA's *Perchlorate 2004* event. A legal and policy round table discussion will cap the event, focusing on perchlorate impacts to domestic wells in southern Santa Clara County.

Make your plans now to attend *Perchlorate 2006*! GRA's past perchlorate events have attracted attendees from 22 states and have sold out. If you would like to present a talk or poster, please visit GRA's website for the Call for Abstracts. Questions may be directed to co-chairs Jon Rohrer of Komex H₂O Science Inc., at 714-379-1157 x241, or Tom Mohr of the Santa Clara Valley Water District, 408-265-2607x2051. 💧

Upcoming Events

GRA and UC Davis Cooperative Extension Short Courses

Introduction to Groundwater and Watershed Hydrology-Monitoring, Assessment, and Protection
February 9-10, 2006 — Glendale, CA

Groundwater and watershed monitoring, assessment and protection is an integral part of many water-related programs at the local, state, and federal level designed for sustainable development and protection of water resources in California. Today, many professionals and non-professionals find themselves lacking the multidisciplinary background or expertise to meet the technical and regulatory challenges related to water and drinking water resources management. The amount of technical information available is often overwhelming. This short course will provide an overview of the most common tools for measuring, monitoring, and assessing groundwater and surface water resources. Course attendees who may have some experience with, but no formal training in, hydrology or related engineering or science fields, will benefit from the basic and intuitive, yet comprehensive approach of this course.

Groundwater Modeling
March 8-10, 2006- UC Irvine Extension

This course introduces the conceptual principles and practical aspects of groundwater modeling in an intuitive yet comprehensive manner. The course objective is to demystify the use of groundwater models by providing solid understanding of the

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Save the Date! Nitrate in Groundwater - Recent Trends in California

APRIL 4-5, 2006
MODESTO, CA - DOUBLETREE HOTEL

The Nitrate Symposium is the 17th symposium to be held in the GRA "groundwater contaminant series." This series was developed to provide an intensive review of each particular contaminant. A nitrate in groundwater symposium was held in Fresno in November 2002. We had over 200 attendees and it was very well received. Nitrate is still a very important groundwater concern, especially in agricultural and rural areas; it is time for an update. Please watch the website at www.grac.org for more information. 💧

Wells and Words

BY DAVID W. ABBOTT, TODD ENGINEERS

Determining the long-term discharge of a well using the specific capacity

The recommended long-term discharge of a production well is estimated by multiplying the specific capacity (SC) of the pumping well by the available drawdown in the well as shown by the equation:

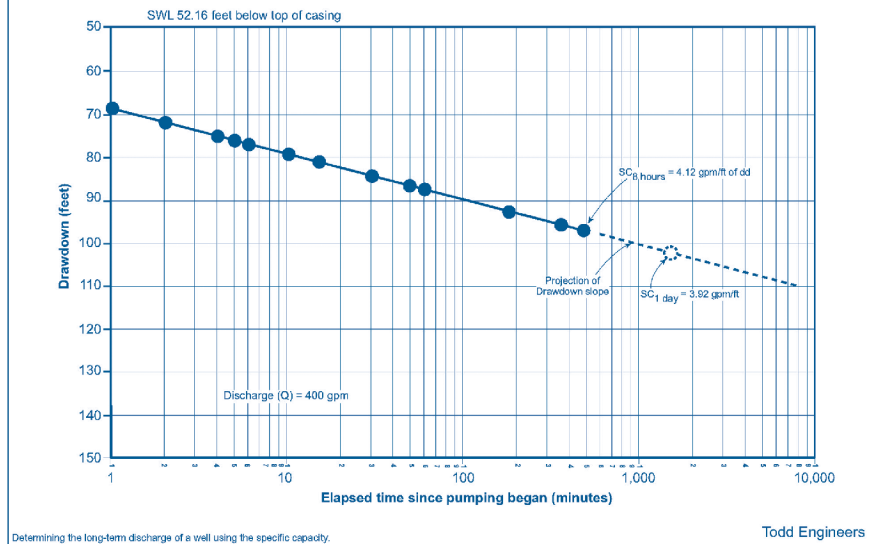
$$\text{Discharge (gpm)} = (\text{SC (gpm/foot of drawdown)} \times (\text{available drawdown (feet)}))$$

This equation seems simple enough; but, to my knowledge, no technical criteria have been established in the groundwater industry to systematically determine either the SC or the available drawdown for this application. Field experience with the equation, site-specific conditions, and well performance have been applied in the absence of strict guidelines.

The SC is a measured quantity from variable and constant discharge pumping tests and varies depending on the time and/or discharge conditions at which it is obtained. For example, the SC_{10 minute} is usually greater than the SC_{1 day}; while the SC_{10 gpm} is usually greater than the SC_{1,000 gpm}. Therefore, the SC should be selected at some standard elapsed time and measured near (or less than) the estimated long-term discharge. Since many wells operate on a daily basis, the SC_{1 day} is a convenient “yardstick.” A 24-hour constant discharge pumping test is not required to obtain the SC_{1 day}. The term can be estimated from shorter pumping tests through the projection of time-drawdown semi-logarithmic straight-line plots to 24-hours (see Figure 1). This projection assumes that no aquifer boundaries are encountered. The measured SC incorporates the well efficiency, and no correction factor is needed.

Technical Corner

Pumping Test on Well 1



To promote the longevity of the well and consistent operating standards, the pumping water level (PWL) should not expose the top of the well screens, perforations, or fractures. Therefore, the available drawdown (dd_{avail}) is defined as:

$$dd_{avail} = (\text{the depth to the top of the well screen, perforation, or water bearing fracture}) \text{ minus } (\text{the depth to the non-pumping water level})$$

Exposing these openings during pumping allows groundwater to cascade into the well, aerating the groundwater and promoting geochemical changes in the vicinity of the well and excessive mechanical wear to the pump. The dd_{avail} is the maximum PWL, which in turn limits the recommended long-term discharge.

In addition, there are other considerations that often result in the recommended drawdown (dd_{rec}) being less than the dd_{avail} . The non-pumping water level may fluctuate due to seasonal changes (long-term or short-term) caused by varying amounts of aquifer

recharge and interference drawdowns from nearby pumping wells resulting in potential over- or under-estimation of the dd_{avail} . In addition, long-term drawdowns are expected to increase with time due to decreasing well efficiency. Due to these and other changes anticipated during long-term pumping, the dd_{rec} is usually less than the dd_{avail} . Typically, the dd_{rec} is two-thirds (alluvial aquifers) or one-half (bedrock) of the dd_{avail} ; which compensates for changing hydraulic conditions that can rarely be quantified.

Another example for recommending operating drawdowns that are less than dd_{avail} is when screens and fractures are at depths allowing for hundreds of feet of dd_{avail} . Excessive drawdowns in the pumping well (and the aquifer in the vicinity of the well) can lead to accelerated aging of the production well from both geochemical changes and mechanical failures, which affect the well efficiency. Excessive drawdowns create significant hydraulic pressure head differences between the outside

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Current State-of-the-Practice of Perchlorate Forensics

BY WILLIAM E. MOTZER, PH.D., PG,
SENIOR GEOCHEMIST,
TODD ENGINEERS

Introduction

Since the late 1950s, ammonium perchlorate (NH_4ClO_4) has been manufactured and used as a solid rocket engine fuel oxidizer; perchlorate salts are also contained in munitions, pyrotechnics (fireworks and road flares), and electroplating solutions. When dissolved in water NH_4ClO_4 dissociates into the ammonium (NH_4^+) cation and perchlorate (ClO_4^-) anion. Before 1997, ClO_4^- could not be readily detected in groundwater at concentrations below 100 micrograms per liter ($\mu\text{g/L}$). In that year, the California Department of Health Services developed an acceptable analytical method (now EPA Method 314.0) that lowered the detection limit to 4 $\mu\text{g/L}$. Subsequently, ClO_4^- contaminated groundwater was soon encountered in several western states and contamination also became apparent in Colorado River water. However, ClO_4^- has also been discovered to occur naturally in rock formations and groundwater. This has posed the question: can anthropogenic (human) sources be differentiated from geogenic (natural) sources?

