HYDRO VISIONS

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GROUNDWATER RESOURCES ASSOCIATION OF CALIFORNIA

Summer 2002

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Issue Theme: The Klamath Calamity- A Portent of California's Future?

Last year, the conflicting needs of agriculture and the environment led to the first case of civil disobedience over water in decades. Since the potential for similar confrontations exists in California's Central Valley and elsewhere, this issue of HydroVisions will examine the issues and the potential solutions, including recent groundwater investigations in the basin that are laying the groundwork for conjunctive use. GRA thanks Dan Keppen of the Klamath Water Users Association for the local perspective and Bill Ehorn for the update on DWR Northern District's drilling activities in the basin. The views expressed by the authors are their own and do not represent those of GRA. Editor.

Groundwater Management in the Upper Klamath Basin - A Local Perspective

BY DAN KEPPEN, P.E., EXECUTIVE DIRECTOR, KLAMATH WATER USERS ASSOCIATION

Introduction

On April 6, 2001, the U.S. Bureau of Reclamation (Reclamation) announced its water allocation for the Klamath Irrigation Project (Project) after the U.S. Fish and Wildlife Service (Service) and the National Marine Fisheries Service (NMFS) officials finalized the biological opinions (BOs) for project operations in a critically dry year. Based on the actions of those regulatory agencies, Reclamation announced that no water would be available from Upper Klamath Lake to supply Project irrigators.

With the loss of Klamath Irrigation Project surface water last year, agencies and local water users immediately directed their attention to local groundwater resources as one means of mitigating for the pending catastrophe that began to emerge last spring. The groundwater management activities undertaken later in the year generated a mixed reaction within the local community. The local views regarding Klamath Basin groundwater management are as varied as the numerous programs that were implemented in the Basin last year. Understanding these perspectives is a vital step towards ultimately appreciating the complex challenges of managing groundwater in a basin that encompasses two states and is characterized by a strong federal presence.

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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.

Conjunctive Use In The Tulelake Subbasin

BY WILLIAM M. EHORN
CALIFORNIA DEPARTMENT OF WATER RESOURCES, NORTHERN DISTRICT

Introduction

The Upper Klamath Basin is located in southern Oregon and northeastern California (Figure 1). The Tulelake Subbasin is part of the Upper Klamath Basin that straddles the Oregon/California border. Tulelake Irrigation District (TID) in California is about 75,000 acres in size and encompasses the largest part of the subbasin. TID manages nearly all of the agricultural water deliveries in the subbasin pursuant to a contract with the U.S. Bureau of

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President's Message

BY JIM CARTER

We are halfway through my term as your GRA President for 2002, and I am very excited by what we have done so far and are planning to do in the future! So far we have had a tremendous number of seminars, symposia and training classes plus our Lobby Day, and we still have the rest of the year to go! Hydrovisions continues to get bigger and better, and we are continuously making improvements to our web site. We also plan to complete and publish the update of the Groundwater Management Manual this year.

I want to personally thank the Board of Directors, Branch Officers, our Executive Director Kathy Snelson and her staff, and our volunteers for all their outstanding work. We have a concern that we may be offering too many programs and burn out our resources, but we keep getting new ideas and enthusiastic volunteers. We have more programs planned for the rest of the year including our Annual Meeting (September 18 & 19th in Newport Beach), Groundwater Flow and Transport Modeling (September 25-27, Bay Area TBD), Bioremediation of MtBE (October 17th, San Jose) and Nitrate in Groundwater (November 12-13th, Fresno). Wow!!

In addition to these activities GRA is making a push to fulfill the Legislative Awareness and Advocacy part of our Mission and Objectives. The objectives include developing a pro-active role with the legislature as an authority on technical groundwater issues, and to assume a leadership role in communicating the needs and values of our industry to government officials. I would like to thank Tim Parker, Legislative Committee Chair, and the rest of his committee for the great work we have done in this area. Our Lobby Day was a huge success, and it was very clear with the impacts of term limits, that now more than ever our Senators and Legislators need our input and expertise to help address the critical issues facing our groundwater resources.

I am very excited about GRA and I am looking forward to more activities and accomplishments the rest of the year.

GRA Annual Meeting Field Trip - September 17, 2002

OCWD/OCSD Groundwater Replenishment System

The Southern California Branch of GRA is assembling a special Field Trip for the afternoon of September 17 that includes a tour of the Groundwater Replenishment System (GWR), a project jointly sponsored by the Orange County Water District (OCWD) and Orange County Sanitation District (OCSD) that will purify highly treated sewer water that is now being discharged to the ocean. Using Advanced Water Treatment facilities, sewer water from OCSD's sewage treatment plant will be purified to levels that far exceed drinking water standards. The water will then be stored in the Orange County groundwater basin either by injection along the coast or by natural filtration through ponds near the Santa Ana River. The underground basin provides 75% of the water used by north and central Orange County cities.

The half-day tour includes:

Stop 1. "Forebay" tour of OCWD spreading grounds along the Santa Ana River, including a drive along the river levee and stops at key facilities for brief discussions of recharge operations that include recharge within the Santa Ana River channel using T-levees as well as diversions from the river to separate spreading basins.

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

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Upcoming Events

Nitrate in Groundwater: Sources, Impacts and Solutions

November 12 & 13, 2002
Fresno, CA

Plan to attend GRA's Sixth Symposium in its *Series on Groundwater Contaminants* for a well-targeted set of technical and policy talks and exhibits by California's leading experts in nitrate contamination of groundwater. Emphasis on source identification, management, basin-wide monitoring programs, discerning long-term trends, regulatory framework, public health and land use policy issues will be featured. Keynote speakers will include leading policy makers and politicians active in nitrate management issues.

Nitrate remains California's most widely recognized groundwater contaminant, and the problem appears to be growing. 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, issues have become polarized and the cooperation and coordination needed to solve problems on a regional basis may not be occurring. Recent investigations reveal that nitrate contamination may be more wide spread, and in deeper groundwater, than previously thought. Politics, shaped by litigation, may be playing a stronger role in identifying issues than thoughtful discourse and sound science.

Collaborators from the agricultural, public water supply, urban waste water, academic, consultant and regulatory fields of California have joined together to provide a neutral, non-partisan

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"Sustaining Groundwater Resources: The Critical Vision"

GRA's 11th Annual Conference and Meeting

September 18 and 19, 2002

The Groundwater Resources Association of California (GRA), in cooperation with the International Association of Hydrogeologists (IAH), National Ground Water Association (NGWA), American Water Works Association (AWWA) Water Education Foundation (WEF), California Groundwater Association (CGA), and other organizations, invites you to join us for our 11th Annual Conference and Meeting, "Sustaining Groundwater Resources: The Critical Vision" in Newport Beach, California. The goal of this Conference is to present local and regional (and also a few global) groundwater management strategies and programs that are currently being implemented or refined to ensure reliable (sustainable) groundwater supplies.

"Sustainability" is a broad term that ultimately conveys a necessary goal, particularly with regard to reaching and maintaining a long-term balance between water supply and demand that is also protective of water quality and mitigates the potential for undesirable effects. However, sustainability also describes a complex and changing water paradigm. There is an increasing need to define and quantify critical groundwater issues and particularly to expand our knowledge of the interrelated nature of the components of the hydrologic system in order to develop and implement successful, comprehensive groundwater management programs. While the concept of achieving long-term sustainability is seemingly clear and desirable, economic, political and environmental concerns, and also future social values that may differ from those of today, make defining the specific objectives for reaching and maintaining sustainability extraordinarily complex and sometimes contentious.

There are significant challenges now and in the future to address the expanding stresses on our water resources that are occurring through extraction, transfer, consumption, recharge interception, and supply diversion. These stresses dictate the need for multi-faceted groundwater management programs that: 1) define clear management objectives, 2) define the managed resource (i.e., the total

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Technical Corner

Treatment Technologies for the Removal of NDMA from Contaminated Groundwater - Summary

BY JOSEPH M. WONG, P.E., DEE

N-nitrosodimethylamine (NDMA) is a contaminant of recent concern by drinking water regulators because of its discovery in contaminated groundwater supplies, in reclaimed water and treated drinking water from treatment plants where chlorination is the primary disinfection process. Because NDMA historically has not been considered a common drinking water contaminant, it has no state or federal drinking standards. In April 1998, California Department of Health Services (DHS) established a drinking water action level (AL) for NDMA of 0.002 microgram per liter (µg/L). However, analytical capabilities did not enable detection at that concentration, so DHS's approach was to consider any detectable quantity as exceeding the DHS action level for NDMA. In November 1999, DHS temporarily revised the NDMA AL from 0.002 µg/L to 0.02 µg/L, while studies are taking place on the possible production of NDMA in drinking water treatment processes. The AL will revert to 0.002 µg/L once those investigations are completed.

The author recently conducted a wellhead treatment study for a private water purveyor whose groundwater supply is contaminated by NDMA. The treatment objective for NDMA is <0.002 µg/L. The treatment technologies evaluated for NDMA in drinking water include ultraviolet (UV) irradiation, UV/oxidation, and resin adsorption. UV irradiation was recommended for NDMA removal because it is the most technically effective and cost-effective process for the application. Other advantages of the UV process include: 1) no secondary wastes, 2) no off-gases, 3) quiet, compact and unobtrusive equipment, 4) low maintenance and operating requirements, and 5) flexibility if other organics are present (by adding hydrogen peroxide). The full article including references is on GRA's website at www.grac.org/Wong_NDMA.pdf.

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"Perchlorate and NDMA in Groundwater: Occurrence, Analysis and Treatment" Symposium Highlights and Summary

BY RULA A. DEEB, PH.D. & ELISABETH HAWLEY

Background

Water supply managers in California and elsewhere in the United States are facing an increasingly complex array of threats to water quality as more contaminants are discovered and regulated, and as laboratory analytical techniques for detecting these compounds improve. Perchlorate (ClO4) and NDMA (N-Nitrosodimethylamine) are two emerging contaminants which have been recently reported to impact drinking water resources nationwide.

Perchlorate is a primary ingredient in solid propellant for rockets and missiles and thus a common contaminant at aerospace facilities. Additionally, perchlorate-based chemicals are used in a range of industrial processes including aluminum refining, rubber manufacture and production of paints. Perchlorate has a high solubility in water and a high specific gravity. It sorbs weakly to aquifer materials, is not known to break down abiotically and has a low biotransformation rate. As a result, perchlorate has been shown to be fairly mobile and persistent in subsurface environments. A press release issued by a California-based environmental group recently suggested that over 20 million people in California, Arizona and Nevada have perchlorate in their drinking water supplies. In fact, the California Department of Health Services (DHS) reported that perchlorate has been detected in 246 of 3900 drinking water sources recently tested in California. Earlier this year,



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Perchlorate and NDMA

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DHS lowered the advisory drinking water action level for perchlorate from 18 to 4 parts per billion (ppb). While human exposure to high levels of perchlorate has been reported to cause cancer, the impact of perchlorate on human health at low levels in drinking water is not yet clearly understood.

Like perchlorate, NDMA is also present in rocket fuel but as an impurity (up to 0.1%). Additionally, NDMA is used as an antioxidant in lubricants, as a nematocide, as a plasticizer for rubber and acrylonitrile polymers and in condensers to increase dielectric constants. Contamination of surface and groundwater supplies from NDMA at missile and other rocket fuel sites is a significant concern, but the formation of NDMA during wastewater treatment processes as a disinfection byproduct is a greater concern for many wastewater treatment plants which discharge treated water for reclamation purposes. NDMA is a potent carcinogen with a very lower advisory action level of 10 parts per trillion (ppt) in California. This low action level raises questions about the development of more reliable and less expensive analytical methods for NDMA detection in water.

Symposium Overview

The Groundwater Resources Association of California recently dedicated its fourth symposium in its Series on Groundwater Contaminants to discuss state-of-the-art research related to the occurrence, analytical detection and removal of perchlorate and NDMA from water. The meeting was held on April 17, 2002 at the Radisson Hotel in the San Gabriel Valley, a fitting location as the San Gabriel Valley overlies one of California's largest groundwater perchlorate plumes. The symposium attracted over 235 participants and exhibitors, and showcased key speakers from universities, national laboratories, regulatory agencies and industry.

Technical Corner

The symposium provided a neutral forum for discussing a range of technical, legal and policy development issues related to perchlorate and NDMA. Current impacts of perchlorate and NDMA on California water resources were identified, as well as remediation and water treatment options to mitigate environmental damages. Information was shared on perchlorate and NDMA sources, fate and transport behavior, toxicity, regulatory status and analytical techniques. The symposium was organized into three sessions which are discussed in some detail below. In addition, a lunchtime speaker panel discussed the impacts of the California Supreme Court's Hartwell Decision, which allowed private lawsuits against water companies and industrial defendants over water quality.

Session 1: Sources, Occurrence, Geochemistry, Fate and Transport, Analysis and Toxicity of Perchlorate and NDMA

Kevin Mayer started the symposium with a historical overview of perchlorate in the Western United States. Mr. Mayer is EPA's Pacific Southwest Perchlorate Coordinator and a co-author of EPA's recent publication on perchlorate toxicity [Perchlorate Environmental Contamination: Toxicological Review and Risk Characterization; www.epa.gov/ncea, Publications; EPA's Superfund Records Center (415) 536-2000]. Mr. Mayer focused on the toxicity of perchlorate and EPA's interpretation of perchlorate toxicology data. He discussed perchlorate-related regulations and emphasized that only 4 states currently have perchlorate action levels. He stated that detection capabilities for perchlorate as well as the state of scientific data on perchlorate are not sufficient to create a Federal MCL. Mr. Mayer also talked about the occurrence, fate and transport of perchlorate in the environment. He stated that perchlorate appears to spread easily through the environment and is likely to have trans-boundary impacts on groundwater resources as evidenced by case studies involving the Colorado River and Lake Mead, NV.

Bill Mitch, a Ph.D. candidate in Professor David Sedlak's research group at the University of California at Berkeley, presented results of his research on the formation of NDMA during the chlorinamination of water. Monochloramine is an alternative disinfectant used instead of chlorine to decrease the formation of trihalomethane compounds such as chloroform during chlorination. Mr. Mitch identified monochloramine as an important precursor to NDMA formation. Since NDMA is 1,000 times more potent as a carcinogen than trihalomethanes, Mr. Mitch suggested that this might impact a utility's decision to use monochloramine as a drinking water disinfectant.

The third and last speaker in this session was William Steeber, Section Chief of the Department of Health Service's Sanitation and Radiation Laboratory. Mr. Steeber discussed the analytical challenges faced by many laboratories when trying to reliably detect perchlorate and NDMA in water. In addition, Mr. Steeber elaborated on the impact of analytical detection limits on state and federal regulations.

Session 2: Perchlorate and NDMA in California

This session started with a one-hour discussion focused on perchlorate problems in the San Gabriel Valley. Mr. Fred Fudacz, chair of the Water Law Group at Nossaman Guthner Knox and Elliott LLP, provided a legal perspective regarding the cleanup of the Baldwin Park Operable Unit in the San Gabriel Basin. Second, Carol Williams, Watermaster Executive Officer for the

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Nitrate in Groundwater

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environment within which the most recent advances and knowledge can be shared and the state of the situation accurately defined. Your participation during the two days will add expertise and an additional voice directed towards resolving the issues and shaping the future of California's groundwater.

PROGRAM SUMMARY

Tuesday, November 12
(1:00 p.m. to 6:30 p.m.)
Registration
Technical Sessions
Reception

Wednesday, November 13
(8:30 a.m. to 4:00 p.m.)
Registration
Opening Keynote
General Assembly Sessions
Luncheon and Keynote

For additional information, please contact Kathy Snelson, GRA Executive Director, at executive_director@grac.org. Updated information will be posted on GRA's Web site, www.grac.org when it is available.

