HYDRO VISIONS

GROUNDWATER RESOURCES ASSOCIATION OF CALIFORNIA

Volume 1, No. 4 *Winter 1992*

GRA's First Annual Meeting and Conference Wins Approval

–by Gene Luhdorff, Jr.

Attendees of GRA's first annual meeting and conference, held on November 6 and 7 at the Mark Hopkins Intercontinental Hotel in San Francisco, overwhelmingly agreed that the charter year program was very successful. The conference was presented in cooperation with the California Environmental Protection Agency, Department of Toxic Substances Control, State Water Resources Control Board; U. S. Environmental Protection Agency; Association of California Water Agencies; and the Water Education Foundation. Over 150 people attended the two day conference which was organized around the theme ***Visions into California's Vital Resource.***

The conference began with a welcoming address from GRA's president Ms. Vicki Kretsinger which was followed by the conference's keynote speaker Mark Reisner. Mr. Reisner, who is a well known author of numerous environmental articles including his award-winning book *Cadillac Desert*, spoke on the subject "Bringing Groundwater Management into the 20th Century - and Beyond."

Two concurrent sessions were conducted to reach the needs of all GRA members. Seminars in Session A were designed to inform those members working in groundwater related fields about Title 22 and 23 requirements, on how to comply with these regulations, and the ways government and industry can work together for maximum results. Session B was developed to provide updated information on California's groundwater management policies, drawing from the experience of the selected speakers. Both sessions were well received by those in attendance.

Also invited to speak at the conference, and in attendance at the convention was Bill Dendy of Bill Dendy & Associates, Davis, California. Mr. Dendy was scheduled to speak on *Groundwater Basins and Water Transfers*. Unfortunately for all concerned, his presentation had to be rescheduled during the conference because of a time conflict. Mr. Dendy's personal schedule, however, did not permit him to remain for the rescheduled presentation. GRA deeply regrets the unfortunate occurrence, both on behalf of Bill for his efforts to prepare for the presentation and to the members of GRA who had looked forward to hearing him speak.

The conference concluded with the Association's first annual meeting.

Days following the conference and annual meeting have been occupied by members of the organizing staff and GRA Board members reviewing critique sheets completed by the attendees. Plans are presently being established for the 1993 conference using the constructive comments offered by those in attendance. GRA personnel are pleased with the favorable responses to the charter year's convention and meeting and extended their appreciations to Vicki Kretsinger and Wendy Ernst of Gordian Business Solutions, who served as Conference Manager, for their excellent efforts in producing the highly successful event.

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IN THIS ISSUE

PRESIDENT'S MESSAGE

We have nearly 500 members as the charter year of GRA closes. As a young organization, we have gathered recognition as an association which has the potential to contribute significantly to the assessment, management and protection of California's groundwater resources. As charter members, you should be proud of GRA's early accomplishments. Key factors in GRA's success have been and will be the continued steady development of a solid foundation for the association and member participation.

I cannot emphasize strongly enough the importance of member participation. In the formative stages of this association, members have the opportunity to contribute to the development, direction and success of GRA. Member participation can dictate the benefits you derive from belonging to a state association.

You have the opportunity to make a difference. You have the opportunity to actively address California's Groundwater needs at the local and state levels. As professionals in this industry, we have an obligation to contribute our collective knowledge and expertise to broaden public awareness and understanding of groundwater, particularly with regard to the planned management and protection of the resource.

As we look forward to the challenges ahead, and toward plans for the association in 1993, it is appropriate to recount the highlights and accomplishments of GRA in 1992.

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Taking a Closer Look at Well Design

Part 2 of 2

–by Gene Luhdorff, Jr. P.E.

In my first article concerning well design, I discussed my experiences evaluating the flow of water into a well through its well screen. My conclusions were that regardless of the type of screen employed, be it wire wrapped, louvered perforations, milled slotted casing, etc., the following principles seemed to apply to every completed well:

A. Flow into the well from the completed aquifers was influenced by the location of the pump's suction or bowl unit. If the bowl unit was located above the highest screened section of the well, the greatest production of water to the well would occur through the shallowest screen. If the pump suction was placed near the bottom of the well, production could be induced from aquifers located near the bottom of the well.

B. Regardless of the type of screen installed, flow into the well through a well screen is not uniform along its vertical axis and it often exceeds design inlet velocities such as 0.1 feet per second (ft/sec).

C. Evaluation of well performance at various flow rates indicates that well efficiency remains very uniform in a properly designed and constructed well even though inlet velocities through the intake structures (screens) are high and unevenly distributed.

D. Increasing the depth of a well or adding additional screen sections (or aquifers) to a well completion does not assure an increase in either well capacity (gpm) or well yield (gpm/ft).