Perchlorate Characteristics

The ClO_4^- anion, containing a central chlorine (Cl) atom surrounded by four oxygen (O) atoms, is produced when highly soluble solid salts of ammonium, potassium, and sodium perchlorate dissolve in water. Perchlorate salt solubilities range to 220,000 parts per million (ppm) for NH_4ClO_4 . Concentrated

solution densities are greater than water, producing brines capable of sinking through the groundwater column. Once dissolved, ClO_4^- is extremely mobile and stable, requiring decades to naturally degrade. In groundwater, ClO_4^- is relatively unretarded, moving by advection through porous, unconsolidated sediments.

Perchlorate Occurrences

Geogenic derived ClO_4^- salts have been documented in nitrate fertilizer imported from the Atacama Desert of Chile, caliche in alluvium, evaporate deposits, and kelp. Natural ClO_4^- of possible atmospheric origin has also been detected in eastern New Mexico and west Texas groundwater. The EPA has reported anthropogenic ClO_4^- releases in 35 different states, two territories, and Washington, D.C. As of mid-October 2005, California had 38 documented releases from aerospace, explosive, flare, ordinance, and other facilities. Confirmed plumes occur at several locations in California and Nevada. Two ClO_4^- groundwater plumes near Henderson, Nevada were found to impact drinking water and southern California agriculture (e.g., lettuce and milk).

Environmental Forensics

Because ClO_4^- moves at groundwater flow rates, it was once used as a

tracer for associated volatile organic compounds and metal contaminants that are significantly more retarded. However, with the advent of ClO_4^- as a direct groundwater contaminant the search has been for newer forensic techniques that directly analyze the ClO_4^- anion's chlorine (^{35}Cl and ^{37}Cl) and oxygen (^{16}O , ^{17}O , and ^{18}O) isotopic ratios to fingerprint perchlorate plumes and potentially trace them back to their source. Chlorine-oxygen isotope forensics has not differentiated anthropogenic ClO_4^- from solid rocket fuel sources and geogenic ClO_4^- in Chilean nitrate fertilizers and west Texas groundwater. Other forensic techniques (defined as ClO_4^- surrogates) include identification of metals and stable isotopes associated with ClO_4^- compounds used in manufactured products. For example, metals (magnesium, mercury, nickel, strontium and others) are commonly included in pyrotechnics to add color to the explosive display.

William E. Motzer, Ph.D., PG, is a Senior Geochemist at Todd Engineers in Emeryville. He may be reached at bmotzer@toddengineers.com. A longer version on this article, with references, is on the GRAC website at www.grac.org/perchlorateforensics.pdf. ♠

Technical Corner



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Legislative Committee Update - 2005 Legislative Session

BY CHRIS FRAHM,
HATCH & PARENT,
GRA LEGISLATIVE ADVOCATE

The 2005 Legislative Session ended with a whimper, not a bang. The session ended a week early, with many bills being put over until January 2006. The Legislature sent 961 bills to Governor Schwarzenegger, who signed 729 and vetoed 232. Of the bills of interest to the groundwater community that this column has been tracking, three were held over until next year, and one was vetoed by the Governor.

Bills That Were Held Over

AB 290 (Leslie) Hard Rock Wells
This bill requires the Department of Health Services (DHS) to study the methodologies used to determine water source capacities in hard rock wells. The bill was held in the Legislature for further action in January 2006.

AB 371 (Goldberg) Water Recycling
Referred to as the Water Recycling Act of 2005, this bill removes recycled water

from the local government regulatory scheme and creates a single statewide process for using, managing, and approving the use of recycled water. The bill raises issues of risks to groundwater quality from percolation or injection of recycled water. As amended, the bill allows local agencies that manage groundwater basins to adopt and enforce regulations protecting groundwater quality. The bill also allows regional boards to impose additional conditions on permits for recycling projects to address local groundwater conditions. The bill was put on the Senate Inactive File to be held for next year.

SB 773 (Cox) Artificial Recharge Using Drinking Water This bill exempts any injection well that is used to inject drinking water from prohibitions on the release of waste into aquifers. The bill specifies that the definition of "waste" does not include drinking water that is percolated, injected, or conveyed into a groundwater aquifer. The bill arises out of the decisions of certain regional water boards to require waste discharge permits for artificial recharge projects. It tries to relieve the tension between the need to develop artificial recharge projects and the protection between groundwater quality. Senator Cox agreed to leave SB

773 in the Senate Environmental Quality Committee as a two-year bill. It may be heard again in January 2006.

A Governor's Veto

SB 820 (Kuehl) Water Management
Governor Schwarzenegger vetoed SB 820. SB 820 was the biggest water bill for 2005 and would have affected many areas of water law and management. With respect to groundwater, the bill required that any person who extracts more than 25 acre feet of groundwater per year file an annual notice of extraction with SWRCB. The bill also requires that any local agency that has adopted a groundwater management plan update that plan every five years beginning in 2008, and file the update with specified entities.

The bill was extensively amended. The final version provided that a person who reports to an agency or groundwater management group that reports in turn to the state does not have to report directly to SWRCB. Although under existing law the failure to file an annual notice on time would be considered equivalent to non-use of the water for that year for purposes of water rights determinations, SB 820 was amended to delete that provision and provide for a civil penalty instead.

According to the Governor's veto message, extraction data alone does not provide sufficient information regarding the health of groundwater basins. He advocated having the Department of Water Resources do a survey of information that is available for making decisions regarding groundwater and information that is needed but is currently unavailable. The information-gathering process should be incorporated into the next update of Bulletin 118.

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Regulating the Geoscience Professions in California

BY PAUL SWEENEY,
EXECUTIVE OFFICER, BOARD FOR
GEOLOGISTS AND GEOPHYSICISTS

When Governor Ronald Reagan signed legislation creating the Board of Registration for Geologists and Geophysicists in 1968, he initiated the beginning of professional licensure for the geoscience professions in California. Subsequently, geophysicists, engineering geologists and hydrogeologists would become licensed and regulated under the renamed Board for Geologists and Geophysicists (Board) within the California Department of Consumer Affairs.

In addition to establishing minimum standards for licensure, the Geologists and Geophysicists Act (Chapter 12.5 of the California Business and Professions Code) monitors the practice of geology and geophysics in California by giving the Board authority to investigate complaints and to discipline licensed geologists and geophysicists when there is a violation of the Act, and to investigate other complaints, such as unlicensed practice.

Since its inception, the Board has accomplished many things, including: realization of a national examination for geologic licensure, implementation of a rigorous enforcement program, streamlining and improving the functional operation of the Board and its staff through enhanced personnel selection and superior special fund financing and through implementation of many statutory and regulatory developments.

The Board is at the forefront of mitigating the unsatisfactory practice of geology and geophysics by both

California Regulatory Corner

licensed and unlicensed practitioners by significantly utilizing its Cite and Fine authority, as well as working with the Attorney General's office in enforcing the Geologist and Geophysicist Act to revoke licenses when necessary and to enforce Permanent Injunctions against unlicensed individuals. If an unlicensed or incompetent individual is never pursued and is allowed to continue to practice, then the public/consumer is at a greater risk of being harmed. Lack of enforcement also penalizes those who play by the rules, which is usually the great majority of professionals. If there is a strong enforcement presence, then consumers and the licensed profession can assist the Board by being effective watchdogs because the public is confident that appropriate action will be taken upon those that transgress the law.

The demand for licensed and competent geoscience professionals has never been greater. Whether that is due to increased regulatory requirements at the federal, state and local level and/or due to an improved recognition by the public (through the Internet or other means) of the specialized skills of Professional Geologists and Professional Geophysicists, it will continue to be a priority of the Board for Geologists and Geophysicists to actively pursue compliance with its legislative authority and the spirit of its Mission Statement.