Mark Your Calendar
for the
Fifth Symposium in GRA's
Series on Groundwater Contaminants
"MtBE in Groundwater"
October 17, 2002
San Jose - DoubleTree Hotel

For additional information, please visit GRA's Web site at www.grac.org

Sustaining Groundwater GRA Annual Meeting

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water balance and flow system for the physical conceptual model of the groundwater basin), 3) employ comprehensive monitoring programs to gather the data necessary to manage groundwater resources, and 4) plan for and implement water resources management actions such as surface and subsurface recharge, in-lieu use, and conjunctive management to ensure water supplies are replenished and the balance of the hydrologic system is maintained. As pressures to meet demands and stresses on water resources increase, the intricacy of achieving sustainability will become more visible. As a result, this Conference intends to broaden attendees' awareness of the critical vision for accomplishing sustainability through presentations provided in the Plenary Assembly and Conference Sessions on the following topics, which are further described below:

- Groundwater as a Component of the Natural Resources Infrastructure
- Recharge Management * Reclaimed Water Management
- Sustainable Groundwater Management Strategies, Water Supply Assessment and Optimization
- Wastewater Management and Emerging Contaminants
- Comprehensive Approaches to Groundwater Quality Characterization

PLENARY ASSEMBLY: Groundwater as a Component of the Natural Resources Infrastructure

This session establishes the framework for the Conference theme "Sustaining Groundwater Resources: The Critical Vision." The focus on sustainability sets forth the ultimate goal we wish to achieve with groundwater management programs, yet the identification and implementation of the means to ensure success in reaching this goal are now, and will continue to be, the true challenges we face to sustain the quantity and quality of our water resources. Groundwater is a vital component of the natural resources infrastructure that is intimately connected to other components such as surface water, the soil, the landscape, and the aquatic ecosystems. Groundwater scientists and other professionals involved in groundwater management will increasingly be called upon to address issues that intimately involve these linkages. This session provides presentations on key aspects of groundwater as a critical component of the overall infrastructure; the presenters in the Plenary Assembly include:

- Dr. T. N. Narasimhan, Professor, University of California, Berkeley
  Groundwater as a Component of the Natural Resources Infrastructure
- Dr. William Woessner, Professor, University of Montana
  Exchange of Groundwater at the Stream - Floodplain Interface

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- Dr. Steven Ingebritsen, Chief, Branch of Regional Research, USGS, Menlo Park, CA
  Land Subsidence in California
- Dr. Neil Dubrovsky, Supervising Hydrologist, USGS, Sacramento, CA
  The Shifting Challenge of Ground-Water Quality Management in the Central Valley of California
- Dr. Harvey Doner, Professor, University of California, Berkeley
  Redox Processes, Soils and Trace Element Solubility
- Dr. William Alley, Chief, Office of Ground Water, USGS, Reston, VA
  Integrated Groundwater Monitoring in Support of Long-Term Sustainable Use
- Dr. Michael Hanemann, Professor, University of California, Berkeley
  Long-Term Groundwater Resource Sustainability: Economic Implications
- Randolph Flay, University of California Berkeley (see also Student Research Corner)
  Groundwater Management: Comparative Study of Six Western States
- Dr. Ramon Llamas, Professor, University Complutense, Madrid, Spain
  Cooperative and Effective Groundwater Management in Arid Lands: Spanish Experience

DAY 1 - TRACK 1: Recharge Management

A critical component of groundwater management is recharging the aquifers from which we are extracting increasing volumes of groundwater. This session will focus on techniques for managing and maximizing both surface and subsurface recharge (injection), as well as water quality issues such as atmospheric contamination, constructed wetlands, and public perception. Presentations will include: strategy for 100% reuse and recharge of the City of Rio Rancho, New Mexico's wastewater; effective hydraulic area calculation for injection wells; and management and optimization of water bank recharge and extraction operations using groundwater flow models.

DAY 1 - TRACK 2: Reclaimed Water Management

Whether potable or non-potable, direct or indirect, water reuse is becoming an important potential option for augmenting existing water supplies. This session will explore the various aspects of reclaimed water management, including considerations for recharging groundwater with reclaimed water, effects on groundwater quality (including emerging and/or unregulated contaminants), treatment and distribution of reclaimed water, treated water reuse policies, and other technical, political, and legal issues.

DAY 2 - TRACK 1: Water Supply Assessment, Conjunctive Management & Optimization Strategies

California's population is projected to grow by approximately 50 percent to 47 million over the next 20 years, which will be a critical challenge to meet our future water supply demands. Adding to the complexity of meeting our future water supply needs are rising water quality issues. The tools available to meet our future water needs include better basin assessments, comprehensive groundwater management approaches, water transfers, conjunctive water management, and optimization strategies. A panel discussion session by leaders in the water supply industry will provide insight on how they plan to develop and implement integrated strategies to meet California's water management needs. Presentations will also be provided on several of these approaches to meet our future water supply needs, including presentations on municipal water supply, groundwater management, and conjunctive use in the Fresno area; management of groundwater resources in Souss-Massa River Basin of Morocco; the cost of water in southern California; and groundwater modeling tools available for basin management.

DAY 2 - TRACK 2: Wastewater Management and Emerging Contaminants

Wastewater is no longer considered a flow stream that consists only of salts, organic matter, and common pathogens. More than 10 years ago, research began to assess the presence of pharmaceuticals in wastewater, however, it is just in the last few years that the occurrence of these and many other non-conventional pollutants have begun to receive significant scientific attention. A large variety of new (or commonly referred to as emerging) compounds are now being detected in lakes, rivers, wastewater, and groundwater across the US and globally. These compounds include pharmaceuticals such as codeine, antacids, cholesterol lowering-agents, hormones, and antibiotics; there are also endocrine disrupting compounds, disinfection byproducts, commonly consumed substances (e. g. caffeine), personal care products, solvent stabilizers (e.g. 1,4- dioxane), and the list goes on and on. Pathogens also present a greater potential health risk than previously considered, particularly since more resistant forms are being detected in effluent streams.

This session will explore: research and studies conducted (or underway) to better define the occurrence of pharmaceuticals, pathogens, and other emerging contaminants; the potential for chemical bioaccumulation and persistence in the environment; approaches for identifying the presence of these emerging compounds in the watershed; the status of regulatory activity to establish health-protective limits; and contaminant transport mechanisms on local and regional (watershed) scales, including transport in groundwater.

DAY 2 - GENERAL ASSEMBLY: Comprehensive Approaches to Groundwater Quality Characterization

Water quantity is intrinsically linked to water quality. The approaches used to characterize groundwater quality conditions, and especially projected conditions resulting from future water use and management scenarios, must account for potential changes in water quality to meet designated demands. This session will explore approaches for characterizing quality, including long-range hydrologic and ecosystem processes; effective long-term, regionally based monitoring programs; nonpoint source pollution monitoring and control strategies; and evaluating the source of "new" constituents of concern.

CONFERENCE WHITE PAPER

In addition to establishing the framework of the Conference, a second purpose of

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Federal Legislative/Regulatory Corner

Current Happenings at U.S. EPA

BY JUDY BLOOM, U.S. EPA & GRA DIRECTOR

US EPA Reviews National Primary Drinking Water Regulations

The U.S. EPA recently conducted a review of the existing National Primary Drinking Water Regulations (NPDWRs). The 1996 SDWA requires EPA to periodically review existing national primary drinking water regulations (NPDWRs) and, if appropriate, revise them. The intended purpose of the review is to identify those NPDWRs for which current health risk assessments, changes in technology, and/or other factors, provide a health or technical basis to support a regulatory revision.

Based on its review, and pending an evaluation of public comments, the Agency preliminarily believes that the 68 chemical NPDWRs remain appropriate at this time. It is suggested that the Total Coliform Rule (TCR) be revised.

Stakeholders have suggested modifications to reduce the burden of implementing the TCR. EPA has determined that an opportunity for implementation burden reduction exists and will analyze the effect that such changes would have on public health protection as part of the Agency's regulatory development/revision process. Only EPA will consider those measures that reduce the TCR implementation burden while still assuring public health protection.

EPA intends to undertake a rulemaking process to initiate possible revisions to the TCR. As part of this process, it may be appropriate to include this rulemaking in a wider effort to review and address broader issues associated with drinking water distribution systems. This would be one way of addressing some of the recommendations of the Microbial/ Disinfection Byproducts (M/DBP) Federal Advisory Committee in the Stage 2 M/DBP Agreement in Principle (65 FR 83015, December 29, 2000 (USEPA, 2000h)). As part of the TCR rulemaking, EPA plans to assess the effectiveness of the current TCR in reducing public health risk, and what technically supportable alternative/additional monitoring strategies are available that would decrease economic burden while maintaining or improving public health protection.

EPA will publish the findings in August 2002. The written response to comments will also be published. For general information about, and copies of, the federal register notice [Federal Register: April 17, 2002 (Volume 67, Number 74)] or information about the existing NPDWRs, contact the Safe Drinking Act Hotline at (800) 426-4791.

Wanted: Groundwater/Surface Water Interactions - Research Needs

EPA's Office of Research Development (ORD) is looking for suggestions on research needs for groundwater/surface water interaction issues. If you have encountered a research question or issue in the gw/sw interaction arena, perhaps this is a venue to get some answers. Your question/issue must be one that is viewed as critical by a regulatory agency or nonprofit, and must be submitted to EPA (bloom.judy@epa.gov) by that agency or nonprofit by June 30, 2002. The research questions can be geared toward hazardous health, human health or ecological risk...there is a lot of flexibility in the questions. We have been asked to think about the outcome or desired product and what it would look like - - a model, an equation, or enhanced knowledge. Please take this opportunity to raise the gw/sw interaction issues that are so important in California and get them on the table for consideration.

Comprehensive Nutrient Management Planning & CA

In California, a new guidance (working draft) that could help prevent the over-application of nutrients via animal manure applied on croplands will soon hit the pavement. Manure waste is a by-product of the livestock production industry that can also be a valuable product for cropland production - if handled properly. Over-application of animal manure can result in increased levels of nitrates in the underlying ground water and may runoff to nearby surface waters. The proposed revisions to the NPDES regulations and Effluent Limitation Guidelines for Animal Feeding Operations recognize a need for proper nutrient management. A nutrient balanced system will help livestock operators comply with their permit requirements and help ensure that manure-contaminated runoff will not reach surface waters. In addition, many counties are now requiring that dairies and other feeding operations develop a nutrient management plan for their facility. To address this need, the concept of "Comprehensive Nutrient Management Plans" (CNMP) was developed. Prepared by qualified individuals, with the participation of the livestock producer, these customized plans will lay out a strategy for the producer to use to make sound manure application decisions. It will also help the producer to identify any needed improvements on the facilities to control manure handling and storage and assist in tracking nutrients from the feed to the land application.

Since the CNMP covers a variety of expertise areas, the USDA Natural Resources Conservation Service (NRCS) brought together a team to develop the CNMP guidance manual. Led by the NRCS, the group is composed of the CA Dairy Quality Assurance Partnership, State and Regional Water Quality

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Conjunctive Use - Tulelake Subbasin

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Reclamation (USBR).

In 1905, the USBR began building the Klamath Project to deliver surface water from Upper Klamath Lake to reclaimed agricultural land in the Klamath Basin. Since 1928, the Klamath Project has provided an abundant supply of surface water for agricultural use in the basin. In spring of 2001, the USBR was directed by the U.S. District Court to reduce surface water deliveries to about 26 percent of normal. This decision was a result of a U.S. Fish and Wildlife Service (USFWS) opinion and the Endangered Species Act. The USFWS issued a biological opinion addressing water requirements for two species of suckerfish in the upper basin and the coho salmon in the lower basin. Drought conditions were present due to natural climatic conditions and were exacerbated by diminished surface water deliveries. TID had no alternate supply of water and farmers faced economic disaster. As a result, the governors of California and Oregon declared drought emergencies.



Figure 1.--Upper Klamath Basin ground-water study area.

California Governor Gray Davis requested that the legislature fund an emergency well installation program within Tulelake Irrigation District. The California Office of Emergency Services issued a $5,000,000 grant to TID for the installation of production wells in the subbasin to help offset surface water supply deficiencies. The California Department of Water Resources (DWR) worked closely with TID during the well installation and was responsible for groundwater monitoring in the subbasin. In addition, DWR began a hydrogeologic investigation to evaluate existing and future groundwater development in the basin.

DWR's Northern District groundwater section and TID worked quickly to produce a well installation contract for bid. Drilling began in May 2001. The location and design of the new wells was based on TID's canal distribution system, available power, and the hydrogeology of the area. Most new wells were placed near the top of the distribution system to facilitate gravity flow through the canal network. The wells were drilled deeply to intercept the basalt aquifer in anticipation of high yields and to minimize impacts to shallow domestic wells. Ten high production wells were drilled, with the last well completed on September 7, 2001. Figure 2 shows the locations of the new wells. You can find Figure 2 on the website at www.grac.org/hv.html.

Tulelake Subbasin Geology

The Upper Klamath Basin lies on the east side of the Cascade Mountain Range on the western boundary of the extensional Basin and Range Province and the northern boundary of the Modoc Plateau. The Tulelake Subbasin is consistent with the regional geologic and tectonic setting. It is a graben valley separated by horst mountain blocks as a result of extensional tectonic forces. Numerous north-northwest trending faults, which exhibit normal displacement, have been mapped on the edges of the subbasin. The horst mountain blocks are composed predominantly of basaltic lava flows. The graben valleys are filled with surficial deposits consisting of Quaternary fluvial and lacustrine deposits. Tertiary pyroclastic deposits and Tertiary sedimentary continental deposits also exist locally in the subbasin. Generalized geologic cross sections from west to east and from south to north across the subbasin are shown on Figure 3 on the website at www.grac.org/hv.html.

The predominant and oldest basalt unit exposed in the subbasin is the Lower Basalt of the Tertiary High Cascade volcanic sequence. This unit is Miocene to Pliocene in age, is exposed in the horst

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Conjunctive Use...Tulelake Subbasin

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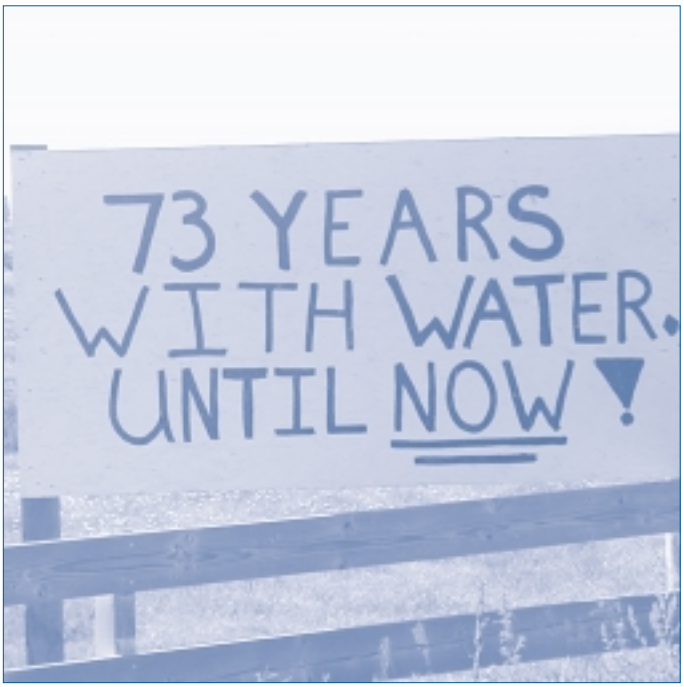
mountain blocks, and underlies the entire subbasin. There are two other major basalt flows that originated from the Medicine Lake Highlands to the south and flowed in a northerly direction into the subbasin. These two units are the Intermediate and Upper Basalts and are Pleistocene and Holocene in age, respectively. The Lower and Intermediate Basalt both outcrop on the mountain blocks on the east and west margins of the subbasin, indicating that faulting occurred following deposition. The Upper Basalt overlies the Intermediate Basalt and interfingers with lacustrine surficial deposits as it terminates in the southern portion of the subbasin.