I suggested in Part 1 of this article that while such findings violate certain published and assumed principles of well design, knowledge of such well behavior can be used to an advantage by the design engineer. Let's examine a few thoughts and applications:

1. Well Spacing. It has long been understood (and correctly so) that the influence of one well on another in a well field is a function of well spacing, aquifer transmissivity, formation storage, pump capacity and the length of time of pumping. One can easily calculate the impending drawdown in a second well caused by pumping the first well using equation (1).

$$(1)\quad s = \frac{264Q}{T}\log\frac{0.3Tt}{r^2S}$$

where:

- s = drawdown in feet
- Q = pumping rate in gallons per minute
- T = transmissivity in gallons per day per foot
- t = time in days of pumping
- r = radius in feet between the wells
- S = storage coefficient

PLEASE KEEP US INFORMED OF YOUR CURRENT MAILING ADDRESS!! SEND CHANGES OR UPDATES IN THIS REGARD TO GRA AS SHOWN IN THE EDITORIAL BOX BELOW. Changes may also be telephoned to Ms. Wendy Ernst at (916) 661-0884.

HydroVisions is the official publication of the Groundwater Resources Association of California (GRA). GRA's mailing address is P.O. Box 355, Davis, California 95617-0355. Any questions or comments concerning the contents of this publication should be directed to the newsletter editor.

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Equation (1) can also be applied to the pumping well to determine its drawdown based on measured aquifer characteristics. For such calculations, I have found that using a value of 1.5 feet for the radius of the pumped well provides reasonably good estimates of drawdown in field investigations.

But what does equation (1) assume? It assumes that the wells are completed in the same aquifer(s) or at least producing water from the same aquifers. If by practice we have observed that wells produce water from those aquifers located and completed with well screens closest to the pump's suction and that little if any production is occurring from aquifers located at greater distances from the pump's suction, then would it not be possible to complete wells adjacent to one another using different aquifers in each well for an increase in total production without measurable interference between the wells? The answer is yes. And while this may seem simplistic, apply the principle of Item C to this practice. Imagine a typical well completion using four aquifers each being 10 to 20 feet in thickness, each aquifer being separated from each other by relatively impervious clays as typically found throughout the valleys of California. If you accept the premise that production from the lower screens is reduced by placing the pump bowls above the upper screen, what would be the result of completing each aquifer in separate wells, located as close as possible to each other? The answer may surprise you.

Convinced that the ultimate yield was not being obtained from a well combining several aquifers, I have constructed for water utilities multiple wells into separate aquifers on single well sights with excellent results. Two wells were constructed side by side. Each well was tested and aquifer characteristics evaluated. In one case in an area where maximum production from wells was typically 2000 to 2500 gpm with specific capacities approaching 100 gpm/ft, we were able to produce from two wells, these same capacities with specific capacities still reaching 100 gpm/ft in each well. Additionally, no influence was measured between the adjacent wells. In other words, we could produce twice the capacity previously pumped in the region with one-half the drawdown that would have been expected if we could have pumped the same amount of water from a single well. To the advantage of the user, the wells were constructed on a common well lot. Besides increased capacities being obtained from the site, we also achieved the ability to control water quality at the site by being able to individually pump from each aquifer. Additionally, we could now monitor each aquifer and establish a comprehensive program to provide for groundwater management encompassing a far more flexible pumping strategy for the future.

Well spacing becomes critically important since now we can increase production at a given site from closely spaced wells without causing undesirable pumping interference between closely spaced wells.

2. Water Quality. It is very common to find water quality variations between overlying aquifers. These variations occur because of the aquifer's source of water, and from non-point and point source contamination. Throughout California, the present practice of well design which incorporates the use of multiple aquifers in each well completion causes a composite water product to be produced from each well subject to the flow variations from the multiple aquifers as previously discussed. If the upper aquifers contain excessive levels of manganese, for example, and pump bowls are located above these aquifers, water quality might be changed by merely changing the location of the pump's suction in the well. The lowering of the suction should induce flow into the well from the lower aquifer while reducing input from the upper aquifers.

In well design, is it not more reasonable then to isolate each major aquifer group by single group completion in multiple wells on site rather than to combine the aquifers in a single multiple well completion strategy? I believe it is. The use of the single aquifer completion obviously provides great flexibility in water quality management. If one aquifer fails to meet a standard of quality, it simply is not used. This is a difficult task to achieve in multiple aquifer completions as we have sadly experienced throughout the state.

3. Entrance Velocities. As discussed in the first part of this article, the selection of a design parameter for entrance velocity such as 0.1 ft/sec, is the acceptance of extensive commentary by many people over the past thirty years. Today, to say you do not accept the value of 0.1 ft/sec as the basis of design for the entrance velocity of water through a well screen section is almost like saying you are against motherhood. What scientists and regulators have ignored, however, is that we have no control over how fast water flows into the well. In design practice, one meets the requirement of a low velocity by simply having a sufficient length of screen (and therefore aquifer footage) to achieve a given average velocity based upon the open area of the selected screen. Nearly every engineer and water well driller knows equation (2) which defines the capacity of water that can be pumped at an entrance velocity of 0.1 feet per second per foot of screen.

(2) gpm/ft = 0.31 x Screen Area

where:

GPM/ft equals the amount of water that can pass through the screen at a velocity of 0.1 ft/sec when the screen has an open area of X inches per foot.