Paul Sweeney is the Executive Officer for the Board for Geologists and Geophysicists, California Department of Consumer Affairs. He can be reached at geology@dca.ca.gov. The website of the Board is www.geology.ca.gov.

CCGO Highlights

BY JANE GILL-SHALER,
CCGO EXECUTIVE DIRECTOR

Officers for 2006

CCGO would like to welcome our new (and returning) officers, President Jason Preece, representing AEG San Francisco Section; Vice-President Charles Nestle, representing AEG Southern California Section; Secretary Tim Parker, representing Groundwater Resources Association; and Treasurer David Abbott, also of GRA. We offer our sincere thanks to former Treasurer Anne Cavazos, of the Association for Women Geoscientists and President of Cavazos Environmental, for holding the post and doing such a great job for many years. Thanks, Anne!

New Executive Director Sought

After three years, I will be stepping down as your Executive Director, to assume a lower profile position at CCGO, that of volunteer. We are looking for someone with a lot of experience and knowledge of California Geology, legislation, and keeping track of members. Please email or call me if you are interested in applying for this paid position: JaneHGill@stanfordalumni.org or (415) 456 8678.

SB228 Signed into Law

SB228 SIGNED INTO LAW - Thanks are also due to a number of members and volunteer letter-writers, whose efforts helped in the passage of Senate Bill 228, which provides for the regulation of geologists and geophysicists by the Board for Geologists and Geophysicists (BGG), in the Department of Consumer

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The Federal Corner

BY JOHN UNGVARSKY, EPA

Updated EPA Ground Water Web Site. In the Pacific Southwest, 80% of public water supply systems rely to some extent on ground water, which is vulnerable to contamination from activities occurring on and below the earth's surface. EPA Region 9 recently updated its Ground Water web site to highlight three Safe Drinking Water Act programs: the Underground Injection Control regulatory program, the Sole Source Aquifer designation program, and the Source Water Assessment and Protection program, which includes wellhead protection. For more information, including current EPA contacts for these various programs, go to <http://www.epa.gov/region9/water/groundwater/index.html>.

Source Water Protection Handbook.

The Trust for Public Lands has published a "Source Water Protection Handbook" based in part on the scientific, economic, and public health justifications for land conservation as a critical strategy for protecting America's drinking water sources and recharge areas. The handbook, partially funded by EPA, provides resources to help a community both make the case for land

conservation and also go about actually conserving those lands. The report also summarizes research about drinking water and public health, the costs of not protecting water sources, and the management of watersheds. For more information, go to <http://www.epa.gov/safewater/protect/features.html#trust>.

Withdrawals from Principal Aquifers.

This recently published United States Geological Survey (USGS) circular, "Estimated Withdrawals from Principal Aquifers in the United States, 2000" discusses ground water withdrawals from 66 principal aquifers in the US for irrigation, public-supply, and self-supplied industrial water uses for the year 2000. These uses represented 92 percent of the fresh ground-water withdrawals for all uses in the US. For more information, go to <http://pubs.usgs.gov/circ/2005/1279/>.

Ground Water Management Process for Ground Water Model.

This recent USGS report, "GWM - A Ground Water Management Process for the U.S. Geological Survey Modular Ground-Water Model (MODFLOW-2000)" describes a ground water man-

agement (GWM) process for the USGS' modular three-dimensional ground water model, MODFLOW-2000. The report describes the formulation of ground-water management problems that can be solved with GWM, the approaches that GWM uses for solving the management problems, and the input and output files associated with a GWM run. The report also includes three sample problems of the application of GWM to typical ground water management problems. For more information, go to <http://pubs.usgs.gov/of/2005/1072/>.

National Rural Water Association Assistance.

Through two cooperative agreements with EPA, the National Rural Water Association (RWA) employs technicians that assist communities of less than 10,000 to protect community water systems, including ground water-based systems. For more information and links to various states, go to <http://www.nrwa.org/>.

National Source Water Assessment and Protection Guidance.

"State and Federal Source Water Assessment and Protection Program Measures - Final Reporting Guidance," an EPA guidance document addressing EPA's strategic plan for source water protection and tracking of its implementation, is now available on the web at <http://www.epa.gov/safewater/protect/features.html#measures>.

John Ungvarsky is an Environmental Scientist at the U.S. Environmental Protection Agency, Region 9. He works in the Water Division's Ground Water Office and oversees source water protection efforts in CA. For information on any of the above topics, please contact John at 415-972-3963 or ungvarsky.john@epa.gov. ♠



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Toxic Gumbo: Lessons from Katrina

BY BART SIMMONS

Hurricane Katrina caused damage unprecedented in recent times. The physical damage to homes, businesses, and industry is obvious, but the lasting extent of damage to surface water and groundwater is yet not clear. Fortunately, initial predictions of outbreaks of waterborne infectious disease appear to be overblown, although other biological problems, particularly mold proliferation, are clearly serious.

Testing of floodwaters showed “greatly elevated levels” of *E. coli*, which drove precautions about preventing ingestion of floodwaters. Chemical testing of floodwaters found lead commonly exceeded the EPA drinking water action level. Arsenic, barium, thallium, chromium, benzene, selenium, and cadmium were detected in some samples at levels that exceeded EPA drinking water Maximum Contaminant Levels (MCLs). Several contaminants, such as hexavalent chromium, manganese, p-cresol, toluene, phenol, 2, 4-D (an herbicide), nickel, aluminum, copper, vanadium, zinc, and benzidine were detected in floodwater, but EPA said they were not immediately hazardous to human health.

EPA, in coordination with the Louisiana Department of Environmental Quality (LDEQ) also tested sediments deposited by the floodwaters. Measured contaminants include diesel and fuel oils, *E. coli*, plus some elevated levels of inorganics.

EPA has issued advice for users of groundwater wells (<http://www.epa.gov/safewater/privatewells/whatdo.html>), including procedures for emergency disinfection of flooded wells

Chemist's Corner

using household bleach. The procedure includes pouring one gallon of bleach into a well, allowing 6 to 24 hours for disinfection, followed by testing for bacteria after 7 to 10 days. No specific guidance is given on testing or treatment for chemical contaminants, although EPA also maintains a Safe Drinking Water Hotline (<http://www.epa.gov/safewater/hotline/index.html>, 1-800-426-4791).

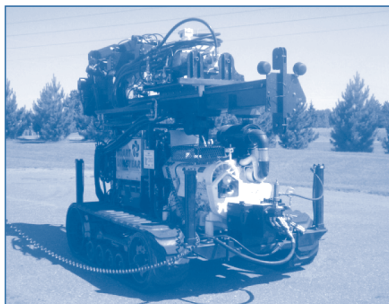
The “Toxic Gumbo” spectre looks something like this: wastewater treatment plants, Superfund sites, and industrial facilities are leached with flood waters, which then recede, leaving sediments and waters contaminated with a mixture of fuels, metals, bacteria, and synthetic organics. The reality appears to be a different image. Infections caused by *Vibrio* bacteria, particularly

through open wounds, have killed many people, although exposure to organic and inorganic substances has not been a significant threat. The lasting effects on groundwater are yet to be assessed, and may pale compared with other, more acute, effects.

The lessons of Katrina are still being learned. Although huge resources have been devoted to protection from terrorist attacks on transportation systems, drinking water systems, and other infrastructure, the Hurricane Katrina has reminded us how fragile our communities really are, and how unpredictable the effects of natural disasters can be. One hopes that the lessons of Katrina will be well learned.

Bart Simmons can be reached at bartonps@aol.com. 💧

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How Involved Are You In Researching School Board Candidates?