Tulelake Subbasin Hydrogeology

The volcanics and the surficial deposits comprise the two major aquifer systems in the subbasin. The volcanic aquifer system is deepest in the north-central portion of the basin and becomes shallower toward the margins of the subbasin. Due to extensive fracturing, this aquifer is typically highly permeable and it is the major source of groundwater for irrigation and municipal wells, yielding very large quantities of water. Groundwater in this unit is strongly confined along the axis of the subbasin where it underlies the surficial deposits. At the edges of the basin to the east and west, groundwater is unconfined or semi-confined by the Lower Basalt. In much of the Klamath Basin, the lower volcanics serve as a relatively deep layer of transmission for regional groundwater (Gates, 2001). Recharge to the Lower Basalt aquifer is from the higher portions of the basin including the Cascade Range to the west and other elevated upland areas to the north, east, and south.

Based on the well completion reports and aquifer test data, wells installed in the Lower and Intermediate Basalts yield 9,000 to 12,000 gallons per minute (gpm) in the west to middle portion of the subbasin to 4,000 to 7,000 gpm near the east side. The specific capacities of the wells range from 17 to 396 gpm/ft of drawdown. Aquifer transmissivities in the Lower and Intermediate Basalts near the center to west side of the basin range from about 700,000 to 1.7 million gpd/ft. In the eastern third of the basin, transmissivities of the TID wells range from about 50,000 to 180,000 gpd/ft. The difference in production between the west to middle and the eastern side of the subbasin is due to a change in geology from well-fractured basalts to basalts with interbedded tuffaceous siltstones and claystones that exhibit lower water-bearing capabilities. Drilling, construction, and production characteristics of the new wells are posted on GRA's webpage at www.grac/org/HydroVisions.





The surficial deposits, composed of fluvial and lacustrine sediments, are unconsolidated to semi-consolidated and range in thickness from about 1,100 feet in the north central portion of the subbasin to a thin veneer along the margins of the subbasin. These sedimentary deposits comprise the primary water resource for the domestic wells in the area but do not yield sufficient quantities of water for irrigation. Groundwater in these sediments is unconfined. Recharge to the sediments is local from precipitation and surface water infiltration.

Pyroclastic and continental sedimentary deposits exist locally and also contribute to the groundwater resources in the subbasin. The pyroclastics include scoria and ash vent deposits and tuffaceous material. Lenses of scoria or vent deposits can yield moderate to high quantities of water suitable for irrigation purposes. Tuff deposits in the subbasin yield varying quantities of groundwater, generally inadequate for irrigation. Groundwater in these units is unconfined to confined depending on subbasin location.

Depths to water are similar in both the volcanic and alluvial aquifer systems and range from less than 10 to about 30 feet in the interior of the subbasin to 60 to 100 feet on the edges of the basin due mainly to topographic relief. Groundwater in the subbasin generally flows southward toward Tule Lake under a gradient of about 2.1 feet per mile.

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"Ask-A-Groundwater Specialist" Education Outreach Program Seeks More Volunteers

BY SUSAN GARCIA, GRA DIRECTOR AND EDUCATION COMMITTEE CHAIR

GRA needs more "Groundwater Specialists" to support our website-based, "Ask-A-Groundwater Specialist" education outreach program. The objective of this program is to answer groundwater-related questions posed by students and the general public. Since the program was initiated in December 2001, it has averaged about three questions a month, with questions coming from northern and southern California, Oregon, and Nigeria. Questions have ranged from general water quality within a specific groundwater basin to drinking water quality and specific contaminants. We would like to increase our current pool of "Groundwater Specialists" so that we can expand the program to the education community.

Questions are forwarded to "Groundwater Specialists," who in turn are expected to respond to the question within a few days. Question responses can be as detailed as desired, but will typically take between 5-to-20 minutes to respond. Responses can also refer the inquirer to other references either on- or off-line. Become a "Groundwater Specialist"; sign-ups are being taken at our Education page on GRA's website (http://www.grac.org).

Highlights from "Ask-A-Groundwater Specialist"

GRA would like to thank our "Groundwater Specialists" for taking the time to respond to student questions. In today's article, I highlight three inquiries/responses that may be of interest to our members. Minor edits have been made to the text. Thank you Steve Zigan, Jim Jacobs and Tim Parker for your responses.

Education Corner

Question:

I am doing a project that requires knowledge in the field. Since the problem of perchlorate seems relatively unheard of, I have had a bit of a problem trying to find someone. If anyone that reads this can help please email me back.

1. When was perchlorate first detected in our drinking water?

2. Do we know for sure how it got there?

3. Are there any actions being taken to remove perchlorate from the drinking water?

4. What is the standard for perchlorate in drinking water?

5. Are there any set plans in place to remove perchlorate from the drinking water?

6. Why isn't the public more readily notified about this problem?

Thanks for taking the time to answer these questions; if you have any other pertinent information that you think might help please feel free to attach it.

Thanks, Sarah

Answer:

Perchlorate is commonly used as a degreaser. That is, it takes the grime and grease off of clothes and parts. As such, it is commonly used in manufacturing plants, such as airplane and space manufacturing, metal plating shops, and electronic industries. It is also used in dry cleaning industries. The chemical is usually stored in vats, and unfortunately, sometimes those vessels or their piping leak. When that happens, the chemical can leach down to and impact the groundwater.

Perchlorate has been used for decades, but my friends tell me that, due to increased sensitivity of laboratory analytical equipment, its widespread detection dates from just a few years ago. Whereas large contaminant plumes with high concentrations have been know for a while, some of the plumes with lower concentrations have just recently been discovered.

The California drinking water standard for perchlorate is only 5 parts per billion (ppb). That means that for every billion drops of water (about one swimming pool), you can only have 1 drop of perchlorate. You can see by this low ratio that perchlorate is a very toxic chemical. But don't worry. Although it is in the groundwater, all of our drinking water is tested, and cannot be delivered to you unless it is less than this concentration. Also, please feel comforted in the fact that the 5 ppb limit has a 1000 fold safety factor built into it. That means that we believe that one drop in a swimming pool would be a danger, but place the limit at one drop per 1000 swimming pools just to be safe. People in my industry are well aware of the problems with perchlorate. The general public and news agencies may not discuss it much. Maybe that reflects the quality of the job that the regulatory agencies and people in my industry (groundwater cleanup) are doing to protect your water supply. When it is found at concentrations exceeding the drinking water standard, there are many (albeit complex) ways of removing it. That is the job that I do.

I hope that this answers your questions. Please feel free to contact me if you have more questions.

Sincerely,
Steve M. Zigan
Certified Hydrogeologist

Question:

How do you remove arsenic from my home drinking water? The levels are running 90 ppb and that's kind of high. The state just lowered it to 10 ppb.

Thanks, Chad, Pioneertown, CA

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Groundwater Management - Upper Klamath Basin

Continued from page 1

The 2001 Klamath Basin Crisis

The Project had been operated for nearly a century to provide a reliable water supply up to 210,000 acres of farms and ranches, and to two wildlife refuges near the California-Oregon state line. Since 1995, Reclamation has issued annual project operations plans that address potential impacts on federally listed species, including two sucker populations, coho salmon and bald eagles. Reclamation is required to consult with the Service on the two sucker species and eagles, and with NMFS for coho salmon on the Klamath River. The combination of the Service BO that holds Upper Klamath Lake at high levels, the NMFS BO, which calls for historically high river flows, and the drought all contributed to the problems facing the Project.

The 2001 water cutoff imposed impacts to the local community that were immediate and far-reaching. Loss of irrigation supplies devastated farmers and imparted an estimated $200 million economic "ripple" effect through the broader community. Last year's cutoff also tragically underscored the vital linkage that exists between irrigated farmland and wildlife. Water that would normally flow through farmland habitat was directed instead towards three species protected under the ESA. The vitality of over 430 other wildlife species was threatened when they were subjected to the same fate as farmers.

Recent, Ongoing and Planned Groundwater Management Efforts in the Basin

Prior to the 2001 water crisis, Reclamation, the U.S. Geological Survey, California Department of Water Resources (DWR) and the Oregon Water Resources Department (OWRD) were all engaged in various groundwater management activities in the Basin, which were suddenly put on the back burner when the urgent needs of the water cutoff took precedent. Aggressive and successful emergency actions were undertaken on the California side when DWR teamed with local irrigation districts to develop supplemental groundwater supplies to establish cover crops so the region's soil would not be lost to wind erosion. OWRD in 2001 issued dozens of emergency drought permits and limited licenses on the Oregon side of the Basin to accelerate supplemental groundwater development.

Groundwater also played an important role in satisfying the demands of the two national wildlife refuges served by the Project. The refuge complex is an important stopover for Pacific Flyway waterfowl and provides habitat for over 200 species of migratory and resident birds, including threatened bald eagles. A coalition of environmental groups filed its intent to sue the Department of the Interior on behalf of refuge eagles in May 2001. The groups delayed legal action after Reclamation began providing purchased and donated non-project water, taken from wells, to the refuge on a month-to-month basis. Despite the extra water, the Lower Klamath refuge barely managed to meet its needs last year.

The actions undertaken last year have contributed to the heightened involvement that agencies are now taking relative to Klamath Basin groundwater issues. The activities by the California Department of Water Resources are discussed further in the companion article in this issue of Hydrovisions.

The flurry of groundwater management activities last year - particularly the federal program that provided well water to the refuges - also caught the attention of domestic well owners near the California-Oregon border, who claimed that increased groundwater pumping adversely impacted their shallow wells. This very controversial issue brought to light many of the complexities inherent in an emergency situation involving multiple agencies and jurisdictions. While many questions remain regarding the importance of specific reasons for declining groundwater levels, the shallow wells were likely impacted the most due to reduced recharge caused by: 1) Lack of surface water in the extensive irrigation delivery system; and 2) Loss of percolation to shallow aquifers from applied irrigation water. In certain cases, it appears that additional groundwater pumping in 2001 may have had a direct impact on neighboring wells. However, clear correlations of such occurrences have, for the most part, been established thus far for wells contained within the same fault zone, producing from a deeper volcanic aquifer. Resources agencies in both states are still wrestling with the challenge of delineating drawdown impacts associated with the drought, new wells, and existing wells. Again, this task is made all the more daunting due to the political and jurisdictional complications associated with a shared groundwater basin that underlies two states, three counties, and two national wildlife refuges.

By many accounts, the emergency groundwater development programs implemented last year were successful. However, the outcry raised late last fall by local domestic and agricultural well owners near the California-Oregon state line should provide a warning to all water managers of the risks associated with increased reliance on a relatively unknown resource.

The Role of Groundwater in a Project Environmental Water Bank

Local water users and producers have developed initial principles and a draft implementation framework to guide a voluntary environmental "water bank" within the Klamath Project. Preliminarily, this bank would seek to secure between 0 and 90,000 acre-feet of water (maximum, in critically dry years) from the Klamath Project to help meet environmental water requirements for endangered suckers and coho salmon. This water would be developed using three primary tools: 1) Winter storage; 2) Compensated one-year idling (20,000 acres, maximum); and 3) Groundwater substitution. A key principle of this program is that, in exchange for participation in the water bank, 100 % of the irrigation demand for the remaining acreage from participating producers will be satisfied, season-long. Another critical principle supporting this program is ensuring that groundwater impacts to third parties are avoided or minimized.

Local water users have proposed that all groundwater development related to this program will first be used to offset the need for any idling of farmland. Conceptually, the total maximum amount of water generated through groundwater

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Comparative Analysis of Groundwater Management Strategies

BY RANDOLPH B. FLAY AND T. N. NARASIMHAN
MATERIALS SCIENCE AND MINERAL ENGINEERING, UNIVERSITY OF CALIFORNIA BERKELEY

Editor's Note: The authors will be presenting on this subject at GRA's 11th Annual Conference and Meeting, "Sustaining Groundwater Resources: The Critical Vision" in Newport Beach, California on September 18 and 19, 2002 (see page 3 for more conference details). The views expressed are those of the authors and do not represent those of GRA.

The following quote from the case of *Cline v. American Aggregates,* which came before the Supreme Court of Ohio in 1984, reasserts the fundamental need to apply improvements in groundwater science to our institutional and legal arrangements that manage it. The court stated: "Finally, a primary goal of water law should be that the legal system conforms to hydrologic fact. Scientific knowledge in the field of hydrology has advanced in the past decade to the point that water tables and sources are more readily discoverable. This knowledge can establish the cause and effect relationship of the tapping of underground water to the existing water level. Thus, liability can now be fairly adjudicated with these advances which were sorely lacking when this court decided Frazier more than a century ago."[1] While California has since 1903 not observed the English Rule of Capture with regards to property rights in groundwater (which was overturned in Ohio by the case above), there is a significant need to move beyond the current system of management which has done little to ensure certainty in groundwater rights and protect groundwater quantity and quality for the long-term. Given the recent effort undertaken to examine the authority of the State Water Resources Control Board (SWRCB) to control groundwater,[2] this is perhaps a suitable occasion to examine how far California has come since the *Report of the Governor's Commission to Review Water Law in California* some two decades ago recommended to the state legislature several steps for California to incorporate advances in science into our systems of management.[3]

> *"Recent advances in understanding the importance of regional groundwater flow and chemistry must be reconciled with California's laws and institutions that dictate its allocation and management."*

The management of groundwater in the western United States has evolved greatly over the past 70 years. States such as Arizona, New Mexico, and Texas have put in place systems that impart expanded regulatory and management activities on the part of state government. In most states, except Texas, common law traditions recognizing the English Rule have been replaced by the correlative and appropriation rights doctrines. These actions have been in response to conditions of overdraft, subsidence, and, in some cases, contamination from nitrates and other contaminants of anthropogenic origin. More recently, interstate compacts and endangered species concerns have required the accurate quantification of all water resources in basins, leading to the quantification of rights and permitting programs.

California remains one of a handful of states without a formal administrative role in the protection of groundwater. Except for limited circumstances where basins have been adjudicated or statutorily created groundwater management districts exist, the vast majority of groundwater extraction is unquantified. In overdrafted regions, decisions over allocation are largely left to the costly and uncertain processes of adjudication, while issues of protection and management are left to the motivation of local districts with few venues for basin-scale planning. Reliance on existing institutions has not been successful in reducing the uncertainty associated with groundwater rights. Further, it has failed throughout many regions of the state, in particular the San Joaquin Valley, to mitigate conditions of overdraft, salinization, and trace element contamination, all of which are intimately connected to the patterns of groundwater use.

Our research examines the approaches of Arizona, Colorado, Nebraska, New Mexico, and Texas to the management of groundwater to seek solutions that are compatible with California's hydrologic and legal settings. These states have taken steps to integrate recent scientific knowledge of groundwater flow and chemistry into their legal mechanisms of allocation and protection. Recent advances in understanding the importance of regional groundwater flow and chemistry must be reconciled with California's laws and institutions that dictate its allocation and management. Optimal and sustainable groundwater use requires the installation of institutions that manage groundwater at the temporal and spatial scales at which it interacts with surface water and the land. The San Joaquin Valley is an example of where the current management system lacks the capacity to manage groundwater optimally at large scale, cognizant of groundwater-surface water connections. Utilization of the Institutional Analysis and Development framework has helped discern where conventional approaches to groundwater management (e.g. AB 3030 and adjudication) are not appropriate in large, arid basins with diverse water uses.

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New NGWA Conference Format Designed to Enhance Impact of Program on Ground Water/Surface Water Interaction

BY JULIE SHAW, NGWA

Ready for new ways of exploring hot topics and breakthrough findings in the realm of ground water? Then plan now to attend the Annual Meeting and Conference of the Association of Ground Water Scientists and Engineers (AGWSE), a membership division of the National Ground Water Association, December 9-11, Las Vegas, NV.