Common practice is for engineers to simply supply sufficient screen length to achieve the desired average entrance velocity at the well's design capacity. Interestingly, efficient wells have been constructed having velocities as high as 1.5 ft/sec or 15 times greater than the commonly used standard of 0.1ft/sec. A better practice is to select the type of well screen and its open area based upon the aquifer's thickness and its grain size distribution. Using entrance velocities higher than 0.1 ft/sec will still produce very efficient wells.

4. System Utilization. The use of vertical distribution of aquifers in multiple well completions provides additional benefits in system utilization. If the only requirement was to produce a given quantity of water from the site, it now can be divided between multiple pump stations, such as one third of the capacity being supplied by each of three wells. As demand for water occurs, pumps are started as required to meet the given demand. The process allows for demands to be met using only the necessary energy (HP) to meet the demand. Addition-

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Presidents Message continued. . .

CHARTER YEAR 1992 HIGHLIGHTS

GROUNDWATER RESOURCES ASSOCIATION
OF CALIFORNIA

GROUNDWATER RESOURCES ASSOCIATION

- Began Association January 1, 1992
- Official Incorporation
- Association kick-off meeting March 1992; Douglas Wheeler, Secretary of the Resources Agency, spoke on the Governor's Water Policy Task Force
- Non-profit Mutual Benefit Association
- Nine branch areas established; 5 of 9 branches started
- Nearly 500 members statewide
- Bimonthly branch meetings have included the following speakers/topics:

  Jeffory Scharff; Litigation Avoidance and Public Agency Compliance

  ***Gary Hall*;** Discharge of Treated Groundwater to POTW's

  Jon Marshack; California's Water Quality Standards and Their Applicability to Waste Management and Site Cleanup

  Jim Yost; Water Transfers/Conjunctive Use in Eastern Yolo County

  George Wheeldon and Carl Hauge; Groundwater Analysis of Fractured Rock in the Sierra Nevada Foothills

  Carl Hauge; Groundwater Management in California - Present and Future Issues

  Richard Volpe; Land Subsidence Issues

  Brian Baca; Methods for Evaluating Groundwater Use in Santa Barbara County

  Stanley Hatch; Development of New Groundwater Basin Management Strategies

  Anthony Nelson; Fundamental Need of Team Approach for Environmental Project Execution

  ***Fletcher Driscoll*;** Preserving Your Professional Reputation

  Joe Birman; On Becoming the Cleanest Third World Country on the Planet

  Seth Daugherty; MCL as the Groundwater Cleanup Level

  John Allen; Overview of 1992 Environmental Legislation and Legislative Plan for 1993

- Established Standing Committees

  Membership

  Legislative (Includes Groundwater Quality & Management)
  Seminar

  Education

  Liaison

  Newsletter

  Technical Guidance and Standards

  Scholarship

  Annual Meeting

- Quarterly Newsletter - HYDROVISIONS
- Seminar - *Testing and Modeling Low Yield Aquifers* June 2 and 4, 1992 in the Los Angeles and San Francisco Areas (approximately 140 attendees)
- Input to state and local agencies

  Review and comment on the Sacramento County Well and Pump Ordinance

  Review and comment on DWR revised Well Drillers' Report form and instructions

  Review and comment on San Joaquin County Draft Well Ordinance

Asked by DWR to participate on DWR Well Standards (74-91) committee

- Education

  Participated at National Groundwater Education Consortium; September 1992 in Minnesota

  Participated in educational workshop conducted by the American Groundwater Trust at the NGWA Convention, October 1992

  Preparing grant proposal in cooperation with the Water Education Foundation and DWR to develop a groundwater map for California

- Liaison Activities

  Explore opportunities for mutual benefit affiliation with the American Institute of Hydrology, Association of Engineering Geologists, California Environmental Health Association (CEHA) and the National Groundwater Association

  Presentation to CEHA educational workshop, August 1992

  Presentation to NGWA Board of Directors, October 1992

Membership Directory Scheduled for February 1993 Release!

Joint GRA Sacramento Branch and Sacramento Chapter of AEG meeting December 1992

- Establishing relational database for membership tracking and membership directory development (directory scheduled for distribution February 1993)

Charter Year Conference and Annual Meeting

Conducted in cooperation with several agencies; two concurrent conference sessions; Marc Reisner, keynote speaker (see article this issue).

Thank You Charter Members and Supporters

Special thanks are due to those individuals who have served as branch officers, organizing members, and committee chairpersons and members. These individuals and their respective firms have helped the foundation of GRA in a manner that would not have been possible without their donations of time and/or materials. Thanks are also due to the numerous individuals who have made voluntary monetary contributions to GRA.

Special thanks are also due to the sponsors and exhibitors at our first annual conference and meeting. The sponsors included Roscoe Moss Company and Westbay Instruments; exhibitors included Welenco, Layne Environmental and Colorado Silica Sand. Our appreciation is extended to cooperating agencies participating in this charter year's conference and annual meeting, including Cal-EPA DTSC and SWRCB, the Water Education Foundation, the Association of California Water Agencies and the U.S. EPA.

Membership Directory

The GRA Membership Directory is in the process of being designed and assembled. It is due to be mailed to members in February 1993. Your membership application information has been entered into a database that is used for newsletter distribution and for other mailings. Please be sure to inform us if you move or if other important information changes.