BY SUSAN GARCIA, MIDDLE SCHOOL SCIENCE TEACHER, GRA BOARD MEMBER & CSTA MS/JUNIOR HIGH SCHOOL DIRECTOR, AND CHRISTINE BERTRAND, EXECUTIVE DIRECTOR, CALIFORNIA SCIENCE TEACHER ASSOCIATION (CSTA)

The following article first appeared in the California Classroom Science (CCS), a bimonthly publication of the California Science Teacher Association (CSTA). If the words “science teacher” are replaced with scientist, engineer, or other professional, this article is intended to accomplish two purposes for GRA’s membership. The first purpose is to raise awareness of the concerted effort by some to have the faith-based, Intelligent Design taught as an alternative hypothesis to the scientifically-based, Theory of Evolution in science classrooms. The second is to promote the concept that we screen our school board members on their positions for educating our youth on water-related issues. School boards have the ability to dictate what is taught in the classroom, the books and materials used to teach, and the individuals hired to lead and teach in our schools. Isn’t it time we start screening our school boards for those issues that are important to us?

Questions To Ask School Board Candidates

Many school districts around the country are experiencing a concerted effort by some groups to elect local school boards which will require “alternatives to evolution” to be taught in science classrooms. Under the guise of “intelligent design,” these groups are gaining momentum in many areas. As a science

teacher and a concerned citizen, you have a right and responsibility to learn as much as you can about those people running for—and being elected to—your local school board. CSTA provides these suggestions for interviewing or obtaining written responses from school board candidates in your community.

We highly recommend you emphasize the need for students in your community to learn real science through understanding the nature of science and the facts gained by testable and peer-reviewed research. You might consider ways to make the interviews known to your local newspapers and other media outlets.

- ◆ Why are you running for the school board?
- ◆ What goals do you hope to achieve if you are elected?
- ◆ What special strengths do you believe you would bring to the board?
- ◆ Relative to other subjects that students are required to take, how important is science instruction, in your opinion?
- ◆ California is in the forefront of many areas of science research and study. Much of California’s economy is based on science and technology. What do you see as the role of science in our community as it pertains to the education of our youth?
- ◆ If someone were to say to you that learning the nature of science was important to the students of our community, what would that mean to you?
- ◆ Do you support research-based science instruction?
- ◆ What is your position relative to teaching creationism as an alternative, or in addition, to the theory of evolution to students in science classrooms?

Education Corner

- ◆ What would you do as a board member to ensure that equity and fairness and scientific facts are used as the basis for decision making in terms of curriculum, materials and methodologies used in our districts’ schools?
- ◆ What is your opinion of teaching evolution in our district’s schools?
- ◆ What will you, as a board member, do to assure that teachers have the support and materials needed to successfully assist students in meeting state standards, including the teaching of evolution?
- ◆ How will you encourage the district administration to provide the support and resources necessary for teachers to successfully meet requirements for standards-based science instruction?
- ◆ How would you balance your decisions as a member of the board with the input of parents and teachers at each site in regards to science instruction?
- ◆ What kinds of influence do you think special interest groups should have on decisions related to curriculum and materials used for student instruction, and how would you go about making decisions about quality instruction if outside pressure is brought to bear on the board?
- ◆ What would you do in this district to increase and improve student learning of the nature of science and research-based science information?
- ◆ Preparing students for America’s jobs of the future is a national priority. What would you do in this district to increase and improve student access to computers and other classroom technology?

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National Ground Water Association Stresses Importance of Ground Water Data

BY THAD PLUMLEY, NGWA DIRECTOR OF KNOWLEDGE PRODUCTS

The National Ground Water Association (NGWA) used its new observation well to spotlight the need for more data on the world's ground water during World Water Monitoring Day on Oct. 18. The U.S. Geological Survey (USGS) joined in the event, providing satellite uplink technology for the observation well located at NGWA headquarters in Westerville, Ohio. This enables anyone to access real-time water level data through the Web. To view data from the NGWA observation well, go to www.ngwa.org or USGS's observation well network at <http://waterdata.usgs.gov/nwis/gw>.

"About half the world's population depends on ground water for its drinking water supply. Yet we lack the data needed to adequately monitor this essential source of fresh water," said NGWA Executive Director Kevin McCray. "USGS does an outstanding job at monitoring ground water. However, this is a massive challenge that requires participation at all levels of government." An NGWA statement on the importance of ground water data collection and sustainability can be found at <http://www.ngwa.org/ngwainwashington/environmental.shtml>.

For the observation well project, USGS installed a submersible pressure transducer (Level Troll™ 500, donated by In-Situ Inc.) to measure water levels every hour in the shallow aquifer at NGWA headquarters. Once every hour, the most recent measurement is uplinked via a Sutron® SatLink2™ datalogger and transmitter to a satellite that in turn sends

the data to the USGS office in Columbus, Ohio. The data are decoded, checked, and stored in the USGS National Water Information System (NWIS) along with data from thousands of wells monitored by the USGS, more than 850 of which are available with real-time ground water level data.

Geoprobe Systems® installed a "prepack" monitoring well. A prepack screen consists of two concentric screens with the annular space between the screens filled with sand. This screen system is lowered down the casing to the designated installation depth. The screen interval for the NGWA well is from 21 to 26 feet below ground surface in a sandy zone bounded both above and below by finer grain silts and clays.

One unique feature of this well is that both the site investigation and the well installation were accomplished using "direct push" techniques by Geoprobe Systems®.

Alliance Corner

Direct-push techniques rely on the driving of tooling, rather than drilling, to advance a borehole. Direct push techniques, which typically use smaller diameter tooling than conventional drilling, are becoming increasingly popular for ground water monitoring applications in unconsolidated soil aquifers such as the one found at NGWA headquarters.

The observation well was unveiled during World Water Monitoring Day (WWMD), cosponsored by America's Clean Water Foundation and the International Water Association. While WWMD focuses almost entirely on surface water bodies, NGWA has contributed new ground water content to the WWMD web site (www.worldwatermonitoringday.org). 💧



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It's time to renew your GRA membership for 2006. You can renew online via GRA's Web site, www.grac.org, or you can request a hard copy dues renewal invoice from Kevin Blatt at grac@inreach.com. To save time and effort, GRA recommends that you renew online as the process is secure and seamless. It will also help GRA to keep related expenses to a minimum.

As GRA approaches 2006 with nearly 1,200 members, the goal of having 1,350 members by the end of 2006 is attainable. To make this happen, please renew your membership and recruit one new member to GRA. Recruiting a new member is a way to introduce your colleagues to a credible, innovative organization that provides many benefits for only \$95.

Thank you for your interest and continued participation in protecting and improving California's groundwater resources. 💧

Organizational Corner

GRA Presents 2005 Annual Awards

At the GRA Annual meeting in Sacramento, the Lifetime Achievement Award for 2005 was presented to Dr. Luna P. Leopold, Professor Emeritus of Geology at the University of California, Berkeley and formerly Chief Hydrologist with the U.S. Geological Survey. Because Dr. Leopold was unable to attend the meeting, his colleague and long-time acquaintance, Dr. David K. Todd, made the presentation in absentia. In the presentation Dr. Todd recalled how the two of them met at the Darcy Centennial Symposium in Dijon France in 1956 where, in addition to participating in the international conference, they shared samples of Burgundy wine in the vineyards surrounding the city. Dr. Leopold has contributed significantly to

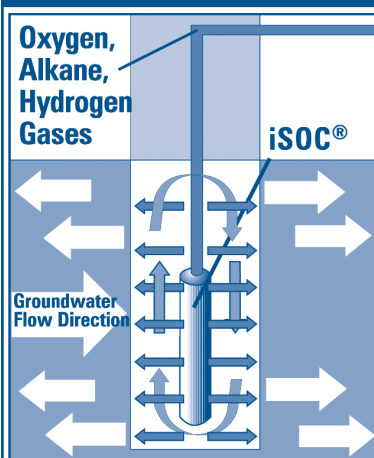


GRA President's Award recipients Sarah Raker, Bob Van Valer, and Tim Parker.

the fields of stream and fluvial mechanics and surface water including several authored and co-authored books: *Water A Primer* (1974); *Water in Environmental Planning* (with Dunne, 1978); and *Waters, Rivers and Creeks* (1997).