Enhancing the exchange of information among attendees and presenters is the goal behind the format changes for this year's program, titled ""Linking Surface and Subsurface Hydrology-From Science to Technology." There will be three basic elements to the three-day conference:

- Featured presentations by leading authorities in the ground water industry
- Live demonstrations
- Technical Interactive Presentations (TIPs).

Featured speakers will include:

- Scott Bair, Ohio State University, "Intoxicating Cases of Ground Water Under the Influence of Surface Water"
- Cliff Dahm, University of New Mexico, "Hydrogeology and Biogeochemistry of Surface Water and Ground Water Interfaces"
- David Pyne, ASR Systems LLC, "Aquifer Storage Recovery: Science, Technology and Regulation"
- Bridget R. Scanlon, University of Texas
- Edward Sudicky, University of Waterloo, "Fully-Integrated Modeling of Surface and Subsurface Water Flow and Solute Transport: Model Overview and Applications"
- Garth van der Kamp, Environment Canada
- William Woessner, University of Montana

The Action Demonstration Sessions, sponsored by The HDD Well Team, will be a unique series of technology demonstrations designed to showcase the latest in ground water monitoring equipment in a format conducive to technology transfer and application exchange. Following live demonstrations, attendees will be encouraged to interact with the presenters. In addition to the Action Sessions, attendees will have the opportunity to see the latest ideas and technology from more than 250 exhibitors

The information exchange will continue with TIPs, a new approach designed to encourage the active exchange of ideas between presenters and interested conference attendees. TIPs are composed of poster material, field equipment, site samples, and computer displays. Every TIP will be on display for a specific day, and each TIP presenter will also be assigned a 30-minute period in which to present. Attendees again will have an opportunity to ask questions and discuss the project with the presenter.

The AGWSE Annual Meeting and Conference is part of the National Ground Water Association's annual Ground Water Expo, to be held December 9 -11 at the Las Vegas Convention Center. The event will feature a range of additional activities open to all conference attendees, including several workshops. Included among the workshops are

- Darcy Lecture Series: Dr. David Hyndman - "Efficient Large-Scale Bioremediation in a Heterogeneous Aquifer: The Schoolcraft Bioaugmentation Experiment."
- Neil Manusuy - "Water Well Rehabilitation - Understanding Problems and Solutions"
- Dr. Norman Jones and Jeff Davis - "GMS: Conceptual Modeling and MODFLOW 2000"
- Dr. Aziz Eddebbarh, Bruce Robinson and George Zyvoloske - "Yucca Mountain Ground Water System"
- McEllhiney Lecture Series: David Hanson - "Introduction to the Year of the Professional."

For details on NGWA's 2002 Ground Water Expo, visit the Expo section of the NGWA Web site-www.NGWA.org-where visitors can also register for the event and find information on the Las Vegas area. Register anytime now through October 31 and get the discounted registration fee of $75 for NGWA members.

Alliance Corner

CGA Update

BY MIKE MORTENSSON
CALIFORNIA GROUNDWATER ASSN.
EXECUTIVE DIRECTOR

Guy Waterman encourages water conservation and protection

In the last issue of HydroVisions, I wrote about the California Water Awareness Campaign and its efforts to conduct a year long campaign to encourage Californians to Use Water Wisely... and Keep It Clean....It's A Way of Life! The Campaign introduced Guy Waterman, its new spokesman in May. He'll be bringing you water saving tips through the media and local water agencies. Later this summer, the Campaign will issue its second educational booklet, Water Sources, for use by elementary students in the 4th and 5th grades in the ensuing school year. You can visit the campaign's web

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International Association of Hydrogeologists Update

BY LENNY KONIKOW
PRESIDENT, U.S. NATL. CHAPTER

GRA/IAH Alliance

The Groundwater Resources Association of California (GRA) and IAH developed an allied partnership in 2001 and launched a Joint Membership Program beginning in 2002. From the perspective of IAH, this has been a great success. On behalf of IAH and its U.S. National Chapter (USNC), I would personally like to welcome the 55 new members who have joined IAH through this GRA program. Please feel free to contact me (e-mail: lkonikow@usgs.gov) if you have any comments, suggestions, or questions about IAH activities.

GRA members interested in learning more about IAH, please check the IAH web site at http://www.iah.org. For those who are interested in the particulars of the GRA/IAH Joint Membership Program, please check the GRA web page (see "Support GRA" tab and Membership), or for a PDF file discussing the option, see http://www.grac.org/IAH_GRA.pdf

32nd Congress of IAH

The 32nd IAH Congress will be held in Mar del Plata, Argentina, in October 2002. The overall theme is "Groundwater and Human Development," but the technical sessions will focus on a variety of technical and managerial groundwater issues. It will also include workshops, several organized field trips, as well as pre-Congress short courses. More details are available on the web site at: http://www.mdp.edu.ar/exactas/geologia/iah2002/version_english.html

Alliance Corner

GSA/IAH

The Geological Society of America (GSA) has accepted the IAH/USNC as an Associated Society. Among other benefits, this will allow any member of IAH to pay registration fees for GSA Meetings at discounted GSA Member rates. This should also lead to closer cooperation between IAH and the Hydrogeology Division of GSA, as we have many interests in common. More information about GSA can be obtained through their web site at: <www.geosociety.org/>. IAH/USNC is organizing two special sessions at the next GSA Annual Meeting in Denver during Oct. 27-30, 2002. These include:

Groundwater Depletion and Overexploitation: A Global Problem

The volume of fresh groundwater in storage has decreased significantly during the past century, but the magnitude and global impacts are uncertain. This session focuses on the magnitude and effects of groundwater mining, methods to quantify depletion, U.S. and international case studies, status and future trends, global impacts, and management solutions. Detrimental environmental side effects of overexploitation include reduced groundwater discharge to springs, streams, and wetlands, water-quality and salinity degradation, and land subsidence. The magnitude of worldwide depletion of groundwater in storage may be so large as to constitute a measurable contributor to sea-level rise, but the magnitude of depletion is poorly documented worldwide. The management concept of "sustainable development" may offer a viable approach to dealing with overexploitation of groundwater resources, but its implementation has been largely subjective and sometimes arbitrary.

Groundwater and Hardrock Mining

The Rocky Mountains of the western United States have tens of thousands of abandoned, inactive, and active sites related to precious-metal mining. Mining activities often resulted in mobilization of and transport of associated heavy metals that can pose a significant threat to aquatic communities in mountain streams. Papers are solicited on all related topics.

In addition to these two IAH sessions, the overall Hydrogeology Program at the 2002 Annual GSA Meeting will also include many other sessions of interest to groundwater specialists. More information on the overall meeting is available at: http://www.geosociety.org/meetings/2002/. The abstract deadline for electronic submissions is July 16.

IAH Commission for Management of Aquifer Recharge

Water banking and bank filtration harness natural processes to manage and enhance aquifer recharge, a vital tool in the sustainable management of the world's groundwater resources. IAH recently formed a permanent Commission to focus on this important issue. The Commission aims to expand water resources and improve water quality in ways that are appropriate, environmentally sustainable, technically viable, economical, and socially desirable by encouraging development and adoption of improved practices for management of aquifer recharge. More information is available on their web page: www.iah.org/recharge/index.html.

Organizational Corner

2002 Annual Awards Program

GRA Board of Directors Seek Nominations for the "Kevin J. Neese Memorial Award" and "Lifetime Achievement Award"

The Board is accepting nominations for the 2002 "Kevin J. Neese Memorial Award" and the 2002 "Lifetime Achievement Award." The "Kevin J. Neese Memorial Award" recognizes a significant accomplishment by a person or entity within the most recent twelve-month period that fosters the understanding, development, protection and management of groundwater. GRA's "Lifetime Achievement Award" is presented to individuals who have dedicated their lives to the groundwater industry and were pioneers in their field of expertise.

Nominations for either award should indicate the reason you are making the nomination, a brief statement of qualifications of the nominee and your full contact information. for the award by August 8th. Email nominations to Kathy Snelson at executive_director@grac.org by August 8, 2002. Nominations will be reviewed at the August 10, 2002 GRA Board meeting. The awards will be given at GRA's Annual Meeting, which is September 18-19, 2002. If you have any questions or need additional information, please contact Brian Lewis, Chair of the GRA Awards Committee, at (916) 255-6532.

GOAL

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

Objectives

The objectives of the Annual Awards Program are:

1. To provide recognition to individuals who have demonstrated leadership and continuous dedication in the field of groundwater management;

2. To provide recognition for unique contributions to the field of groundwater management in 2001; and,

3. To provide recognition to GRA (as an organization) whose mission is dedicated to resource management that protects and improves groundwater through education and technical leadership.

AWARDS

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

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A Message from the GRA Executive Director

BY KATHY SNELSON



This is the time of year that GRA focuses on connecting with GRA members who have not yet renewed their membership from the previous year. Since this process is similar to fishing, I decided to review a book titled *Fish!* by Stephen C. Lundin, Ph.D., Harry Paul and John Christensen. The book was written to help managers with motivating and retaining employees, but its primary focus is about "choosing and learning to love" the work a person does. Like the book cover reads, "Catch the Energy and Release the Potential," GRA wants to "catch" non-renewing members and help them understand the "potential" of their loyalty to GRA and groundwater resources in California.

Fish! implies that if the "quest for ideal work focuses on the future, we will miss the amazingly wonderful life that is available today." I see membership in a

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GRA Web Site/Database Integration Project Update

BY KEVIN BLATT, GRA WEB & DATABASE MANAGER, AND
MARTIN STEINPRESS, ELECTRONIC COMMUNICATIONS COMMITTEE CHAIR

In January 2002, the GRA Board approved a project to create a web-based administrative system that will automate many administrative tasks related to processing membership applications and event registrations. The system will increase operational efficiency, reduce labor costs, and add convenience for our members.

In a nutshell, the system will connect the GRA web site (grac.org) to a comprehensive membership and event registration database. Members will be assigned a login ID and password that will allow them to access a restricted portion of the web site where they can check membership status, renew, update contact information, and register for

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Website/Database Integration Project

Continued from page 16

events. While the web site is currently being used for these functions, they are not automated. Data submitted via the web site is manually entered into a database, credit card transactions are manually processed, and email confirmations and receipts are manually generated. The new system will automate all of these tasks and will make them more convenient for our members. For example, when a member uses the web site to register for an event, their contact information will be called from the database and automatically inserted into the event registration form to save them from typing. Any edits made to this information will be automatically updated in the database.

The initial investment for this project will be about $8,000. We anticipate that the project will pay for itself in the first year. The benefits will be numerous and are difficult to fully describe and measure. However, the most quantifiable savings will come in the form of reduced labor costs. These savings will be largely determined by the extent to which our members and customers use the web site to submit membership applications and event registrations. Encouraging people to use the web site will be helped by the fact that the online processes will be more convenient than the alternative methods such as fax, phone and mail.

The project began in April with the hiring of a contractor (Don Kuhwarth of Midtown Computer Services in Sacramento (midtown.net), which has been GRA's internet service provider for the past 6 years. The project is expected to take approximately three months. Upon completion, members will be encouraged to use the web site for online event membership renewals and event registrations. Questions should be directed to Kathy Snelson, GRA's Executive Director, at executive_director@grac.org.

Organizational Corner

GRA 2001 Statement of Activity - Unaudited

Changes in Unrestricted Net Assets

Revenues:		
Program Fees		$218,095
Membership Dues		41,709
Contributions		3,575
Other Income:		
Advertising	$4,125	
Reimbursed Expenses	3,527	
Interest	2,083	
Special Activity - Lapel Pins	110	
Total Other Income		9,845
Total Unrestricted Revenues		$273,224
Expenses		
Program Expense (Seminars)		$146,312
Executive Director		34,700
Printing and Reproduction		18,550
Web Site		7,245
Contract Labor		6,657
Postage and Shipping		2,727
Dues and Subscriptions		2,250
Insurance		2,191
Fundraising		1,964
Travel		1,089
Professional Fees, (Tax Prep./Accounting)		885
Telephone		717
Legal Fees		450
Supplies		338
Miscellaneous		3,449
Total Expenses		$229,524
Increase in Unrestricted Net Assets		$43,700

Changes in Permanently Restricted Net Assets

Grants Received	$20,000	
Grant Labor and Admin.	750	
Increase in Permanently Restricted Net Assets		$19,250
Increase in Net Assets		62,950
BEGINNING NET ASSETS (CASH)		$40,246
ENDING NET ASSETS (CASH)		$103,196

2002 CONTRIBUTORS TO GRA THANK YOU!

FOUNDER
($1,000 and up)
Hatch & Parent
Leah Walker

PATRON
($500 - $999)
Geomatrix Consultants, Inc.

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($250 - $499)
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John McAssey
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Bookman-Edmonston
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Environmental Resolutions, Inc.
Linda Spencer
Jennifer Beatty
Fran Forkas
(Michael) Joe Weidmann
Murray Einarson
Dan Day Lawrence

Organizational Corner

GRA Welcomes the Following New Members

MARCH 1, 2002 - MAY 15, 2002

Till Angermann	Luhdorff & Scalmanini, C.E.
Tom Barnes	ESA
Cary Bean	Precision Sampling, Inc.
Anthony Bouquillon	Maxxam Analytics, Inc.
Ralph Boyajian, PE	BSK, Inc.
Garrett Broughton	England Geosystem, Inc.
Kim Brower	Luhdorff & Scalmanini C.E.
James Bunker	ENVIRON International
Christopher Campbell	Baker, Manock & Jensen
Mark Capps	ENSR International
Michael Cassidy	Gradient Engineers, Inc.
Guy Chammas	
Mary Cheung	US Filter
Robert Cheung	Geomatrix Consultants, Inc.
Yueh Chuang	CH2M Hill
Robert Coffin	San Diego Public Utilities Advisory Commission
Eric Cole	Baker, Manock & Jensen
Jim Connell	West Yost & Associates
Craig Corbell	Welenco, Inc.
Dan Davis	Daniel B. Stephens & Associates, Inc.
Larry Disque	City of Sunnyvale
Michael Donovan	
Charles Drewry	Calgon Carbon
Barry Epstein	Fitzgerald, Abbott & Beardsley, LLP
Stanley Feenstra	Applied Groundwater Research Ltd.
Jonathan Ferris	Daniel B. Stephens & Associates, Inc.
Cole Frates	Layne Water Development & Storage, LLC
Mark Gage	Geomatrix Consultants, Inc.
Luis Gomez	Foster Wheeler Environmental
Dave Goorahoo	Center For Irrigation Technology - CSU Fresno
Allen Gribneu	LA County Dept. of Public Works
Michael Guilbert	Kleinfelder, Inc.
Jeffrey Hart	The Environmental Company
Yemia Hashimoto	GeoSyntec Consultants
Juliana Herrington	Bookman-Edmonston
David Holland	Baker, Manock & Jensen
Tamlyn Hunt	Hatch & Parent
Chris Ingalls	CDM
Greg Issinghoff	CA RWQCB, Central Valley Region
David Johnson	Harding ESE
Christopher Johnson	Kleinfelder, Inc.
Douglas Jones, PE	ENVIRON International
Christian Knoche	Law/Crandall, Inc.
Elizabeth Lafferty	Lahontan RWQCB
Mariana Lake	Valley County Water District
Cheryl Lehn	Tulare County Farm Bureau
Stephen Lofholm	Golder Associates
Michael Malone	Giblin Associates
Mary Ann Mann	Sweetwater Authority
Vicki McCartney	Tetra Tech EM, Inc.
Mary McClanahan	California Water Institute
Mike Menne	California Water Service Company
Elizabeth Mergener	UW-Madison/Golder Associates
Philip Mihopoulos	Tait Environmental Management, Inc.
Philip, PE Miller	England Geosystem, Inc.
Leslie Moulton	ESA
Bruce Myers	CA RWQCB
Bassil Nahhas	City of Monrovia
Hooshang, PhD, PE	Nezafati CH2M Hill
Obiajulu Nzewi	Fugro West, Inc.
William O'Braitis	Law/Crandall, Inc.
Charlie O'Neill	CDM
Deems Padgett	TRC Solutions
Bill Perkins	St. Mary's College
Tim Peschman	US Filter Recovery Services
Cathy Reed	Tetra Tech EM, Inc.
Kyle Rheubottom	ENV America, Inc.
Stephen Ross	Komex-H2O Science, Inc.
Manuel Saavedra	
John Sankey	Westbay Instruments, a Schlumberger Company
Clive Steggals	Komex-H2O Science, Inc.
Jenny Sterling	Sterling Environmental
Chris Tatum	Precision Sampling, Inc.
Lucius Taylor	CH2M Hill
Dennis Tucker	Malcolm Pirnie, Inc.
Christine Tulloch	Santa Clara Valley Water District
Donald Warner, III	Kleinfelder, Inc.
Jeannette Weber	California Water Service Company
Todd Webster	Envirogen, Inc.
Katherine Weeks	AMEC Earth & Environmental, Inc.
(Michael) Joe Weidmann	Haley & Aldrich, Inc.
Joe Wells	
Andrew Werner	Layne Water Development & Storage, LLC
Jacob Westra	Kings River Conservation District
Kaylea White	S.S. Papadopulos & Associates, Inc.
Casey Whittier	US Filter
Thomas Wright	Mission Geoscience, Inc.