Membership Renewals/New Members

Mass mailings of newsletters to potential members will be curtailed following this issue. **If you are not yet a GRA member, you may be deleted from future mailings.** Beginning with the spring 1993 HydroVisions, printing and mailing will be reduced to reflect newsletter production for GRA's paid membership.

Non-members take this opportunity to join now; an application form is included on page 6 in this issue of HydroVisions.

Westbay Instruments Inc.
507 E. Third Street,
North Vancouver, B.C., Canada V7L 1G4
Phone (604) 984-4215
Phone (in U.S.) (800) 663-8770
Fax (604) 984-3538

Roscoe Moss Company
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NON MEMBERS JOIN NOW!

This will be your last complimentary issue.

APPLICATION FOR MEMBERSHIP

Name _____

Title/Position _____

Employed by _____

Mailing Address _____

County, City, State, & Zip Code _____

Phone (____) _____ Fax (____) _____

Category of employer:

❑ Academic ❑ Consulting ❑ Government ❑ Industry/Business
❑ Contractor ❑ Retired ❑ Other *(specify)*

Education/Credentials:

Highest Degree, Year, Discipline _____

Registration or Licenses _____

Years of Experience in the Groundwater Industry _____

Specialty *(see list on reverse side)*: _____/_____/_____/_____/_____

Membership Category (see reverse side for description):

❑ Regular Member $50/yr ❑ Associate Member $50/yr
❑ Student Member $15/yr *(must be endorsed by a University faculty member)*

Member of Professional Associations? (list) _____

Voluntary Financial Support Categories:

❑ Supporters ($10-24) ❑ Sponsors ($25-99)
❑ Charter Sponsors ($100-499) ❑ Founders (over $1000)

Amount of dues enclosed: $_____

Amount of donation to help develop GRA (optional) $_____

Total amount enclosed $_____

Make check payable to Groundwater Resources Association of California and mail to:

GRA
P.O. Box 355
Davis, CA 95617-0355

Contact Vicki Kretsinger with questions:
916-661-0109, Fax 916-661-6806

By signing below, I acknowledge that the information contained in this application is true and correct to the best of my knowledge:

Signed: _____ Date: _____

SPECIALTY FIELDS

Please indicate your area(s) of professional expertise/business specialty by selecting up to five (5) of the following specialty codes. Rank in order with your principal specialty listed first. The following information will be included in the membership directory.

1. Artificial Recharge-Conjunctive Use
2. Biology Including Aquifer Biology
3. Chemistry Including Aquatic Chemistry
4. Coastal Hydrology/Hydrogeology
5. Drainage and Irrigation
6. Engineering Geology
7. Engineering Hydrology
8. Environ. Engineering Including Public Health Eng.
9. Environmental Impact
10. Environmental Law
11. Environmental Sciences
12. Environmental Site Assessment
13. Geology
14. Geophysics
15. Geotechnical Engineering
16. Groundwater Exploration and Development
17. Groundwater Hydraulics-Hydrodynamics
18. Groundwater Hydrology
19. Groundwater Management
20. Groundwater Pollution and/or Soil Remediation
21. Groundwater Quality Monitoring
22. Groundwater Quality Assessment and/or Management
23. Groundwater/Surface Water Relationships
24. Hazardous Waste Impact Assessment and/or Mgmt.
25. Hydrochemistry
26. Hydrogeology
27. Hydrology
28. Injection Wells
29. Landfills and Other Waste Disposal Systems
30. Modeling (transport and/or chemical)
31. Monitoring Well Installation
32. Pollutant (contaminant) Transport
33. Pumping Systems Including Water Supply Systems
34. Real Estate Site Assessments
35. Risk Assessments
36. Salt Water Intrusion
37. Soil Gas Measurements
38. "Superfund" RI/FS and/or Site Remediation
39. Toxicology
40. Unsaturated Flow/Soil Moisture-Vadose Zone
41. Underground Storage Tank Investigations
42. Water Law
43. Water Pollution Control
44. Water Quality
45. Water Resources Planning and Management
46. Water Supply-Domestic and/or Industrial
47. Water Treatment
48. Water Use/Transfer
49. Water Well Construction Technology
50. Other (specify) _____

MEMBERSHIP CATEGORIES

Regular Members:

Must support the Association's stated purposes and objectives. Must have applied experience; education in the earth, environmental, natural or physical sciences or engineering; or conducted research in areas related to the Association's stated purposes:

- Bachelor's plus 2 years experience
- Master's plus 1 year experience
- Doctorate plus 1 year experience
- California Drilling or Pump Contractor's License (C57 or C61) plus 2 years experience
- Six years of experience working under the supervision of a California registered, certified or licensed professional in the groundwater industry
- Special appointment by the Board of Director.

Associate Members:

Any person interested in the groundwater resources of California and who supports the stated purposes and objectives of the Association.