Tom Mohr, GRA Vice President, also presented the organization's President's Awards on behalf of Tom Johnson. The 2005 recipients (pictured from left to right) are Sarah Raker of the San Francisco Bay Regional Water Quality Control Board, Robert Van Valer of Roscoe Moss Company, Tim Parker of Schlumberger Water Services, and (not shown) Jim Strandberg of Malcolm Pirnie, Elie Haddad of Locus Technology, and Tom Mohr of the Santa Clara Valley Water District. President's Awards are issued to those GRA officers, Directors, Event Chairs, and other volunteers who have provided outstanding service to GRA in the past year. The recipients chaired committees, organized events, and provided key services to GRA. Congratulations to all! 💧

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GRA Board Elects 2006 Officers

At its 4th and final quarterly meeting of 2005 on November 12, the GRA Board of Directors elected the following to lead the organization in 2006:

- ◆ **President – Tom Mohr**, Santa Clara Valley Water District
- ◆ **Vice President – Jim Strandberg**, Malcolm Pirnie, Inc.

◆ **Secretary – Bill Pipes**, Geomatrix Consultants, Inc.

◆ **Treasurer – David Von Aspern**

In other business, the Board adopted the 2006 budget and received feedback from the membership survey. The next Board meeting is the Strategic Planning Meeting on January 14-15, 2006 in San Diego. ◆

Organizational Corner

GRA Extends Sincere Appreciation to its Co-Chairs and Sponsor for its September 2005 Groundwater Resources Series Workshop, "Basin Yield & Overdraft: Scientific & Legal Perspectives"

Co-Chairs

Steve Bachman,
ACWA Groundwater Committee

Carl Hauge,
CA Department of
Water Resources (Retired)

Tim Parker,
Schlumberger Water Services

Eric Reichard,
U.S. Geological Survey

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GRA Extends Sincere Appreciation to its Co-Chairs and Sponsors for its October 2005 14th Annual Meeting and the 25th Biennial Groundwater Conference

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Luhdorff & Scalmanini

Sarah Raker,
San Francisco Bay Water Board

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David L. Kirchner
Bonnie Lampley
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Frank Yeamans

Technical, legal, and operational perspectives.

The next three sessions addressed the topic of groundwater yield from the technical, legal, and purveyor perspectives, respectively. Richard Laton (California State University, Fullerton), Steve Bachman (United Water Conservation District), and Hugo Loaiciga (University of California, Santa Barbara) presented the hydrogeologic perspective. Laton focused on the importance of identifying data gaps and quantifying data uncertainty. Bachman described case studies from coastal California Basins, illustrating how estimates of ground-water “overdraft” can be well within the uncertainty associated with the water-budget components that the estimates are based on. He emphasized the challenge of conveying uncertainty to non-hydrologists. Loaiciga presented a game-theory approach that demonstrated the value of cooperation among ground-water users. (Editor’s note: in what may or may not be a coincidence, less than one month after Dr. Loaiciga’s talk, the Nobel Prize in Economics was awarded to two

developers of game theory). He also described how climate variability can affect determinations of basin yield, noting that population growth may be a more important factor to consider.

Stephanie Hastings (Hatch & Parent) moderated a lively panel discussion on the legal perspectives of overdraft and safe yield. Participants included Rob Donlan (Ellison, Schneider & Harris, LLP), Thomas Bunn III (Lagerlof, Senecal, Bradley, Gosney & Druse) and Steve Saxton (Downey Brand). The four legal experts summarized the different types of groundwater rights in California. It was noted that, in many basins, water rights cannot be quantified without a legal finding of “overdraft.” In addition, it may not be legally necessary to determine a value for “safe yield” of a basin in order for there to be a determination of “overdraft.” In many basins, dormant



A GRA field trip participant is captured above one of the Santa Fe Spreading Facility basins. Photo courtesy Robert Dick, Natural Resources & Mining, Queensland Government, Australia

overlying rights are an important potential issue for the future. As part of the panel discussion, Hastings provided a compendium of summaries and excerpts from key ground-water rights cases in California.

The next session turned to the perspective of water purveyors. Richard Atwater (Inland Empire Utilities Agency) described the integrated management plan for the Chino Basin. Key components of the plan

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include increased artificial recharge, use of recycled water, salt management, and long-term monitoring. Roy Herndon described Orange County Water District's recent experiences in modifying the allowable ground-water pumpage. The basin production percentage (the allowable ground-water pumpage as a percentage of total demand) was reduced in 2003 as a step towards bringing water levels up to target levels and maintaining the viability of the groundwater system. Just two years later, the record rains of 2005 have brought water levels nearly back to target levels. Lance Eckhart outlined the water budget approach that Mojave Water Agency (MWA) has used to compute a "production safe yield." MWA also utilizes long term baseflow and water level data, as well as the USGS ground-water flow model.

Groundwater-surface water interaction

Day 2 of the workshop opened with a session devoted to surface water-groundwater interaction. Stan Leake (U.S. Geological Survey) reviewed and updated work completed by C.V. Theis in 1940. Theis had stated that "all water discharged from wells is balanced by a loss of water from somewhere" and that after a certain time, discharge "...will be made up in part by an increase in recharge" and "...in part by the diminution in the natural discharge." Leake showed simulation results illustrating how the effects of pumpage on surface water may not become apparent for tens or hundreds of years. Art Kidman (McCormack, Kidman, and Behrens) outlined a water rights matrix for surface water and groundwater. Of particular interest to the audience was California's legal definition of "subterranean streams flowing in known definite channels." Kidman highlighted the application of the "non-degradation criteria" by some Regional Boards in their regulation of artificial recharge projects. He also contrasted the legal and engineering components of aquifer storage and recovery programs using direct injection or spreading, versus those utilizing in lieu delivery of surface water to current pumps. Craig Wilson (Stoel Rives LLP) delved further into the regulatory application of the subterranean stream concept by the Water Boards. He detailed other Water

Board decisions relating to underground storage of surface water and described the Board's differentiation between groundwater recharge and groundwater storage.

Tools and technologies

The second session of day two highlighted some specific tools and methods that can be used to address basin yield issues. Mark Wildermouth (Wildermouth Environmental) catalogued some common misconceptions – "there is a negligible lag between recharge and groundwater response" and important information needs – "pumping history is key." Eric Reichard (U.S. Geological Survey) provided an overview of systems analysis applications to sustainable groundwater management. He presented examples illustrating how the approach allows integration of hydrologic, policy, and economic, considerations. Bob Will (Schlumberger Water Services) summarized recent advancements in borehole logging, aquifer test analysis, and simulation modeling (including new gridding techniques and solvers).

What does the future hold?

The workshop closed with an interdisciplinary panel discussion. Panel participants, Joe Scalmanini (Luhdorff Scalmanini Consulting Engineers), Russ McGlothlin (Hatch and Parent), and Ellen Hanak (Public Policy Institute of California), were

asked to address the question: "Are there better policy approaches to encourage sustainable basin management?" Ellen Hanak noted the potential for "friendly adjudication" and pointed to the role that the state can play as neutral arbiter. Joe Scalmanini introduced the concept of "local groundwater management with teeth." Russ McGlothlin pointed to programs that link grant funding to basin management (e.g. Prop 50) as positive developments and emphasized the need to provide certainty to water users.

Other activities and final thoughts

In addition to the seven oral sessions, the workshop included a poster session, a convivial reception, and a field trip. The field trip, led by Carl Hauge, toured three adjudicated ground-water basins: Raymond Basin, Main San Gabriel Basin, and San Fernando basin. Raymond Basin was the first groundwater basin adjudication; Main San Gabriel Basin was the result of agreement between the parties after two years of negotiations that were approved by the court, called a stipulated decision; and the San Fernando Basin (called the Upper Los Angeles River Area) was a controversial case that took 24 years. The Watermasters from each basin provided a great deal of insight into management of each of the basins. Anthony Zampello is Watermaster for Raymond Basin; Carol

Continued on page 16

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Scientific and Legal Perspectives on Basin Yield and Overdraft – Continued from Page 15

Williams is Watermaster for Main San Gabriel Basin; and Mark Mackowski is Watermaster for Upper Los Angeles River Area. At lunch, John Rossi, General Manager, Western Municipal Water District, discussed the program of Metropolitan Water District of Southern California (MWD) for underwriting recharge in southern California, and the Association of Ground Water Agencies' (AGWA) efforts toward increased conjunctive management in southern California basins.