Upcoming NGWA Conference to Feature Advances in Water Disinfection

BY JULIE SHAW, NGWA

WESTERVILLE, OH (May 20, 2002) - What does the U.S. EPA's new Ground Water Rule mean and what are the latest advances in clean water? The National Ground Water Association (NGWA) is sponsoring "Innovative Approaches to Ground Water Disinfection: Coliforms, Pathogens and Treatment," an upcoming conference to be held September 5-6, 2002, in Sacramento, California. Additional cosponsors include the Groundwater Resources Association of California (GRA), California Ground Water Association, and Texas A&M University.

The conference covers the issues surrounding bacteria and viruses and ground water, and provides training on the new Ground Water Rule. Conference attendees will learn how to monitor and treat domestic wells along with municipal systems. The two-day event will include the following topics:

- Bacteria and Viruses
- FEMA Report on Wells
- Emerging Regulations
- Walkerton E-Coli Tragedy
- Water Well Construction
- Disinfection Byproducts
- Anthrax and Water Security
- Chlorination
- Ozonation
- Electron-Beam Virus Treatment
- Zeolite Barrier Technology
- Advances in Genomics

The conference will feature a special guest lecture on water wells by Fletcher Driscoll, author of Ground Water and Wells. John Schnieders, principal chemist of Water Systems Engineering, Inc., will give the keynote address on "Disinfection and Coliform in Water Wells." The EPA's John Cicmanec will provide an update on new testing methods and risk management. More than a dozen additional well experts, manufacturers, and rule makers will make presentations at the event.

For more information or to register, contact the NGWA Customer Service Center at (800) 551-7379, or visit http://www.ngwa.org/education/clean.html. National Ground Water Association members include more than 16,000 U.S. and international ground water professionals-contractors, equipment manufacturers and suppliers, and ground water scientists and engineers. NGWA members are committed to this basic understanding: when you are a ground water professional, it's more than just water. NGWA provides members, government, and the general public with the scientific knowledge and economic guidance necessary to responsibly develop, protect, and manage the world's ground water resources.

Catch 22 - Getting That First Good Job in the California Industry (Summary)

BY JIM JACOBS, GRA DIRECTOR

The environmental industry in California is still attractive, based on the number of calls received from new graduates wanting career opportunities. Although everyone has a resume, new hires are always calling to find out about how to break into the job market. A Catch-22 exists where many companies won't hire new workers without some experience. But how does a newly graduated environmental professional get that first job without experience? Here are a few ideas that might help:

Obtain internships while in school

Join associations (like GRA)

Get to California first

Take the required training

Prepare for a medical exam

Keep a clean driver's record

Bring references and letters

Practice interviewing

The full article is on GRA's webpage at www.grac.org/Jacobs-jobhunt.pdf along with on-line employment opportunities. Best wishes on your job search and see you at the local Groundwater Resources Association meetings and events!

Jim Jacobs, CHG, is Chief Hydrogeologist for FAST-TEK Engineering Support Services. His specialty is in-situ remediation of metals, hydrocarbons and solvents. He has over 20 years of experience and is on the GRA Board of Directors. You can mail email him at augerpro@jps.net.

Ask a Groundwater Specialist

Continued from page 11

Answer:

Arsenic, chromium and other heavy metals are usually removed from drinking water by using reverse osmosis filters, which utilize the bonding properties of the metal atoms you want to remove. To filter out these metals, you must give them something that is more attractive to bond with than the bond they presently have. Zeolites, commonly found in nature, are often used for this purpose.

Other methods are ion-exchange resins, which are not common among home users. There are dozens of sites on the web related to home use filters and purifiers. Carbon filters are less likely to work, since most metals don't bond well with carbon. Carbon will remove "metallic" or other tastes or odors, but carbon is generally not effective at removing the metals themselves. Unfortunately, the cost of some of the filtering units is more than the cost of bottled water that has been certified. Consumer Reports in August 2000 lists bottled waters which do not contain arsenic on page 17 and filters on page 50. Check the individual filters on what they remove and what they do not remove. You can find back issues of Consumer Reports in your local library.

At those high levels, I would suggest that you call the local environmental health department and see if something can be done. Arsenic at 90 ppb is a large amount, and ingested over time, could cause problems, the details of which are beyond my expertise. The local regulators might be able to offer solutions.

Good luck-
-Jim Jacobs, R.G., CHG

Question:

Is there a definition of "remediation well" used in California (by some/all agencies), and if so what is it and what does it cover or not cover?

Steve, Palo Alto, CA

Answer:

That's an interesting question. Carl Hauge, DWR's Chief Hydrogeologist asked me a similar question on Monday. To my knowledge, and after searching the Water Code and Health & Safety Code, the term "remediation well" does not have definition or use. Typically, the terms that I have heard and used in the industry are either monitoring, extraction or injection well for components of a groundwater remediation system. Hope this helps.

Tim Parker, RG, CEG, CHG
GRA Board Member

Hydrovisions
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Blue & White cost per issue	1x	4x
1/4 page	$175.00	$600.00
1/2 page	350.00	1,100.00
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Two pages*	1,400.00	4,800.00

Color advertisements are additional based on current printing rates.
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* Special request only.

For additional information, visit GRA's Web site at www.grac.org or contact Kathy Snelson, GRA Executive Director, at executive_director@grac.org or 916-446-3626.

Current Happenings at US EPA

Continued from page 8

Control Boards, University of California researchers, State Air Resources Control Board, Merced County and other local counties, and U.S. EPA. The objectives of the group are to develop a guidance manual that will satisfy the local, state, and federal regulatory agencies, while also being a farmer friendly document. (When milking cows twice a day, 365 days a year, who needs more paperwork?).

It is clear, however, that a critical interface will be the liaison between the NRCS guidance document and the livestock operators who will need the document. Somehow, the information must get to the producers and in a manner so that they can use it. Recognizing that NRCS does not have nearly enough staff to be the only liaison, the use of "certified specialists" who can assist producers as they develop and implement the CNMP, is being explored. NRCS will be identifying the minimum training and educational requirements for a person to be "certified."

The draft guidance will be available for review late this summer. Work will continue on the document past this date however as it continues to be refined. A Prop 13 grant from the State Water Resources Control Board to Merced County will be used to develop a software version as well as to fund some research activity and ground-truth the concepts and document. Training through the CA Dairy Quality Assurance Partnership and UC Davis may be available as early as fall 2002.

For more information contact Robert.Fry@ca.usda.gov, Dan.Johnson@ca.usda.gov, or bloom.judy@epa.gov

EPA Seeks Comment on Watershed Initiative

On May 23, EPA published in the Federal Register a request for comments on the Process for Designing a Watershed Initiative. Specifically, ideas and possible approaches are sought on the nomination and selection process of the grantees. In 2003, $21 million will be available nationally, for up to 20 watershed organizations. This will be a competitive grant program. For more information please see (http://www.epa.gov/fedrgstr/EPA-WATER/2002/May/Day-23/w12968.htm) or contact the Region 9 representative Sam Ziegler (ziegler.sam@epa.gov).

WHERE ARE THE NEW DRINKING WATER REGULATIONS?

Chemical Contaminant Regulations	Proposed	Final	Compliance
Suspension of Unreg. Cont. Mon. (systems < 10,000)		1/8/99	3/99
Revision of Unreg. Cont. Mon. (CWs + NTNCWs > 10,000 and a sample of Cws + NTNCWs < 10,000)	4/30/99	9/99	1/01
Amendment to 1999 UCMR List	5/15/00 --------- 9/13/00 amends.	1/01	1/11/01
Radon (CWS on groundwater only)	11/99	late2002	?
Lead and Copper Revisions		1/12/00	4/11/00
Radionuclides (uranium+radium+ gross alpha +beta & photon emitters) (CWS +by state option NTNCWS)	proposed 7/18/91 NODA 4/21/00	12/7/00	12/08/03
Arsenic (MCL applies to CWs + NTNCWs) (and compl. determs. for orgs.+inorgs.)	6/22/00 comments due 10/31/01	1/22/01 suspend ed until 2/22/02	7/1/02 (CCRs) 1/23/04(compl. determs.) 1/23/06 (MCL)
MTBE (secondary regulation, unenforceable)	on hold	on hold	?
Other Regulations:	**Proposed**	**Final**	**Compliance**
Public Notification	5/13/99	5/4/00	10/31/00 (DI) 5/6/02 (others)
Reformatting All DW Regs. - direct final	?	?	?
DW SRF: Interim Final Rule Final Rule (Unchanged)		8/00 1/12/01	8/07/00 1/12/01
Ground Water (all systems on GW)	5/10/00	early 2003	?
Surface Water Treatment Regulations:	**Proposed**	**Final**	**Compliance**
Interim Enhanced SWTR (IESWTR) micro/crypto control SW + GWUDI systems serving population > 10,000	7/94 ------- 7/13/00 (minor mod)	12/98 ------ 1/16/01 (minor mod)	12/01 ------ 1/1/02
Stage 1 Disinfectants/DBP (D/DBP) control SW (C + NTNC) systems serving population > 10,000 SW (C+ NTNC) systems serving population < 10,000 & all GW sys.	7/94 ------- 7/13/00 (minor mod)	12/98 ----- 1/16/01 (minor mod)	----- 1/1/02 1/1/04
Filter Backwash Recycling SW systems that recycle	4/10/00	6/8/01	12/8/03
Long Term 1 Enhanced SWTR (LT1ESWTR) SW + GWUDI systems serving population < 10,000	4/10/00	1/14/02	3/15/02
Stage 2 Disinfectants/DBP (all PWSs adding disinfectants)	mid 2002	mid 2003	?
Long Term 2 Enhanced SWTR (LT2ESWTR) (all PWSs on SW)	mid 2002	mid 2003	2004

Updated 01/31/2002 by Jon Merkle

Sustaining Groundwater GRA Annual Meeting

Continued from page 7

the Plenary Assembly, complemented by information presented in other sessions, is to generate a white paper concerning the intrinsic status of groundwater as a vital part of our natural resources infrastructure. For more than a century, groundwater has been subconsciously considered to be a limitless resource, to be discovered, used, and sometimes exploited. However, earth scientists generally recognize the limits and bounds on groundwater systems, which are subject to annual recharge, depletion, and the uncertainties of climate. The challenge of the groundwater profession for the future is to learn to beneficially draw upon the groundwater resource for human sustenance and economy, while simultaneously assuring that the integrity of the infrastructure is maintained and made available for future generations. There is much to be learned as to how we may go about achieving this goal. This will demand a coming together of science, technology, and social behavior. A white paper will be developed under the lead of Professor T.N. Narasimhan. This paper is being prepared in part to submit to the University of California's Water Resources Center for its efforts for the 2003 Biennial Groundwater Conference to further expand upon the technical and political evaluation of groundwater in California as an intrinsic component of the water resource infrastructure.

OTHER PROGRAM FEATURES

In addition to the two-day technical program, the Conference also features distinguished keynote speakers, presentations of GRA's annual Lifetime Achievement Award and Kevin Neese Award, a President's Reception with exhibits and a new Interactive Science Program, and a field trip to the OCWD/OCSD Groundwater Replenishment System the afternoon before the Conference. For further details, check the web site at http://www.grac.org/annual.html; the complete program and registration information will be available in June 2002. For more information, contact Kathy Snelson at executive_director@grac.org or Vicki Kretsinger (Conference Chair), Principal Hydrologist at Luhdorff and Scalmanini, Consulting Engineers, at vkretsinger@lsce.com.

California Legislative Corner

GRA Legislative Symposium and Lobby Day is Fruitful

BY TIM PARKER, LEGISLATIVE CHAIR

The Legislative Symposium and Lobby Day was a great success thanks to the efforts of our Legislative Advocates, Chris Frahm and Jennifer Carbuccia of Hatch & Parent, Theo Cline of Carol Liu's office, our sponsors CH2MHill, CRL Associates, Integrated Resources Management, and the 36 attendees, many of whom attended the afternoon lobby visits. The event was held at the Sheraton Grande Hotel in Sacramento, with lobby visits to the Capitol about four blocks away.

The morning started off with an encouraging address by Assemble Member Carol Liu, 44th District, on a law she introduced last year, AB 599 The Groundwater Monitoring Act of 2001, and the fact that Legislators' have an increasing awareness of groundwater issues. AB 599 requires the State Water Resources Control Board to form an interagency task force (ITF) and a public advisory board (PAB) to develop a comprehensive statewide groundwater monitoring program. Also required by AB 599 is that the ITF and PAB develop recommendations on how to better integrate state agencies' groundwater monitoring efforts and data. The SWRCB is required to submit the recommendations of the AB 599 ITF and PAB to the Legislature by March 2003. In anticipation of ongoing interest and need to address groundwater issues comprehensively, the Speaker of the Assembly has established a Select Committee on Groundwater, which Carol Liu will chair. Informational hearings will be conducted in both northern and southern California to address groundwater preservation and restoration issues including groundwater conservation. Carol Liu has also been asked to sit on the Select Committee on CalFed, which will be chaired by Speaker Emertius Robert Hertzberg. The significance of these actions is that the Legislature realizes the importance of California's water resources and groundwater, and the need to be fully informed so that the Legislature can act to preserve and protect this vital resource.

The first session included an update by Carl Hauge on the Department of Water Resources update of Bulletin 118 on California's Groundwater Basins. Tim Parker also provided an update on the AB 599 Groundwater Monitoring Task Force progress, and Wes Strickland of Hatch & Parent presented a discussion on the Sax Report. Pending legislation that will affect groundwater resources and industry was provided by Chris Frahm of Hatch & Parent, and Bob Gore of CH2MHill provided information on legislative groundwater funding opportunities.

The second session was a panel discussion on the role GRA can take in helping to focus the groundwater policy debates, methods and approaches to effective education and advocacy within the legislature. Panelists included Art Castanares, chief of Staff for Senator Steve Peace, Bethany Westfall, Principal Consultant to Senator Machado, Theo Cline, Staff to Assembly Member Carol Liu, and Chris Frahm of Hatch & Parent. The discussion included the effects term limits have had on the House, which includes that Members no longer carry the vast institutional knowledge that they used to have. This makes for a greater challenge to accomplish lawmaking efforts, especially since Legislative staffs are also moving along much more quickly. Legislative staff is the people that do the real work of lawmaking. The staffs are the individuals to contact with issues and discussions. Staffs are generally very responsive to every citizen, every voter and potential vote. If you have issues of concern and wish to discuss them with your Legislative representative, write a letter or call staff, and set up a meeting to discuss one-on-one.