Student Members:

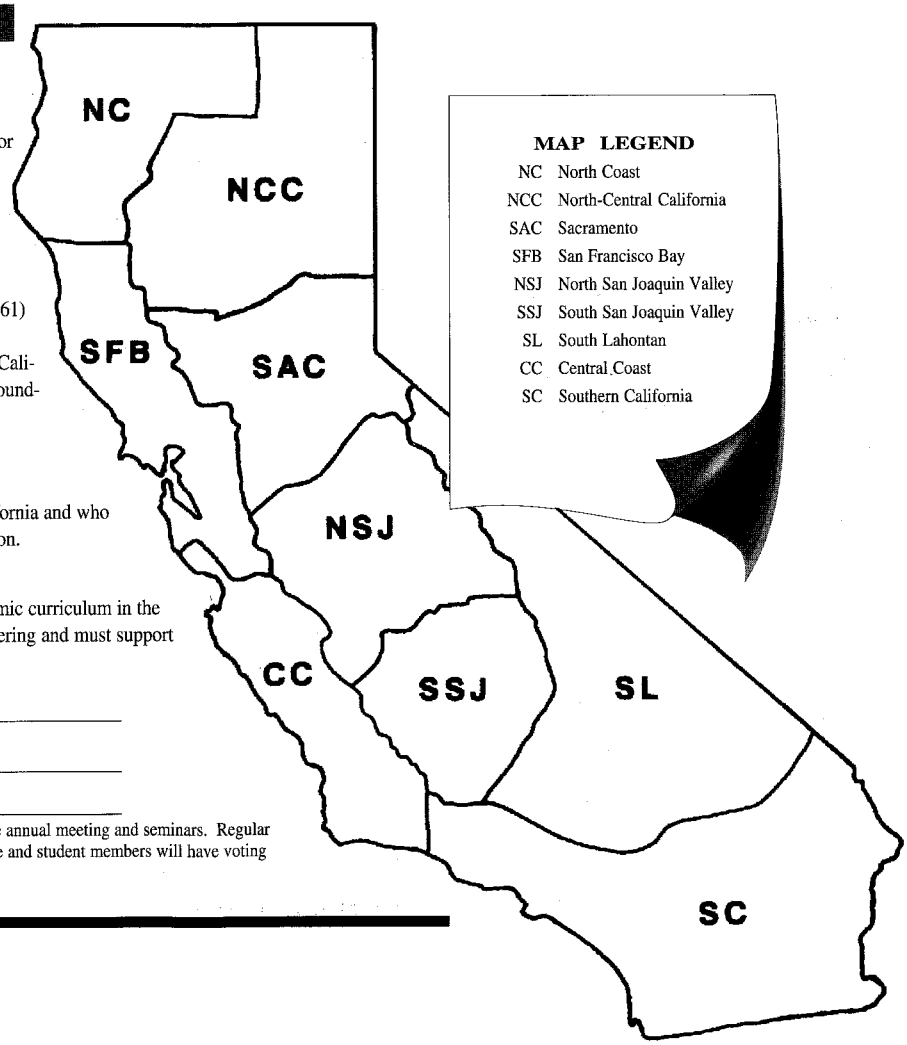
Must be actively engaged as a full-time student in an academic curriculum in the earth, environmental, natural or physical sciences or engineering and must support the Association's stated purposes and objectives.

Faculty signature: _____

Date: _____

Educational Institution: _____

All members receive the Association newsletter and reduced fees for the annual meeting and seminars. Regular members have full voting privileges at membership meetings. Associate and student members will have voting privileges.



Well Design

Continued from page 3

ally, when repairs to the equipment are required, as they always will be, only one-third of the system is taken off line. The concept thus provides a better tool for equipment, system, and groundwater management.

In summary: These examples represent just a few thoughts on well design and well utilization that can be used in the field because of the way groundwater enters a well structure in "the real world." My goal in writing this and the previous article dealing with well design was to bring to your attention a better understanding of the existing principles of well design and aquifer discharge through a well screen and to point out to you what I believe to be errors in these principles based upon my experiences in the field. I have seen too often an over-simplification in the understanding of how wells operate and how they should be constructed. I am convinced we can apply improved design principles in well design based upon a better understanding of well performance and in so doing, provide for improved groundwater development and management in California.

For the vast majority of water utilities, their greatest costs for water development is not the construction of a well but rather the total cost associated with the infrastructure of land acquisition, distribution piping, storage facilities, power costs, etc. Many groundwater users could add more flexible capacity to their systems using existing locations for new well sites if the design principles discussed herein are carefully applied.

I fully understand that many of our readers do not engineer potable water facilities. Their professional services deal primarily in environmental groundwater assessments and groundwater remediation projects. I hope that these discussions can be beneficial to their understanding of existing facilities as they contemplate the source of water quality from a well, as influenced by the pump setting depth, the well depth, its screen placement and the measured well performance.

Gene Luhdorff, Jr. P.E. is the co-founder of Luhdorff and Scalmanini - Consulting Engineers. The firm specializes in groundwater development, management and use throughout the state. Formerly, Mr. Luhdorff was a water well drilling contractor for 35 years in the western United States. He is now retired.

First Annual Meeting

Continued from page 1

The following speakers addressed the conference and spoke on the noted subjects:

Session A:

Water Quality Monitoring

Margie Youngs, Department of Toxic Substances Control (DTSC)

DTSC's Revised Title 22 Regulations...