The contrasts between technical and legal perspectives reverberated throughout the workshop. Hydrogeologists talked about the need to quantify and communicate the uncertainty and variability in water-budget components; lawyers spoke of the need to provide more certainty to affected parties. Lawyers and regulators described the legal and regulatory distinctions between surface water and groundwater; hydrogeologists emphasized the interconnectedness of surface water and groundwater. The workshop provided an opportunity to address these contrasts head on and to identify areas of common ground. 💧

President's Message – Continued from Page 2

tremendous success of our seminars is due in large part to the leadership and members of our hard-working Events Committee. The importance of GRA is also illustrated by the increasing involvement of the organization in legislative efforts involving California water and the outstanding efforts of our legislative advocates and Legislative Committee. This year, GRA also published the vastly improved and critically acclaimed second edition of Groundwater Management, while Hydrovisions continues to be the best publication by far about California groundwater.

So, it is with great satisfaction and gratitude that I look back on the past two years, seeing what we all have done to expand the influence and activities of GRA... Except for that last goal... I did not honestly think that we could change the law overnight to make well and boring information publicly available, as is the case in every other state in the U.S. I know that there are homeland security issues that must be considered, and there may be some cases where business confidentiality is an issue, as in the case of energy exploration or production. However, I still believe that making such information publicly available is critical to the increasing efforts needed to develop and protect California's groundwater supplies. According to the recent GRA poll, the vast majority of you agree that well information should not be confidential.

I have been very fortunate to work with so many dedicated people this past two years and I look forward to continuing to be a part of GRA and its ongoing success. 💧

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and inside of the casing. In addition, these large drawdowns can impact the long-term performance of the aquifer.

In general, if available drawdowns are less than 100 feet, these geochemical and mechanical concerns are less of a problem and the operating life of the well and aquifer will be optimized. A good rule of thumb to use in estimating long-term operating discharges of a production well is to (1) use two-thirds the available drawdown or 100 feet, whichever is less, in alluvial aquifers or (2) use one-half the available drawdown or 50 feet, whichever is less, in fractured bedrock aquifers.

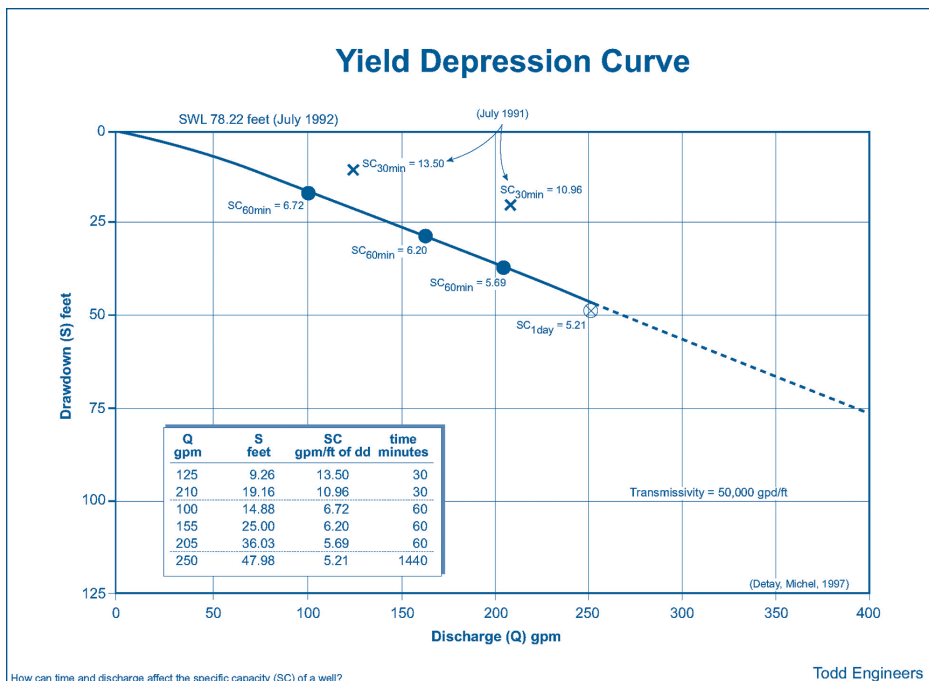
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Discharge = $(SC_{1 \text{ day}}) \times (2/3 \times dd_{\text{avail}})$ or $(SC_{1 \text{ day}}) \times (100 \text{ feet})$, whichever is less.

(Bedrock) Recommended Discharge

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Careful and consistent monitoring of water quality, water levels (both non-pumping and pumping), and discharge may



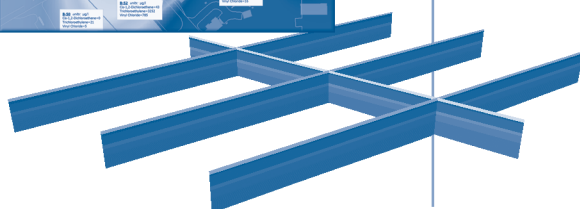
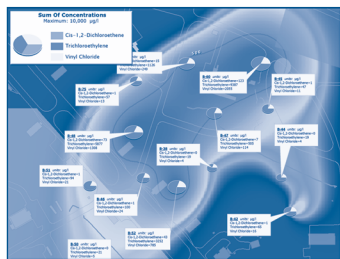
provide more information for estimating long-term discharges on a well-specific and aquifer-specific basis.

David W. Abbott is with Todd Engineers in Emeryville. 💧

Correction: The figure used in the Wells and Words article in the Fall issue of HydroVisions was incorrect. The correct figure is included above.

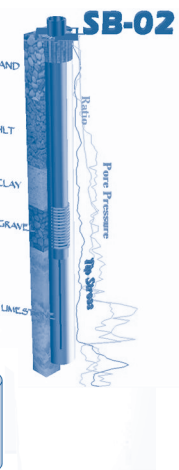
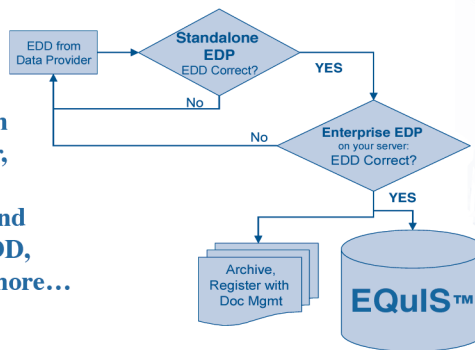
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GRA and UC Davis Cooperative Extension Short Courses

— Continued from Page 3

principles, methods, assumptions, and limitations of groundwater models, as well as hands on experience with the planning, preparation, execution, presentation, and review of a modeling project. The first half of the course reviews the concepts of groundwater flow and transport, and of finite difference and finite element methods. It provides an overview of various software programs for ground water flow and transport modeling and accompanying pre- and post-processing programs. The second half of the course features hands-on exercises based on the USGS MODFLOW flow model and a compatible transport model. Exercises include site-specific models as well as basin/watershed wide models. The course is taught by experienced instructors familiar with many aspects of groundwater modeling and California hydrogeology.

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Legislative Committee Update - 2005 Legislative Session

— Continued from Page 6

Another Bill of Interest

Toward the end of the session, **AB 1421 (Laird)** was amended to deal with the provision of replacement water when a discharger of waste is under a cleanup and abatement order.