Senator Mike Machado was our lunch speaker. Senator Machado has been a long time advocate of protecting California's groundwater resources through better groundwater management. Senator Machado discussed what he sees in the future for groundwater legislation and provided a good dialogue on SB 1938, The Groundwater Management Act of 2002, which he authored. The bill requires specific components be included in any Groundwater Management Plan (GMP) submitted to DWR. The bill also makes an implemented GMP a precondition for a local agency to receive State funds for the construction of any groundwater project. The specific components, inclusive of the AB 3030 GMP elements, include basin management objectives relating to groundwater level, groundwater quality, and subsidence criteria.

Afternoon Lobby Visits were conducted in groups and led by Chris Frahm, Jennifer Carbuccia, and Tim Parker. The Legislators visited are listed below. Lobby Visits typically included an introduction to GRA, a dialogue about groundwater issues and needs both on the part of GRA and Legislators and staff, and a discussion of groundwater bills GRA currently recommends supporting.

In the late afternoon, GRA conducted a groundwater briefing for legislative staff attendees back at the Sheraton. Legislative staff was given a preview of basic groundwater concepts, which will be presented at the first hearing of the Select Committee and Groundwater Quality. Staff was also provided information on Bulletin 118, and DWR Bulletin 160, The California Water Plan. A summary of pending groundwater legislation which GRA recommends supporting were also discussed.

Continued on page 23

California Legislative Corner

The day ended with a reception and debriefs. The reception was well attended by many legislators, legislative staff, and GRA members. All had another chance to discuss the importance of California's groundwater, issues and opportunities to help us meet the continuing challenges in our groundwater future.

This Legislative Symposium and Lobby Day was a great beginning, a beginning to GRA becoming a bona fide voice in the state. GRA can be a voice to help improve our current groundwater conditions and assist in meeting the immense challenges we will need to address in the very near future regarding water availability and water quality. I am honored to have been involved in this effort, and I believe we have made yet another visible leap in this organization's continued evolution, even after over ten years of presence in California. I look forward to continued involvement and success with the Legislative Committee.

GRA would once again like to express our appreciation for our gold level sponsor CH2MHill; our lunch sponsor, Integrated Resource Management, and our reception sponsor CRL Environmental Corporation. Without the support of our sponsors, GRA would not have been able to conduct this very important event. And an additional thanks to Jennifer Carbuccia and Chris Frahm of Hatch & Parent, GRA's Legislative Advocates who put the entire day together - great job!

Legislative Visits:
Assembly Member Pescetti
Senator Sher
Assembly Member Leslie
Senator O'Connell
Assembly Member Hollingsworth
Senator Costa
Assembly Member Wayne
Senator Torlakson
Assembly Member Jackson
Senator Figueroa
Assembly Member Thomson
Senator Poochigian
Assembly Member Briggs
Assembly Member Dickerson
Assembly Member Calderon
Assembly Member Pavley
Assembly Member Wyman
Assembly Member Canciamilla
Assembly Member Kelley

The Council Model: CCGO and the Legislative Process

BY JIM JACOBS, RG, CHG, CCGO PRESIDENT, 2001-2002; GRA DIRECTOR

The California Council of Geoscience Organizations (CCGO) formed five years ago to speak on behalf of the geoscience professions in the legislative process. CCGO is an advocate for the profession in the public interest. The group now has over a dozen organizational members and dozens of business members and individual donors. During the past several years, CCGO has enjoyed great success in developing and enlarging a wide-ranging network of influential contacts within the State Capital. CCGO has been approached by the Deputy Appointments Secretary for the California Governor to make recommendations on geologists for appointments for various state boards. CCGO assisted in the successful renewal of the Board for Geologists and Geophysicists (BGG) during the sunset review process a few years ago. Last year, CCGO produced the first annual review of the BGG, and distributed the results of the evaluation to CCGO members as well as the BGG and policy makers. CCGO has maintained a web site listing our member organizations and business members, as well as geologic community calendar, legislative news, geologic links and job bank. A CCGO geologist in the classroom program was developed and posted on the CCGO web site (www.ccgo.org). CCGO is having two fundraising events this year: one occurred in Los Angeles and is planned for June 5, 2002 in Oakland, California. For the second year in a row, CCGO awarded two AIPG Student Geology Awards at the California State Science Fair.

CCGO has conducted three annual Sacramento Drive-In legislative days, meeting with a variety of legislators and policy makers. This year's Sacramento Drive-In was on March 13, 2002. The CCGO delegation traveled to Sacramento on March 13 to listen to the concerns of those visited, offer technical assistance, if needed, and to deliver several important points from the California geoscience community.

The main points discussed with the legislators included:

- Seismic hazards mapping and mining programs should be funded;
- Earth science education is important and should be rigorous;
- CCGO continues to support the ban on MTBE, a gasoline additive;
- Groundwater and surface water are important resources;
- CCGO supports SB1958 requiring REA IIs to be licensed as geologists or engineers;
- CCGO supports SB 1244 requiring the Governor to make Board appointments within 30days; and
- CCGO does not support SB1500, requiring the CGS to remap seismic hazards in local areas in detail.

The day started with a meeting with the California Geological Survey (CGS).

Continued on page 27

Conjunctive Use - Tulelake Subbasin

Continued from page 10

Water Quality

Groundwater quality is an issue of concern in the Upper Klamath Basin. Wells discharging from the volcanic aquifer in the Lower Klamath Lake area, just west of the Tulelake Subbasin, have elevated levels of chloride, sodium, sulfate, and silicate. High temperature groundwater also exists in portions of the Upper Klamath Basin indicating deep circulation (Gates, 2001). In general, groundwater in the alluvial aquifer system usually contains low concentrations of dissolved constituents but is more susceptible to surface water contamination (Illian, 1970).

DWR collected groundwater samples throughout the Tulelake Subbasin during summer 2001 and compared them to water quality criteria for aquatic life and agricultural goals. Results were variable throughout the subbasin but generally indicated that specific conductance levels were above agricultural goals and dissolved oxygen levels were low in nearly all of the groundwater samples collected. Aluminum, iron, lead, zinc, ammonia, and sulfide were detected in groundwater samples collected from wells in the surficial deposits. One or more of these wells were also high in boron, manganese, and molybdenum. Groundwater samples collected from seven wells in the volcanic aquifer system contained ammonia, copper, and zinc at one or more wells. Boron, chloride manganese, and molybdenum were also detected at one or more of these wells. Groundwater from the alluvial aquifer system is characterized as a sodium bicarbonate or a mixed sodium and magnesium bicarbonate water type. Groundwater from the volcanics is a sodium bicarbonate water type.

Conjunctive Management

DWR is currently developing a plan for a conjunctive management in the TID area. The plan is based on the USBR's draft operational criteria indicating that in any given year the amount of surface water delivered will not be curtailed by more than 50 percent of what is delivered during a normal year. Additionally, a cumulative cutback of 100 percent over any 10-year period will not be made (U.S. Dept. of Interior, 2002). According to the DWR land use survey, the average amount of surface water used in a normal year is approximately 148,000-acre feet (ac-ft). Therefore, groundwater needed to operate the subbasin conjunctively, during a dry year with a surface water cutback of 50 percent, would be 74,000 ac-ft. DWR is proposing that during seasons of inadequate surface water deliveries, the areas on the east and west sides of the basin use groundwater to meet demand. These areas near the edges of the subbasin are on fault zones that yield large quantities of groundwater. Furthermore, nearly all of the irrigation wells required for this plan are installed and operational. Based on yield information obtained from well logs, the proposed plan would require fifty-five irrigation wells. Including the ten new TID wells, forty-seven operational wells exist, leaving eight new wells to be installed. This would allow up to 50 percent of the subbasin to be irrigated by groundwater during the minimum surface water delivery year. Groundwater recharge would be accomplished naturally during normal or above normal precipitation years when surface water deliveries would be the sole source of irrigation water.

Conclusion

The Tulelake Subbasin has historically been supplied with surface water and limited in groundwater development. Due to climatic conditions and instream fishery concerns, groundwater use in the basin is increasing. The two major aquifer systems in the subbasin are the volcanic basalt aquifer and the alluvial aquifer composed of lacustrine surficial deposits. The alluvial aquifer is only sufficient for domestic use and recharge is local, mainly from surface water infiltration. The volcanic aquifer system in the subbasin typically yields large quantities of water with transmissivity values in the 0.5 to 1.5-million gpd/ft range. Recharge to the volcanic aquifer is probably regional in extent. Groundwater quality in the basin is variable, but in general, is marginal for agriculture goals and aquatic life criteria. DWR is currently working on a draft conjunctive management plan in the subbasin to supplement curtailed surface water deliveries. The future of the farmers in the subbasin is dependent on irrigation water. A well-designed conjunctive use plan may prove to satisfy both environmental and farmer's needs.

References and the table of wells are provided on GRA's web page at www.grac.org/hv.html.

Bill Ehorn is a registered geologist in California and Oregon. He earned a BA in physical geography from UC Santa Barbara in 1987 and an MS in hydrogeology from CSU Chico in 1991. He worked in environmental consulting for over 5 years and has been in his present position with the California Department of Water Resources for over 2 years. Email: behorn@water.ca.gov Phone: (530) 528-7403

Technical review was provided by Toccoy Dudley, Senior Engineering Geologist, Chief, Groundwater Section, DWR Northern District, Red Bluff, CA. 96080

Groundwater Management - Upper Klamath Basin

Continued from page 12

substitution would initially be set at a realistic "cap" level that may increase in future years as adaptive management and better understanding of the groundwater resource so dictate. As appropriate reliance on groundwater substitution increases, a corresponding decrease in land idling will occur under this proposal. The long-term goal will be to diminish the need for land idling as properly managed groundwater production increases.

While additional reliance on groundwater provides flexibility relative to meeting the needs of other Project areas, it carries with it the serious risk of potential impacts to surrounding well owners and the related negative local public reaction that can result (even in the absence of a clear relationship between groundwater pumping and alleged impacts). By assigning a "cap" to groundwater use conducted via the water bank, the groundwater extraction and related impacts can be better managed. Given the reaction of local domestic well owners to last year's groundwater program (particularly those wells used to supplement refuge supplies), it is critical that all groundwater programs are coordinated with one another. It will be very difficult for the local community to support a water bank without such control.

Most importantly, through close coordination with other groundwater programs, effort must be directed to better define local and regional groundwater flow direction, discharge and recharge characteristics, to ensure that the cumulative effects of groundwater pumping do not impair aquifer conditions.

In the next year, local interests will work with the Reclamation, U.S. Fish and Wildlife Service, and state resources agencies to further develop an implementation framework for the water bank. This year, it does not appear that Reclamation will seek new water from a Project water bank, given the current runoff forecast.

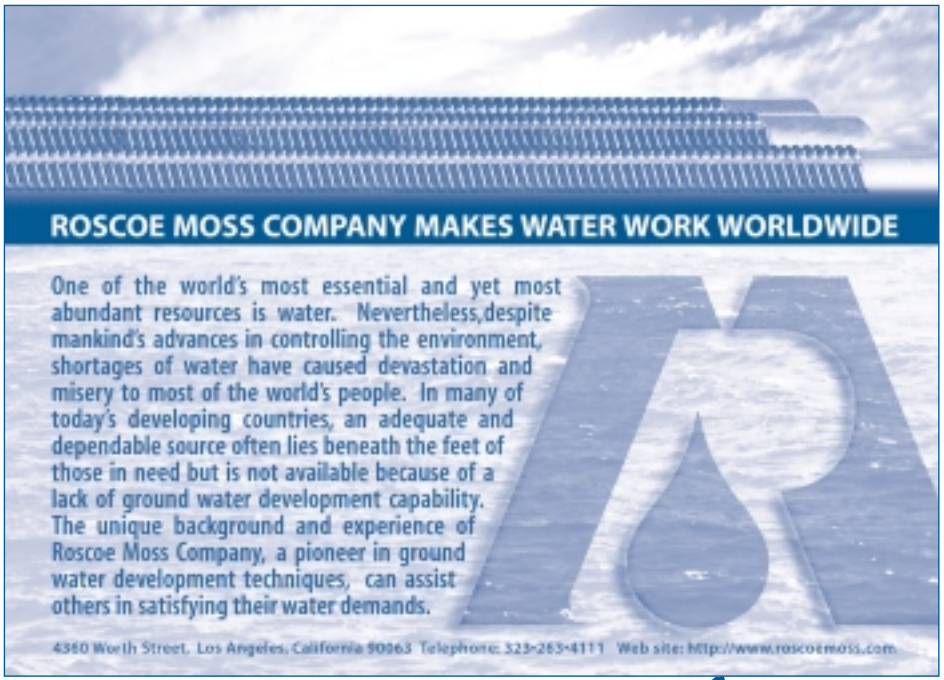
Conclusion

Based on the success of last year's groundwater projects, it is clear that groundwater will play a role in meeting Klamath Project surface water shortfalls. However, the relative importance of groundwater development has yet to be determined, and it is but one of several actions required to reach a balanced solution for the Klamath Basin. Many local water users understand that groundwater cannot replace the surface water provided by the Klamath Project. In certain critical years, however, it may provide one source to supplement Project supplies.

There is no one magic bullet for solving the problems of the Klamath Basin. The relative importance of improved groundwater management has yet to be determined, and it is but one of many actions required to reach a balanced solution in the Klamath Basin. Local irrigators will continue to push for the incorporation of strong science and meaningful restoration activities throughout the Klamath Basin for listed species in the refuges. Progress must also be made to improve storage and develop other water management actions - such as water banking - to satisfy multiple competing demands. These types of actions will ultimately alleviate the disproportionate ESA burden now borne by Klamath Project irrigators.

KWUA is a nonprofit corporation that has represented Klamath Irrigation Project farmers and ranchers since 1953. KWUA members include rural irrigation districts and other public agencies, as well as private irrigators operating on both sides of the California-Oregon border.

Dan Keppen has served as Executive Director for KWUA since November 2001. He has over 13 years of experience in water resources engineering and policy matters, including California groundwater management issues. Keppen served on groundwater advisory committees for CALFED and the state of California, and helped craft legislative provisions that ultimately became AB 303- California's Local Groundwater Management Assistance Act. Keppen received his MS in Water Resources Engineering from Oregon State University and his BS in Petroleum Engineering from the University of Wyoming.



Chemist's Corner

Risk-Based Screening Levels for Brownfields

BY BART SIMMONS, DTSC

Property owners, through their lobbyists, have sponsored a new mandated procedure to evaluate Brownfields. This procedure is included in SB 32, a bill approved and activated on January 1, 2002. The approach used is similar to previous proposals, including Soil Screening Levels (created by US EPA) and Preliminary Remediation Goals, which were promulgated by EPA Region 9. Risk-Based Screening Levels (RBSL), created by Dr. Roger Brewer of the San Francisco Regional Water Quality Control Board, are conservative levels of soil and water contamination, based on existing risk-based numbers and existing models, which would be used to screen potentially contaminated property.

Scientific Peer Review

California EPA is sending the proposed levels to the University of California for scientific peer review, which is required for proposed regulations and policies. The scope of the peer review is the approach used to create RBSLs, including representative chemicals. The peer review is scheduled to be completed by the end of 2002.

Testing issues for RBSLs

Once the scientific basis of the RBSLs has been established, a few practical testing issues arise. They are not new, but arise when purely risk-based numbers are proposed for environmental application. Conservative risk-based numbers often cannot be measured by currently accepted laboratory technologies.

It may be risky, but can we measure it? First, there may not be approved test methods available to measure substances with low risk levels, such as methyl mercury. An easy solution would be to measure total mercury and not take any further action unless the total mercury exceeded a level equivalent to the methyl mercury level.