Ed Wosika, State Water Resources Control Board (SWRCB)

Differences Between the DTSC and SWRCB Monitoring Requirements

Panel Discussion: *Challenges of Compliance*

Charlene Herbst, Moderator; Manager of Closure and Remediation Branch, Waste Management Board

Panel:

Jill Shapiro, CH2M Hill

Dwight Hoenig, Mittelhauser Corporation

Ed Wosika, SWRCB

Margie Youngs, DTSC

David Kaminski, QED Groundwater Specialists.

Session B:

Groundwater Basin Management

Jim Costa, Assemblyman 30th District

Groundwater Legislation in California - Past & Present

Anne Thomas, Best, Best & Krieger

Legal Aspects of Groundwater Basin Management

Stuart Pyle, General Manager of Kern County Water Agency (Retired)

Groundwater Management Programs in Kern County

Sandy Figuers, Alameda County Zone 7 Flood Control and Water District

Practical Aspects of Conjunctive Use...

Jim Goodrich, San Gabriel Basin Water Quality Authority

Building Tools to Effectively Manage Large Groundwater Basins

Matt Hagemann, U.S. Environmental Protection Agency

Comprehensive State Groundwater Protection Programs

Saturday Program:

Steven Ritchie, Executive Director, Caliornia Regional Water Quality Control Board, San Francisco Bay Region

Future Directions for California Groundwater Cleanup Policy

Martin Steinpress, Senior Hydrogeologist, James M. Montgomery, Inc.

Hydrogeology of the San Francisco Bay Region with Special Attention to Implications of Contaminant Migration

What do you owe your firm or organization?

–by Dr. Fletcher Driscoll

Most of us rarely think about our personal responsibilities to the company or organization for which we work, except as narrowly defined by our job requirements. We do, however, spend a great deal of time thinking about what our organization is supposed to do for us. There is a seemingly endless list of benefits we seek to enhance our economic or social status. Yet, what actions are we willing to take to earn these benefits? Too often, the answer is not equivalent to the demands we place on our employer.

From the moment we leave school, our basic technical capabilities begin to decline in most of our skill areas, both relatively compared to our younger peers who are more recently trained and absolutely in terms of what we recall from our own training. But in fulfilling our everchanging job requirements, new supplementary skills must be developed constantly to meet client needs. These new skills, however, are much more circumscribed than our initial background skills which tend to be much broader in scope. Thus, we gain new skills via our on-the-job experiences, but over time, the range of our capabilities covers an increasingly more focused area. It is not unlike the old academic story in which a typical Ph.D. candidate is viewed as "someone who knows more and more about less and less."

So at the same time we are pressuring our companies to give us more and more, we are probably increasing our skills only marginally, if at all. Many of us, in fact, may even be suffering an overall loss in our basic skills. So why should any prudent employer promote anyone who has not demonstrated clearly greater value to the organization? Longevity is not enough! Thus, employees eager to clearly set themselves apart must increase their inherent value — that is, the level of their primary technical and management skills as opposed to their more limited increase in value accruing from the normal range of day-to-day professional activities.

There are three distinct objectives that employees should pursue to qualify themselves for a more important role in their organization. The first is improving basic technical and managerial skills. Periodically, some organizations offer internal training programs in these subject areas. If so, try to seek

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Litigation Avoidance

–by Jeffory Scharff, Esq.

[Editor's Note: This is the third in a series of three articles on some techniques and issues to avoid getting sued. The article is a continuation of Mr. Scharff's speech at GRA's April 1992 Sacramento Branch meeting.]

We have been tracking the evolution of our hypothetical company Generic Environmental Firm (GEF). The principals have gone through basic business organization considerations, have struggled with staffing personnel, insurance and related liability concerns. They now face as the business grows more challenging issues related to liability exposure and potential litigation.

Perhaps the best way to describe some of the ongoing issues is by way of an example. GEF is in the midst of assisting a buyer evaluate a property from which underground storage tanks have been removed with known evidence of a release. Given the evidence of contamination, the buyer is beyond the question of innocent land owner defenses. Instead, GEF has been put to the task of evaluating the investigatory work completed to date, at the client's request, providing estimates of potential cleanup costs.

How many times have you in the course of doing your work been asked by a client in the field to estimate the potential magnitude of the problem? Keep in mind that GEF's client is considering the purchase of this property. As such, even casual estimates may be relied upon by the client as a buyer when determining such things as purchase price and terms.

You will recall that GEF was encouraged to prepare a professional services agreement that included a provision for limitation of consultant liability. However, there are instances when those protections may not apply and it is these with which GEF should be concerned.

In general, limitations on liability do not extend to gross negligence, willful or reckless conduct. These terms are generally defined as the intentional failure to perform a duty in reckless disregard of the consequences that affect the life or property of another. In other words, if the conduct of GEF is inconsistent with the generally accepted standards and principals within the industry, it may rise to the level of gross negligence.