AB 1421 (Laird) Replacement Water Existing law authorizes the State Water Resources Control Board (SWRCB) and the regional water boards to order responsible parties to provide replacement drinking water while they are cleaning up contamination. SWRCB has interpreted this law to apply only when the contamination exceeds a drinking water standard, a public health goal, or a notification level. AB 1421 would authorize the water boards to make a replacement order whenever a discharge of waste degrades a water source beyond its background water quality, giving the water boards the broadest discretion to make such orders. Some stakeholders have expressed concerns that this bill could affect artificial storage and recharge projects, although its provisions would only go into effect in the event of a cleanup and abatement order. The bill is in Senate Environmental Quality Committee, where it may be heard again in January 2006.

Contributors to the Legislative Corner include Chris Frahm and Jeffrey Volberg of Hatch & Parent, GRA Legislative Advocates, and Tim Parker, GRA Legislative Committee Chair. 💧

Save the Date

GRA's Legislative Symposium and Lobby Day

Wednesday, March 29, 2006
Sacramento, CA

Agenda will include:

- Kick-off with morning Keynote by groundwater industry leader
- Briefings on important current legislative issues of interest to groundwater professionals
- Lunch Keynote to be delivered by 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

Contact Gary Robinson at Assistant@hatchparent.com or (916) 441-1232 for further information or to register.

CCGO Highlights—Continued from Page 7

Affairs and the Board for Profession Engineers and Land Surveyors (BPELS). SB228 was passed by the Senate and signed into law by Governor Schwarzenegger. However, due to a late addition to the bill, the extension of the BGG was only for two years, instead of the six asked for by the author, Senator Liz Figueroa. So – CCGO is headed for another round of effort in the next 18 months to prevent sunset, including evaluating the effects of BPELS being written into SB 228. To prepare for this, the Board intends to draft a White Paper on the value of the Geoscience Professions in California.

White Paper Planned

The CCGO Board of Directors had a lively discussion on the planned White Paper during their recent Board meeting on November 16 in Point Richmond. CCGO Secretary Tim Parker will spearhead a committee to research and write the White Paper, and a draft is expected by the first quarter of 2006.

Thanks to Our Members for Their Support

CCGO has a number of Business Members, who, although not always active at our Board Meetings, show their support for our Mission by their financial support, letter-writing, and phone calls to legislators. Their membership dues help to fund our lobbyist, Judy Wolen, our website, www.ccggo.org, and our Annual Legislative Drive-In. All of these activities are aimed at supporting our Mission, which is, “To advocate the use of sound geologic knowledge and practice by proposing, reviewing, and monitoring statutes, regulations, and public policies”. One way we support our mission is keeping the legislature aware of the natural hazards so prevalent in our geologically-complicated state. The more that legislators are aware of the complexity of the geology and hydrogeology of California, the more they will appreciate how BGG and its licensed professionals protect California’s general public and economic strength. So, a big thanks to our members, and a gentle reminder to renew your membership now. Memberships may be renewed by writing Jane Gill-Shaler, CCGO Executive Director, at janehgill@aol.com. THANK YOU! 💧

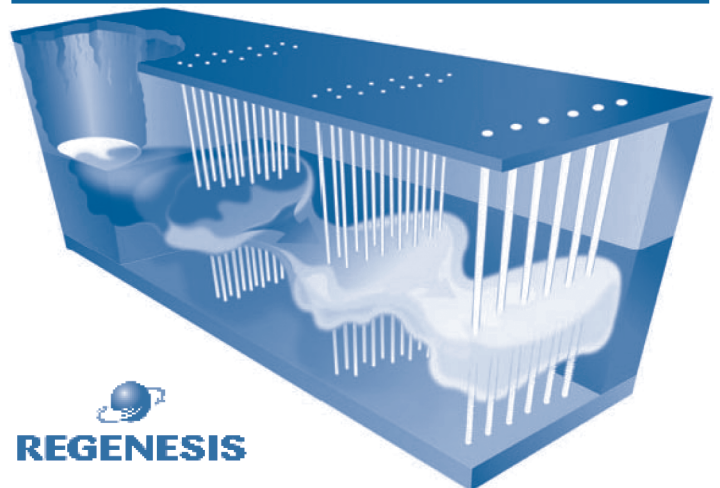
Holiday Gift Idea



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Central Coast Branch Highlights

BY BRADLEY J. HERREMA,
HATCH & PARENT,
BRANCH PRESIDENT

The Central Coast Branch met September 7th to hear Kay Mercer, Coordinator of the Santa Barbara and Southern San Luis Obispo Counties Agricultural Watershed Coalition, speak on “How to Make a Cooperative Monitoring Program for Agricultural Runoff Really Work.” Ms. Mercer discussed agricultural grower requirements under the Conditional Agricultural Waiver and the associated Cooperative Monitoring Program. Ms. Mercer also discussed the challenges for agriculture in compliance with future water quality requirements.

After the speaker meeting, new Branch Officers for 2006 were chosen. Brad Herrema, Hatch & Parent, is our new President, and Bill O’Brien, Kennedy Jenks, Vice-President. Selected as Treasurer was Sam Schaefer of SAIC, and Randy Dean, of CH2M Hill, was elected Secretary.

On November 2nd Bob Will, of Schlumberger Water Services, gave a talk on the application of advanced oilfield technologies for aquifer characterization and groundwater resource management. Mr. Will described his experience utilizing oilfield technologies to characterize an aquifer, and his current projects applying this technology in aquifer storage and recovery and water quality modeling projects.

The Central Coast Branch will hold its next meeting in the first week of February 2006. 💧

Sacramento Branch Highlights

BY PAT DUNN,
MEMBER-AT-LARGE

In February, Chris Petersen, a Supervising Hydrogeologist with MWH, described recent studies and feasibility of Aquifer Storage and Recovery (ASR) in the City of Roseville using dual purpose (injection/extraction) wells. The principal purpose of the Roseville ASR Feasibility Study/Demonstration Project is to evaluate opportunities to store treated surface water from Folsom Lake in the groundwater basin underlying Placer County by direct injection during “wet” years for extraction to supplement the City’s surface water supply during “dry” years. The presentation regarding the cycle-testing within the Mehrten Formation was very interesting.

In March and in association with the Artificial Recharge Workshop, Mr. Marshall Davert, Vice President of MWH, spoke on the Integrated Regional Water Planning Efforts in North Sacramento and Southern Placer Counties. An overview of the planning and political issues associated with the development of a regional conjunctive use program for the greater Sacramento area was provided, along with specific examples of public policy and public interests associated with explosive regional growth.

The April meeting featured Bruce Marvin, a Principal of Aquifer Solutions, Inc, who spoke on the In-Situ Chemical Oxidization Concepts, Chemistry, Safety and Implementation. In situ chemical oxidation (ISCO) is a maturing technology for the treatment of various contaminants including difficult to treat compounds and some dense non-aqueous phase liquids (DNAPL). The application of this class of remediation technologies is growing based on the potential for ISCO to be a fast and relatively low cost way to remediate a site to closure levels. The presentation included an overview of the most common oxidants

(permanganate, ozone, catalyzed hydrogen peroxide, and persulfate), as well as site characterization implications for the design of ISCO delivery systems. Factors of success and failure were summarized nicely.

In May, a presentation on the Do’s and Don’ts for Expert Witnesses was provided by Robert Soran and Michael Mills, partners at the law firm of Downey Brand LLP. Discussions were included on the legal and practical considerations that all environmental expert witnesses should be aware. Assistance efforts to counsel and clients with complex technical problems were detailed. In June, Robert Dearborn of EDR spoke on the AAI Rule – What Does It Mean for you and Your Clients. This rule includes the first federal standard for environmental due diligence nearing promulgation, Mr. Dearborn revealed how the AAI rule will affect not only the way Phase 1s are conducted, but who can conduct them. AAI will have an influence on the ASTM E 1527-00 Standard, and how consultants and the clients complete transactions.