How low can we go? Some substances, e.g., 2,3,7,8-TCDD, cannot be measured by the current method of choice - high-resolution gas chromatography mass spectrometry (HR GC-MS). A common approach is to use the reporting limit (detection limit or quantitation limit) of the method of choice.

What do we really want to measure? The chosen chemicals may not be detected adequately by accepted practice for measuring contamination. As an example, 2,3,7,8-TCDD is now but one of many "dioxin-like" chemicals, including polychlorinated dibenzo dioxin congeners, chlorinated dibenzofurans, and dioxin-like polychlorinated biphenyls (PCBs). In U.S. EPA's recent dioxin reassessment, there was agreement that the entire group of dioxin-like compounds should be regulated according to their relative toxicity according to established Toxicity Equivalence Factors (TEFs). HR GC-MS can measure all of the dioxin-like compounds, so no new technology is necessary. In addition, cheaper and newer technologies using a reporter gene assay or immunoassay may be alternatives to HR GC-MS.

Is it naturally-occurring? Arsenic, for one, exists in California in water and soil in concentrations that may exceed risk-based numbers. The usual cure for this is to establish a "background" concentration and compare site levels with an action level, e.g., an upper tolerance level, based on the background data. While this approach is often used, there is risk that the resultant action level is overly conservative in practice, leading to unnecessary expense.

Implementation

Risk-based screening levels can solve a real problem: how to expedite the clearance of sites with minimal or no significant contamination. The practical testing problems listed above can be solved. In fact, none of them are new. The expanded use of RBSLs provides an opportunity to establish uniform approaches to measuring contamination.

Bart Simmons is the Chief of the Department of Toxic Substances Control's Hazardous Materials Laboratory and can be reached at bsimmons@dtsc.ca.org.

The Council Model - CCGO

Continued from page 23

In addition to the several senior CGS staff, Jim Davis, State Geologist, John Parrish, Executive Officer of the State Mining and Geology Board (SMGB) and Darryl Young, Director of the Department of Conservation, attended. CCGO supports two programs within the Department of Conservation that are in need of additional funding: a CGS Seismic Hazards Mapping Program, and the SMGB Mineral Classification Program. In addition, CCGO does not support the pending SB1500, which would have the CGS map local areas, thereby diverting funds from regional mapping and potentially shifting the authority to impose land use requirements and financial liability to the State.

CCGO met with Mark Grisby, in the Governor's Office of Appointments. We congratulated him on the SMGB appointments made, and encouraged him to push the appointments still needed for the Board for Geologists and Geophysicists (BGG) and the State Water Resources Control Board. Assistant Secretary Bob Spurlock in the Office of the Secretary of Education met with CCGO. Science education was discussed with the point that earth science should be part of the public school curriculum and should be taught in a rigorous manner.

In the Capitol, CCGO met with Paul Sweeney, Executive Officer of the BGG and George Dunfield, Senior Geologist with the BGG. The main issue for the BGG is unlicensed practice. With the REA II program receiving numerous complaints by regulators, CCGO supports the BGG sponsored bill SB1958 carried by Senator Richard Polanco. The proposed bill requires all Registered Environmental Assessors II (REAII) to be either registered geologists (RGs) or professional engineers (PEs). Later in the day, CCGO met with Chris Flammer of Senator Richard Polanco's staff to show CCGO's support of SB1958. CCGO also met briefly with Judy Wolen, AEG's Sacramento lobbyist.

By mid-day, CCGO met with Assemblymembers Elaine Alquist and Joe Nation, and their staffs, and with Assemblymember Manny Diaz's chief of staff. Later in the afternoon, CCGO met with Senators Byron Sher and Liz Figueroa. The lead consultant for the Senate Committee on Governmental Organization is Art Terzakis, who met with CCGO to discuss seismic safety. CCGO discussed with the various legislators groundwater and surface water as one of California's most valuable resources. The Groundwater Resources Association of California and CCGO supported Governor Davis' ban on MTBE a few years ago. Now Governor Davis may retreat on his promise to ban for MTBE, and the legislators were told that CCGO does not support that change.

As part of CCGO's geological sensitivity awareness program, legislators were given copies of the CCGO Mission Statement and objectives, annual reports from the State Mining and Geology Board, and a copy of the American Institute of Professional Geologist's popular Homebuyer's Guide to Geologic Hazards. The CCGO delegation included James Jacobs, President of CCGO representing the AIPG; Betsy Mathieson, Past President of CCGO representing AEG - San Francisco; Richard Blake, Secretary of CCGO, representing AAPG Pacific Section; Sue Jogoda, Vice President and President Elect of CCGO, representing the California Earth Science Teachers Association; Tim Parker, Legislative Chairman representing the Groundwater Resources Association of California; and Jennifer Carbuccia, Legislative Committee, representing the Groundwater Resources Association of California.

CCGO thanks its organizational members: American Association of Petroleum Geologists, Pacific Section; American Institute of Professional Geologists - California Section; Association for Women Geoscientists - Los Angeles, San Francisco, and Sierra Chapters; Association of Engineering Geologists - Sacramento, San Francisco, and Southern California Sections; California Earth Science Teachers Association; Central Coast Geological Society; Davenport Geological Society; Groundwater Resources Association of California; Inland Geological Society; Monterey Bay Geological Society; and American Association of Petroleum Geologists (AAPG) Pacific Section. CCGO is appreciative of the numerous business members and individual donors.

CCGO developed an "Action List" for members to help CCGO as a result of the Sacramento Drive-In:

- Seismic safety and mining programs should be funded; Members can write to their legislators requesting funding. Please contact Jim Jacobs (augerpro@jps.net) for details.
- Earth science education is important and should be rigorous; Please contact Sue Jagoda (skjagoda@uclink4.berkeley.edu) for more details.
- CCGO continues to support the ban on MTBE, a gasoline additive; please notify your legislator, and write to Governor Davis regarding the issue.
- CCGO supports SB1958 regarding the REAII Program; please write letters to Senator Polanco's office and the BGG.
- CCGO supports SB 1244 (Figueroa) requiring the Governor to make Board appointments within 30 days; please write letters to Senator Figueroa's office.
- CCGO does not support SB1500, requiring the CGS to map local areas in detail. Please write to your legislators regarding this issue.

In sum, the CCGO 3rd Annual Sacramento Drive-In was a terrific opportunity to connect with the legislators and government geologists. It was gratifying that many of the legislators remembered us from previous meetings and the discussions were interesting and helpful. All the legislators invited CCGO back again next year for the 4th Annual Sacramento Drive-In in March 2003.

CCGO is poised to expand its role in the legislative, regulatory, and educational affairs of California. In the next year, CCGO will advance programs, request funding and legislation that recognize the state's diverse geologic conditions, advocate knowledgeable use of resources, and work to reduce the impact of geologic hazards. CCGO's work is far from over, and our success ultimately depends on the support of our membership.

Jim Jacobs, RG#4815; CHG#88

CCGO President 2001-2002; GRA Board Member

Chief Hydrogeologist, FAST-TEK Engineering Support Services (www.fast-tek.com/)

Turbulent Flow

Industry News and More

Bill Motzer (formerly with Hydro Environmental) is now at Todd Engineers in Emeryville, which has formed an alliance with Kennedy/Jenks (Kennedy/Jenks/Todd). Martin Steinpress (formerly with MWH) has moved to Brown and Caldwell in Walnut Creek as Chief Hydrogeologist and Groundwater Resources Service Leader. Ken Loy (formerly with MWH) is joining West Yost & Associates in Davis.

One recent Monday seemed bleaker for many Olathe, KS residents when they woke up to reports that the city's water supply was contaminated and unfit for drinking or even bathing. Radio station KQRC (98.9) reported that the water contained "high levels of a naturally occurring substance," dihydrogen monoxide, that causes increased urination, profuse sweating and wrinkling of hands and feet. Boiling the water long enough would get rid of the substance. Jerald Robnett, Olathe's superintendent of water protection, said his department received calls from 150 customers. City officials said that about 30 residents called 911 and that others questioned the city's main switchboard operator for guidance.

Turns out it was all an April Fools' Day gag. But the DJs prank left city officials less than amused. "It's a terrorist act as far as I'm concerned," Robnett said. "It's like going to the airport and shouting that you have a gun. It's stupidity." Neal Mirsky, KQRC program director, said that as soon as the station realized there was a problem, "we pulled the plug on it. We didn't intend for any of this," he said. "We thought a couple of people would go to work without a shower." Mirsky said that the station got calls from some listeners who said they did not think it was funny, but that others called to say, "You got me." Technically they had their facts straight. Dihydrogen monoxide, after all, is a scientific name for water. It can cause the "symptoms" described, and boiling will make it go away. That did not placate Olathe officials. (Katie Weeks, The Kansas City Star, April 2, 2002).

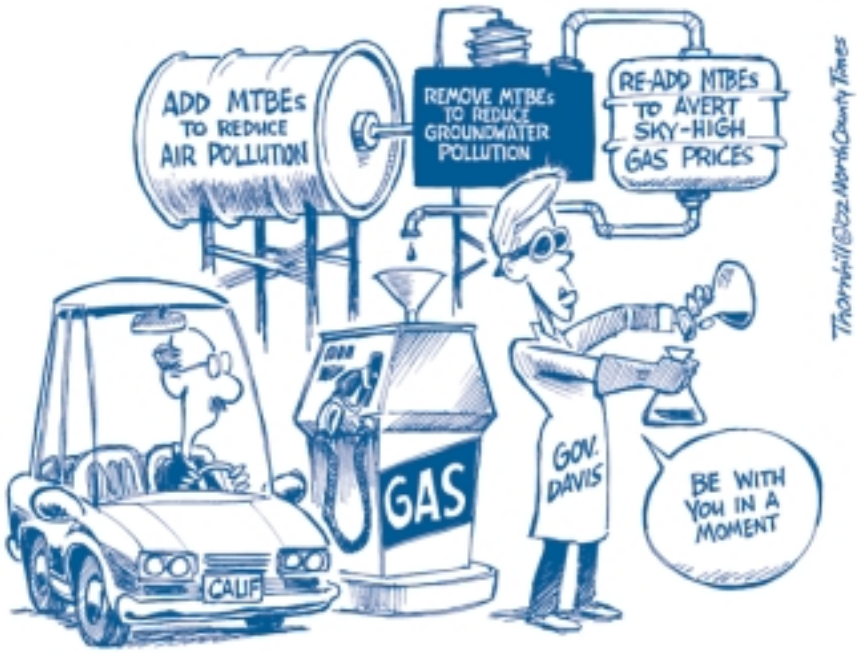


Send industry news for HydroVisions to editor@grac.org

Letters to the editor, Floyd Flood, are welcome and encouraged. Please submit your letter to editor@grac.org

Editorial Page

BY FLOOD FLOYD, EDITOR



San Francisco Bay Branch Highlights

BY GARY FOOTE

The San Francisco Bay Branch is off to a good start in 2002. Branch officers have been working hard to put together a high-quality program for the year and Branch meetings have been very well attended. Here is a brief summary of highlights from 2002 Branch meetings to date:

January 9, 2002 meeting in Oakland. The meeting was the Branch's annual update from the San Francisco Bay Regional Water Quality Control Board. Greg Bartow gave an overview of the Board's current programs and emerging trends including the recently released draft report, "Comprehensive Groundwater Protection Evaluation for South San Francisco Bay Basins." Roger Brewer gave a presentation titled "Hidden Menace? Threat to Groundwater Plumes to Estuary Habitats."

March 13, 2002 meeting in Oakland. The National Ground Water Association 2002 McEllhiney Distinguished Lecturer, John Schnieders, FAIC, CPC, gave a presentation on chemical rehabilitation of wells, an important issue for water supply wells and groundwater extraction wells that are part of groundwater remediation systems.

April 18, 2002 meeting in San Jose. Dr. June Oberdorfer from San Jose State University spoke on the subject of submarine groundwater discharge and presented results from a number of different experiments that were conducted on a coastal aquifer near Perth Australia.

Upcoming activities include:

May 15, 2002 Branch meeting in Oakland. Carl Hauge, Chief Hydrogeologist with the California Department of Water Resources presented an update on statewide groundwater programs and legislation. (Yes, we borrowed this idea from the San Joaquin Valley Branch).

June 19, 2002 joint meeting with American Society of Civil Engineers in Oakland. Dr. David Sedlak, University of California was the speaker.

August 2002 Branch meeting (date and location pending). Jean Moran, Lawrence Livermore National Laboratory (LLNL) will be speaking about LLNL's water supply contamination susceptibility assessment.

October 2002 workshop on environmental forensics. Contact Bill Motzer, Workshop Coordinator, for details (bmotzer@toddengineers.com).

The Branch officers are trying to encourage participation from students at local universities. At the last meeting in San Jose, corporate sponsors paid for approximately ten students to attend the meeting. We hope to continue a sponsorship or student discount program at future Branch meetings. The Branch is also developing an annual scholarship program for students in hydrogeology programs at local universities and plans to host a Branch meeting featuring student speakers.

San Joaquin Valley Branch Highlights

BY BILL PIPES

Serving the Great Central Valley from Stockton to Bakersfield, the newly formed San Joaquin Valley Branch of GRA is off to a great start. The Branch kick-off meeting was January 17, 2002, and we have since held monthly meetings on the third Thursday of every month. The meetings typically attract 40 plus attendees and a diverse stakeholder group in the valley - academics, regulators, water purveyors, students, water attorneys, consultants, planners and politicians.

The meetings start off with a social hour followed by dinner and a featured speaker. Speakers have included:

- Carl Hauge, Chief Hydrogeologist, CA Department of Water Resources
- Dr. Ken Schmidt, Kenneth D. Schmidt & Associates
- Martin McIntyre, Water Systems Manager and Director, Fresno Department of Public Works
- Dr. Karl Longley, Dean of the College of Engineering and Computer Science at CSU Fresno and Director of the California Water Institute
- Jon Parker, General Manager of Kern Water Bank Authority

Officers elected to serve this year 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. Serving as Chair of the Education Committee is Barbara Houghton, Houghton HydroGeo-Logic and as Chair of the Technical Committee is Greg Issinghoff, Regional Water Quality Control Board.

The Branch is grateful to its sponsors for this year's meetings and those that have helped the Branch get started on the "right" foot - GRA, Welenco, Roscoe Moss, Geomatrix Consultants, and Hudson*Orth Communications.

The June meeting features James Giannopolous, Principal Engineer, State Water Resources Control Board, speaking on the threat to deeper aquifers from shallow groundwater contamination. Other meetings this year will be in July (speaker to be announced), October (Neil Dubrovsky, USGS), and December (speaker to be announced).

The Branch is looking forward to hosting GRA's "Nitrate in Groundwater" Symposium on November 12 & 13, 2002 in Fresno!

Southern California Branch Highlights

BY TONY MAGGIO

The Southern California Branch has had an active year so far. In addition to myself, officers this year include Darrell Thompson, Vice President, Bob Ruscitto, Treasurer, Carmen Guzman, Secretary, and Steve Zigen, Member at Large.

The Branch has been fortunate to obtain some very knowledgeable, professional and interesting speakers at its bi-monthly meetings. We kicked off the year in January with the first speaker, Ms. Beth Dorris, Esq., a partner in McKenna and Cuneo's Los Angeles Law Practice. Beth's presentation was titled, "Is Compliance with Agency Standards Enough?" Her presentation addressed the fact that most environmental engineers and geologists focus on satisfying the regulatory agencies that have jurisdiction over their environmental projects. However, this may not be enough to protect the client from being sued for failing to take sufficient corrective action measures. Beth then discussed some of the appropriate measures that one can take to better protect their client - even though they may meet the current "legal standard."