GEF's client is understandably concerned about the cost associated with cleanup of the contamination. When pressed, GEF has provided an estimate in the field in a casual conversation with the client. If GEF has substantially underestimated the cleanup costs, and the client purchased the property with an expectation of lower cleanup costs, the limitations of liability contained in GEF's agreement may or may not be protective. If GEF's conduct is inconsistent with that of the industry, it could be interpreted as being grossly negligent and as a result the professional services agreement limitations of liability would no longer apply.

In addition to the contractual relationship between GEF and its client, GEF also should be mindful of its duties arising out of the business relationships with the client which are independent of any agreements contained within the contract. These duties can give rise to so called tort liability. You are all familiar with the general concept of tort liability which is the basis for claims for things such as automobile accidents. While less commonly thought of, there can be tort liability imposed as a result of the business relationship that GEF has with its client, independent of any contract.

In the case of our example for estimated cleanup costs, GEF may face tort liability in the form of negligent misrepresentation. GEF, having provided an estimate of cleanup costs at the client's request, may have potentially misrepresented the true cleanup costs in a negligent manner. Should GEF's client pursue a claim, they might assert that GEF was negligent in failing to provide the underlying considerations and assumptions that were relied upon in developing the estimated cleanup costs.

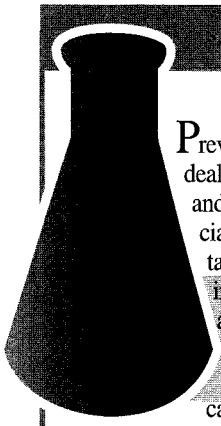
If the client can show the costs of cleanup were negligently misrepresented and GEF failed to exercise care regarding the contamination, and the client relied upon the estimates for cleanup costs when purchasing the property, then GEF's client may have the basis for asserting the claim.

In order to avoid yet another legal pitfall, GEF needs to resort to legal business basics which are documentation of work completed or information requested by a client as it relates to a project. Obviously, GEF should avoid casual or inadvertent communication that potentially is relied upon by a client such as the purchaser of the property in our example. When a request of this nature is received, GEF's field personnel should be instructed to inform the principals of such a request and the principals should discuss the matter in detail with the client. If the client desires to have some estimate of cleanup costs, it should be prepared along with a cover letter containing limitations as to the nature, scope and extent of the information provided. This greatly reduces the clients ability to assert their reliance on any estimates which may be provided.

As you can see in working through this example, the basic rules of business communication and common sense still apply. Document efforts that are conducted on a client's behalf and prepare written communication in response to client inquiries so there can be no question in the future about who said what and when. Yes, it is true it takes some work to prepare these types of agreements and correspondence. However, the rewards are not only liability protections but also better organization and client relations.

Jeffory J. Scharff is a partner in the law firm Scharff & Greben. The firm specializes in business, environmental, real estate law and related litigation.

CHEMISTS' CORNER



–by Don Peterson

Previous articles in this column have dealt with sampling considerations and observations from commercial laboratory personnel that, if taken to heart, will assist in keeping the quality of analytical data at its peak. This essay will be a departure from these themes. I will discuss a class of chemicals, pesticides that are routinely analyzed for soil and water. A brief review of the types of pesticides commonly encountered, their environmental persistence, use patterns, documented or potential appearance in groundwater, and an easily available reference will be presented. The information presented is an accumulation of literature information and personal experience. The author hopes that future contributors to this column will address other classes of chemicals (solvents, metals, etc.) and that this information will lead to a better understanding of the nature of the chemicals in need of testing.

Pesticides are chemicals that kill organisms considered to be pests (-cide means to cut down, kill). They can be classified in a variety of ways. Classifications include the type of organism killed, chemical structure, mode of action and mammalian toxicity. Insecticides, fungicides, herbicides, rodenticides, molluscicides, and nematocides among others, are terms routinely used that classify the pesticide by the organism targeted. Samplers of water and soil, as well as environmental laboratory personnel, likely know these chemicals better by the analytical method used to detect them (e.g. EPA-608, Organochlorine Pesticides and PCBs). This article will review the pesticides by analysis type.

Organochlorine (OC) Pesticides (EPA-508, 608, 8080). As a group, these are very persistent chemicals, many with a half-life greater than one year. They exhibit very low water solubility, low potential to evaporate, and a high affinity to soil organic matter. As a result, the occurrence of these chemicals in groundwater is rare under typical use conditions (surprisingly, Lindane and DDT have been found in groundwater). Presence in groundwater is possible if they are sprayed or dumped into a well or leach lines. They may also be found in situations where the water table is high and they have a carrier that aids movement through soil (e.g. emulsifiers found in pesticide formulations as in the case of pesticide applicator rinsate). Many OCs have been off the market for several years; however, they can be routinely detected in soil (DDT, DDE, Toxaphene) due to their persistence. Most OCs are insecticides (DDT, Toxaphene), although some are fungicides (PCNB) or herbicides (trifluralin). The analysis of this class of pesticide by EPA 508, 608, and 8080 is easily the most requested among pesticide methods.