In August, David Von Aspern, formerly with Wallace-Kuhl & Associates, Inc. provided a pictorial presentation entitled “What Makes a Toxic Weasel Tick.” He shared some insights into that question by presenting color slides collected over the past 15+ years from actual project sites. The slides are those gathered from the most challenging or intriguing projects, where some extraordinary site assessment methods were used to get to the bottom of things or to resolve ‘roadblocks’ that might have caused a client to expend larger amounts of time and money on ‘Phase 2’ site assessments. David’s presentation was not a “how to do” but how to go the extra mile in your interpretation. David has been involved in about 1000 Phase 1 Site Assessments since entering the industry at its infancy in 1988. His projects have run the gamut from old farm homesteads to abattoirs to heavy manufacturing facilities, as well as building renovation projects where David managed asbestos abatement and lead-based paint surveys. As many in GRA know, David is a founding GRA officer and the first editor of *HydroVisions*. 💧

San Joaquin Valley Branch Highlights

BY BILL PIPES, BRANCH PRESIDENT

The San Joaquin Valley Branch has had regular monthly dinner meetings in Fresno, Bakersfield, and most recently, in Modesto. Our September speakers were Marvin Meyers and Jason Dean, Meyers Farming Company, who spoke on *“The Meyers Water Banking Project – A Westside Solution to Improving Groundwater Quantity and Quality.”* Marvin is a successful grower on the west side of the San Joaquin Valley where he and his family have farmed for over 30 years, and Jason manages the water operations for Meyers Farming. Marvin and Jason spoke to us about the water banking project near Mendota which was entirely conceived and constructed and has been financed solely by Meyers Farming.

The water bank will provide their farming operations a more stable water supply in the future and will be invaluable during drought conditions. The water bank also is helping to improve groundwater quality in the Mendota area. They shared with us their road map for a successful, privately-financed water bank including hydro-geological studies, environmental impact studies, coordination with neighboring property owners, and final approval by the U. S. Bureau of Reclamation.

Thanks to Ray Kablanow and Cher Kablanow and their staff at Geological Technics, Inc. for help in coordinating our first Branch meeting in Modesto in October.. Our speaker for the evening was Walter Ward, geologist and Assistant General Manager of the Modesto Irrigation District. Walter’s presentation was titled *“An Overview of Groundwater Management Planning in the Modesto Sub-Basin.”* The cities of Modesto, Riverbank, and Oakdale, Stanislaus County, and the Oakdale and Modesto Irrigation Districts have formed the Stanislaus & Tuolumne Rivers

Groundwater Basin Association (STRGBA) for the purposes of ensuring basin-wide coordination and development of various plans, programs and projects intended to protect and manage the groundwater resources for the benefit of the regional urban and agricultural community. Walter’s presentation described the current local planning activities and regional studies occurring under the direction of STRGBA.

Our next branch meeting is scheduled for January 19, 2006 in Fresno. Please visit the GRA website (www.grac.org) for more details about this meeting and other upcoming branch events. If you would like to be on our mailing/emailing list, please contact Diana Babshoff at (559) 264-2535 or dbabshoff@geomatrix.com. 💧

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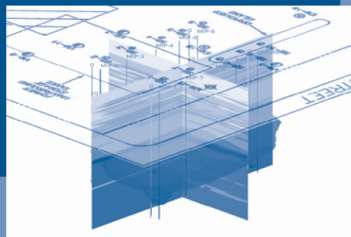


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Todd Hanna
Southern California
Santa Ana

800-VIRONEX

John McAssey
Northern California
San Leandro

Central Coast Branch

e-mail: cc.branch@grac.org

President: Brad Herrema

Hatch and Parent
(805) 882-1493
bherrema@hatchparent.com

Vice President: Bill O'Brien

Kennedy/Jenks
(805) 658-0607
billobrien@kennedyjenks.com

Secretary: Randy Dean

CH2M Hill
(805) 371-7817, ext. 24
randy.dean@ch2m.com

Treasurer: Sam Schaefer

SAIC
(805) 564-6155
samuel.w.schaefer@saic.com

Sacramento Branch

e-mail: rshatz@geiconsultants.com

President: Richard Shatz

Bookman Edmonston Engineering
(916) 631-4500
rshatz@geiconsultants.com

Vice President: Kelly Tilford

Golder Associates
(916) 786-2424
ktilford@golder.com

Secretary: Steve Phillips

USGS
(916) 278-3002
sphillips@usgs.gov

Treasurer: David Von Aspern

(916) 920-0573
dvajet@aol.com

Member at Large: Pat Dunn

Jacobson Helgoth Consultants
(916) 985-3353
pfdunn@pacbell.net

Member at Large: Steve Lofholm

Golder Associates
(916) 786-2424
slofholm@golder.com

San Francisco Bay Branch

e-mail: sf.branch@grac.org

President: Mary Morkin

Malcolm Pirnie
(510) 735-3032
mmorkin@pirnie.com

Vice President: J.C. Isham

The Shaw Group
(925) 288-2087
julian.isham@shawgrp.com

Secretary: Bill Motzer

Todd Engineers
(510) 595-2120
bmotzer@toddengineers.com

Treasurer: David Abbott

Todd Engineers
(510) 595-2120
dabbott@toddengineers.com

South Bay Coordinator: Mark Wheeler

Crawford Consulting
(408) 287-9934
mark@crawfordconsulting.com

Technical Advisory Member:

Bettina Longino

Geomatrix Consultants
(613) 730-6555
blongino@geomatrix.com

Technical Advisory Member: Janet Peters

ARCADIS Geraghty & Miller, Inc.
(510) 233-3200
jpeters@arcadis-us.com

Technical Advisory Member: Jim Ulrick

Ulrick & Associates
(510) 848-3721
julrick@ulrick.com

Past President: Gary Foote

GeoMatrix Consultants, Inc.
(510) 663-4100
gfoote@geomatrix.com

San Joaquin Valley Branch

e-mail: wpipes@geomatrix.com

President: Bill Pipes

Geomatrix Consultants, Inc.
(559) 264-2535
wpipes@geomatrix.com

Vice President: Tom Haslebacher

Kern County Water Agency
(661) 871-5244
thaslebacher@bak.rr.com

Secretary: Mary McClanahan

California Water Institute
(559) 278-8468
mmclana@csufresno.edu

Treasurer: Christopher Campbell

Baker Manock & Jensen
(559) 432-5400
clc@bmj-law.com

Technical Advisory Member:

Barbara Houghton

Houghton HydroGeologic, Inc.
(661) 398-2222
barbara@houghtonhydro.com

Technical Advisory Member:

Gres Issinghoff

RWQCB, Central Valley Region
(559) 488-4390
issinghoff@r5f.swrcb.ca.gov

Technical Advisory Member:

Bruce Myers

RWQCB, Central Valley Region
(559) 488-4397
myersb@r5f.swrcb.ca.gov

Southern California Branch

President: Darrell Thompson

Shaw Environmental
(949) 660-7532
darrell.h.thompson@shawgrp.com

Vice President: Peter Murphy

Kennedy/Jenks Consultants
(949) 261-1577
petermurphy@kennedyjenks.com

Treasurer: Emily Vavricka

DPRA
(760) 752-8342
emily.vavricka@dpra.com

Dates & Details

GRA MEETINGS AND KEY DATES

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

GRA Board of Directors Strategic Planning Meeting	January 14-15, 2006 San Diego, CA	GRA Legislative Symposium	March 29, 2006 Sacramento, CA
GRA Symposium <i>Perchlorate: Progress Toward Understanding & Cleanup</i>	January 26, 2006 Santa Clara, CA	GRA Symposium <i>Nitrate in Groundwater</i>	April 4-5, 2006 Modesto, CA
GRA Short Course <i>Introduction to Hydrology</i>	February 9-10, 2006 Glendale, CA	GRA Course <i>Vadose Zone Modeling</i>	May 10-12, 2006 Redwood City, CA
GRA Course <i>Principles of Groundwater Modeling & Transport Flow</i>	March 8-10, 2006 Irvine, CA	GRA Symposium <i>Emerging Contaminants</i>	June 2006 Northern CA
		GRA 15th Annual Meeting	September 21-22, 2006 San Diego, CA



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