The esteemed speaker at the March meeting was Mr. Barry Pulver, Associate Engineering Geologist with the San Diego Regional Water Quality Control Board (Region 9). Region 9 includes most of San Diego County and portions of Orange and Riverside Counties. Although there is not extensive groundwater use in Region 9, there have been several serious cases of MTBE impacts to drinking water. Barry's presentation conducted an overview of MTBE impacts in Region 9 and specific case studies of the Lakeside and Temecula plumes.

The third meeting was held in early May, inadvertently during the same week as the ACWA conference held in Monterey, CA. Though our attendance was small, the speaker, Mr. Desi Alvarez, Director of Public Works for the City of Downey, CA, was extremely interesting. The meeting ended up being held in an informal manner around the dinner table. Desi gave us an up-to-the-moment update on recent litigation between the pumpers of the Central Basin (LA) and the Water Replenishment District, an issue that deals with ownership of storage rights in an adjudicated basin. Our questions were numerous and Desi's answers were great in that he had the time and luxury, due to the small group, to elaborate in detail upon the history of the Central Basin and the issues leading up to the litigation.

The remainder of our efforts have been in helping arrange for speakers and a field trip at GRA's Annual Meeting September 18-19, 2002 in Newport Beach. More to come on these events.



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Perchlorate and NDMA

Continued from page 5

Main San Gabriel Basin, recounted the discovery of perchlorate in San Gabriel Valley Basin aquifers years after the remediation of these aquifers was initiated to address solvent contamination. Existing groundwater treatment systems that were designed to remove solvents at these sites were found to be ineffective at removing perchlorate. Ms. Williams discussed how agreements were later reached to use wellhead treatment as part of the approved cleanup program rather than costly and redundant remediation efforts. The agreement was a major breakthrough in bringing together parties with diverse and opposing interests, many of which have been in litigation for years. Ms. Williams also discussed how water supply wells operated by the La Puente Valley Water District and forced to shut down as a precautionary measure resumed serving customers a year ago. Third, Mr. Stephen Hoch of the law firm Hatch & Parent presented a fresh perspective on public perception of environmental contamination. He also discussed a range of legal issues specifically related to perchlorate.

After lunch was served, Mr. Alex MacDonald from the Central Valley Regional Water Quality Control Board spoke about NDMA and perchlorate contamination in eastern Sacramento County from an Aerojet facility that caused the shut down of 13 water supply wells. Mr. McDonald provided a historical overview of the problem and outlined the efforts in evaluating long-term strategies and in finding replacement water supplies.

Finally, Dr. Eric LaBolle from the University of California at Davis gave a detailed technical presentation focused on the use of computer models to predict the subsurface transport of perchlorate in the Sacramento area with an emphasis on how subsurface geologic complexities impact the behavior of perchlorate in groundwater systems.

Session 3: Treatment and Remediation

Ex-situ water treatment and in-situ soil and groundwater technologies for perchlorate and NDMA removal were the focus of the third session. Because perchlorate and NDMA are non-volatile and highly soluble in water, they pose unique remediation challenges. Mr. Evan Cox, an associate at GeoSyntec Consultants, started the session with results of enhanced in-situ bioremediation pilot studies for the removal of perchlorate from soil and groundwater. In addition to biologically-based systems, Mr. Cox discussed the use of metal catalyzed reduction reactions for the in-situ destruction of perchlorate.

Second, Mr. Bill Guarini, Vice President and Program Manager for Envirogen's perchlorate treatment program, discussed the use of various ex-situ bioreactor technologies for the removal of perchlorate from water. Most of these systems have been successfully tested at full-scale levels (Aerojet Facility, CA; Longhorn Ammunition Army Plant, TX; etc.) and are commercially available. In addition to discussing ex-situ bioreactors, Mr. Guarini gave a sneak preview of an in-situ bioremediation demonstration which started this past spring. In addition, Mr. Guarini discussed the potential for NDMA biodegradation by a number of pure cultures isolated by Envirogen researchers.

Third, Professor Jacimaria Batista and her graduate student Ms. Tina Gingras from the University of Nevada at Las Vegas discussed the use of ion exchange technologies for perchlorate removal from water. Several ions exchange resins were tested in Dr. Batista's laboratory. Dr. Batista reported that a high perchlorate removal efficiency but low regeneration efficiency were observed with strong base anionic resins, while weak base anionic resins exhibited a good removal efficiency for perchlorate as well as a good regeneration efficiency. Dr. Batista and her student also presented preliminary results regarding the use of bioreactors for the treatment of spent ion exchange wastewater (brine) containing high levels of perchlorate and the optimization of such reactors to achieve acceptable perchlorate degradation rates.

Finally, Dr. Sun Liang from the Metropolitan Water District of Southern California talked about the use of advanced oxidation processes for the removal of NDMA from drinking water. Dr. Liang indicated that pulsed-UV technologies are effective for reducing NDMA concentrations in water and that the UV dose is the most important parameter impacting contaminant reduction efficiency. In addition, Dr. Liang suggested that ozone alone is ineffective for NDMA destruction, but that the combination of ozone and peroxide improves NDMA removal efficiencies.

This symposium was conducted by GRA in cooperation with the International Association of Hydrogeologists, the Association of California Water Agencies, the Society of Environmental Toxicology and Chemistry, the National Water Research Institute, the Professional Environmental Marketing Association and others.

The event was co-sponsored by Dionex Corporation, Envirogen/US Filter, Geo-Syntec Consultants, Malcolm Pirnie, Max-xam Analytical, Pat-Chem Laboratories, the Natural Resources Section of the California Sate Bar and Welenco.

Due to HydroVisions' publication deadline, the Symposium speakers have not had the opportunity to review this Symposium summary, which does not necessarily represent the views of the speakers or their organizations. For additional information on the symposium, binders containing speaker contact information, slides, abstracts and other supplemental information can be purchased from GRA (914-446-3626) or www.grac.org\publications.pdf.

Rula Deeb, Ph.D., is a senior project engineer and bioremediation specialist at Malcolm Pirnie, Inc., in Emeryville, CA. Dr. Deeb chaired GRA's symposium on perchlorate and NDMA. She is one of the managers of a WateReuse Foundation project investigating the removal and destruction of NDMA in wastewater treatment processes.

Elisabeth Hawley is an engineer at Malcolm Pirnie, Inc., in Emeryville, CA. She is working on a number of projects investigating the environmental fate and transport of emerging water contaminants, and the effectiveness of a range of technologies for the removal of these contaminants from soil and groundwater.

Comparative Analysis of Groundwater Management Strategies

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Largely over the past two decades, Arizona, Colorado, Nebraska, New Mexico, and Texas have each devised unique programs for managing groundwater. These states have sought to cultivate institutions that manage by hydrologic regions, as in the case of Nebraska where Natural Resource Districts largely based on hydrologic boundaries have become the unit for implementing the state's groundwater policy. Although these programs understandably differ, they have several common characteristics, including: (1) clear mechanisms of groundwater allocation and dispute resolution, (2) long-term planning and goal setting, (3) clear jurisdiction in administration of groundwater policies, (4) comprehensive monitoring, (5) state oversight with varying degrees of local implementation, and, in some instances, (6) ambient groundwater quality protection programs. Most of these features are absent from California's system of groundwater allocation and quality protection.

A comparison of these states has yielded several interesting findings suggestive of potential action in California. First, given California's long history with water districts at the forefront of water allocation and protection, water districts must be the basis for achieving this optimal outcome. Currently 157 types of water districts exist in California, often with conflicting goals, boundaries, and authority. Second, a comprehensive monitoring and accounting program needs to take shape. The passage of AB 599 this past year to study the potential for increased coordination in groundwater monitoring is a positive step, but substantive changes are necessary. Third, there should be a substantive groundwater planning component to these districts. The establishment of Basin Management Objectives (BMOs),[4] as has occurred in a few areas in California, would further long-term planning goals. Unfortunately, many AB 3030 plans often lack substantive components. Substantive groundwater plans could be used to integrate groundwater into the Regional SWRCBs' Basin Plans.

SB 1938 (Machado) as amended (May 21, 2002) could foster substantive components in groundwater plans by linking state funding to the inclusion of such components. In order to qualify as a groundwater management plan for the purposes of funding, the bill would require BMOs relating to groundwater level regulation, quality degradation, subsidence, and surface water impacts on groundwater quality and level. It also would require the imposition of a monitoring program sufficient to detect changes in groundwater level and quality.

"Currently 157 types of water districts exist in California, often with conflicting goals, boundaries, and authority."

The Commission wrote in 1978, ". . . California's extensive and extremely valuable groundwater resources are not adequately protected. Except in a few areas, groundwater extraction is not managed to the extent that oil and gas production, timber harvesting, mining, or even surface water diversions are. California's water is usually available to any pumper, public or private, who wants to extract it, regardless of the impact of extraction on neighboring groundwater pumpers or on the general community." Given the array of ideas available for remedying the situation that have been implemented in neighboring states, it appears that California could develop more effective institutions to foster the long-term protection of groundwater quality and quantity.

References

1 *Cline v. American Aggregates Corporation* (1984). 15 Ohio St. 3d 384.

2 Sax, J. L. (2002). *Review Of The Laws Establishing The SWRCB's Permitting Authority Over Appropriations Of Groundwater Classified As Subterranean Streams And The SWRCB's Implementation Of Those Laws*. Sacramento, State Water Resources Control Board.

3 Governor's Commission to Review California Water Rights Law (1978). *Final report - Governor's Commission to Review California Water Rights Law.* Sacramento, The Commission.

4 For an excellent overview of the Basin Management Plan concept, see Hauge, C. (2002). *Groundwater Management*. San Joaquin Valley Branch Groundwater Resources Association, Fresno, California.

Randolph Flay (rflay@nature.berkeley.edu) is a graduate student, Department of Environmental Science, Policy and Management, University of California, Berkeley. This investigation is a portion of Mr. Flay's M.S. research. T. N. Narasimhan (tnnarasimhan@lbl.gov) is a professor, Department of Environmental Science, Policy and Management, Department of Materials Science and Mineral Engineering. Prof. Narasimhan also serves as Mr. Flay's advisor. They may be reached at Materials Science and Mineral Engineering, 591 Evans Hall, University of California at Berkeley, Berkeley, CA 94720-1760.

Student Research Corner is compiled by Vicki Kretsinger, GRA Director.

2002 Annual Awards Program

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groundwater industry and have been pioneers in their field of expertise.

Previous Lifetime Achievement Award winners include:

2001 - *Carl Hauge*

2000 - *Joseph H. Birman*

1999 - *David Keith Todd*

1998 - *Eugene E. Luhdorff, Jr.*

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

Previous Kevin J. Neese Award winners include:

2001 - *American River Basin Cooperating Agencies and Sacramento Groundwater Authority Partnership* for fostering the understanding and development of a cooperative approach to regional planning, protection and management of groundwater.

2000 - *Board of Directors of the Chino Basin Watermaster* for delivering a remarkable OBMP that created a consensus-based approach for making water supplies in the Chino Basin more reliable and cost effective.

1999 - *Governor Gray Davis* for his work and leadership in addressing MTBE.

Annual Meeting Field Trip

Continued from page 2

Stop 2. After returning from the Forebay, District staff will describe the geology of the coastal area, including coastal geology as related to seawater intrusion and construction and operation of the District's injection barrier. This part of the tour will include a stop at one or two of the District's injection facilities.

Stop 3. Tour of OCWD Water Factory 21 treatment facility, which receives primary treated water from the adjacent Orange County Sanitation District facilities. This water is additionally treated to meet Title 22 drinking standards prior to blending and deep well injection at the Talbert Barrier injection facilities.

For more information please call Kathy Snelson at (916) 446-3626 or e-mail at executive_director@grac.org. Additional trip details will be posted on GRA's web site at www.grac.org.

A Message from the Exec. Director

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trade association as very similar. How often do we join an association with our focus on how membership is going to reap new business for us? And then, when new business doesn't flow to us like hot lava from a newly erupted volcano, we are quick to point out how benefit-less our trade association membership is. The following are ways to use some of the services GRA offers, how you can quickly communicate your needs, and how you can become directly involved with GRA. Learning to appreciate your membership can provide the benefits you expect.

1. Visit the GRA Web site at least twice a month as information is updated consistently about new GRA technical programs, changes in ongoing and new legislation, developments in groundwater resources policy and regulations arenas, new publications, organizational activities, job postings, groundwater-related resources and more.

2. Use of the new GRA Web site program will enable you to access your specific membership information, view and print the GRA membership directory, renew your membership, register for conferences and symposiums, sign up for various automatic informational emails, order publications and more.

3. Review the new GRA Committee List on the Web site that will include the Committee Chair, Committee members and Committee responsibilities. If you find a Committee that you would like to participate in, you will be able to join the Committee and submit your contact information to the Committee Chair online.

4. Use the Contact and Feedback page on GRA's Web site to quickly submit any questions or comments you may have about GRA, and its services and programs.

Fish! includes a written piece by John Gardner titled "Meaning". He writes, "Meaning is something you build into your life...out of the values for which you are willing to sacrifice something. The ingredients are there." He ends by

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California Groundwater Assn. Update

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site at www.wateraware.org for more information.

Governor Davis declares November 3-9 as California Groundwater Week

In another effort to promote wise use and protection of groundwater, CGA asked Governor Davis to proclaim November 3-9, 2002 as California Groundwater Week. The Governor's proclamation, dated May 8th 2002, notes "groundwater plays an important role in implementing a long-term comprehensive plan to improve California's ecosystems, water supply and water management..."

We believe holding California Groundwater Week in November as we enter our "natural groundwater recharge period" (rainy season) provides an excellent opportunity for all groundwater professionals to help the state's citizens learn more about this vast and important resource. We plan to provide groundwater information, well safety tips for consumers and other items to the public during that week.

We'll also be holding CGA's 54th Annual Convention and Trade Show that week and will hold seminars of interest to groundwater professionals including the NGWA McEllhiney Lecture on Chemical Rehabilitation of Wells. The information gathered at the convention may be useful in helping answer the public's questions about groundwater.

We hope GRA members will consider ways that you can increase public understanding of groundwater quality and supply issues. If you have any ideas on how we can work together to promote wise use and protection of groundwater, give me a call at 707-578-4408 or email: wellguy@groundh2o.org.

A Message from the Exec. Director

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writing, "If it does (life have meaning), then the particular balance of success and failure is of less account." This writing reminds me of the current GRA Board of Directors because the individuals who make up the Board are relentless in their pursuit of the latest groundwater resources information, pressing issues, policy and regulation changes, and the most effective avenues and processes in which this information can be accessible to you. They are working (on behalf of GRA) every day to offer you a variety of ways to find "meaning to your membership."

Is GRA membership meaningful for you? If so, keep your GRA membership in good standing, share your GRA experiences with colleagues and encourage them to join, communicate to me and GRA Directors how the Association is saving you time and money, and connecting you to the "right" resources. Or, if GRA services aren't meeting your needs, let us know what you want so that GRA can ensure that you receive the benefits of "partial ownership" that you expect!

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Dates & Details

GRA Meetings and Key Dates

(Please visit www.grac.org for detailed information unless noted)

GRA Board Meeting	August 10, 2002 Point Richmond, CA
"Principles of Groundwater Flow Transport Modeling"	September 25, 26, 27, 2002 San Francisco Bay Area, CA
11th Annual Meeting Field Trip "Sustaining Groundwater Resources: The Critical Vision" (11th Annual Meeting)	September 17, 2002 September 18 & 19, 2002 Newport Beach, CA
"MTBE in Groundwater"	October 17, 2002 San Jose, CA
"Nitrate in Groundwater"	November 12 & 13, 2002 Fresno, CA

Other Key Dates (programs in which GRA is a Cooperator or Co-Sponsor)

"AGWSE 2002 and the Innovative Approaches to Ground Water Disinfection: Coliforms, Pathogens and Contaminants"	September 5-6, 2002 Sacramento, CA

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