Organophosphorous (OP) Pesticides (EPA-614, 1840). Low to medium persistence relative to the organochlorine pesticides. It is relatively rare to find an OP in soil unless an application has been made to the plot in the last 14-90 days. Relatively low water solubility, short life times, and high binding to soil organic matter make these chemicals unlikely to reach groundwater. Only one occurrence of an OP in groundwater is known to the author, and the circumstances were extremely unusual. Members of this group can show up in agricultural runoff water (Malathion, parathion) and have been detected in central valley fog during the winter months. Chlorpyrifos is among the most persistent and is commonly used as an ant control pesticide. Most OPs are insecticides.

Carbamate Pesticides (EPA 531.1, 632). All of the members of this group are insecticides with low environmental persistence relative to the OC pesticides. As a group, they are relatively water soluble, short lived in surface soil or water, and have medium binding to soil organic matter. Toxicity of this class of chemicals to humans is relatively low. If possible, analyze carbamates by EPA 531.1 (water) or EPA 531.1 modified (soil) instead of EPA 632, due to higher selectivity of the analysis by EPA 531.1 as compared with EPA 632. Carbofuran and Aldicarb have been found in groundwater in many parts of the country. Their appearance in groundwater is usually in areas where the water table is high and the soil is sandy. Both of these insecticides are relatively water soluble (or have a metabolite of toxic concern that is water soluble) and do not degrade significantly in soil once they pass through the aerobic, microbe-rich upper soil layer.

Chlorinated Herbicides (EPA 515, 615, 8150). This widely used class of herbicides is used for the control of broadleaf vegetation. These chemicals bind variably to soil, are not volatile, but can be very water soluble if they are formulated as salts. The persistence of these herbicides in soil range from one month (Dicamba) to over a year (Plicloram). These chemicals are often used in cereal grain production, range land weed control and rice production. 2,4-D, 2,4,5-T, Dinoseb, and Dicamba have been found in groundwater. Due to their wide use and persistence, analysis of the chlorinated herbicides is often requested in the assessment of agricultural sites prior to title transfer.

Triazines (EPA 619). This is another heavily used class of herbicides that control broadleaf and some grass vegetation. As a class of chemicals, they are relatively stable, exhibit low to slight water solubility, low volatility and good binding to soil with at least one-percent organic matter. Atrazine and simazine, used extensively in corn and grain production, have been found in groundwater. Their appearance in groundwater is usually in areas where the water table is high, the soil is sandy, and much of the land has been used continuously for the cultivation of corn grown for animal feed.

There are over 400 pesticidal active ingredients that have been registered for use in California over the past 25 years. It would be impossible to mention all of them in this space. Other classes of pesticides that may be encountered include dithiocarbamate fungicides, pyrethroid insecticides and urea herbicides, among others. If a sampler or project manager encounters a pesticide name that is unfamiliar, contact the laboratory for guidance as to type of analysis that needs to be performed. Many of the pesticides likely to be found in environmental samples are covered by the basic EPA analyses listed in this article. The *Farm Chemicals Handbook* contains an excellent dictionary of most of the pesticides that are or were registered. The Handbook's listings contain pesticide synonyms (lots of synonyms in the pesticide arena), uses, chemical properties, and more. This handbook is a must for organizations working with pesticides. (Order through Meister Publishing Co., 37733 Euclid Avenue, Wiloughby, OH 44094 (216) 942-2000).

Other references that may be useful are...

Water Quality and Pesticides, Vol. 7. *Groundwater Contamination by Pesticides*. California Water Resources Control Board (916) 657-2390, 1982.

Evaluation of Pesticides in Ground Water. Graner, W. et al. ACS Symposium Series 315, American Chemical Society, Washington, D.C. 1986.

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INNOVATIVE TECHNOLOGY

[Editor's Note: The purpose of this potential series of articles is to introduce several advanced technologies and give a brief synopsis of their capabilities. If HydroVisions readers express interest in additional articles similar to the one prepared below by Ms. Lacey Williams, then the series will be continued.]

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Understanding the hydraulics and hydrochemistry of groundwater is becoming a little easier with improved borehole technology. All the technologies summarized in this issue of HydroVisions are groundwater and aquifer characterization techniques. Two of them in particular, Hydrophysical Logging and the Acoustic Televiewer, are particularly helpful in the complicated regime of fractured bedrock. A third technology, the TL300 Temperature Logger, offers highly sensitive groundwater temperature readings for borehole characterization.

The Hydrophysical Logging technique employs advanced logging equipment and sophisticated software during specialized manipulation of the wellbore fluids. This technique, originally developed in association with nuclear waste isolation studies in very deep boreholes (5000 feet), has been recently improved for cost effective application in the shallower regime (<1000 feet). The capabilities of the technique include: 1) precise identification of hydraulically conductive fractures; 2) quantification of the flow rate of the formation water associated with the fractures; and, 3) the water quality of the formation water at depth. The ability to quantify these hydraulic and hydrochemical characteristics is due to advancements in circuitry and design of downhole equipment, and to upgrades in modeling software. These hardware and software components are utilized during pumping and replacement of the wellbore fluids with environmentally safe deionized water. The newly developed fluid management system allows for precise operator control of injection and extraction procedures while the tool is run continuously to provide a time-series of wellbore profiles.

The Acoustic Televiewer (ATV) has been in use for over 20 years, with the first commercial analog version being introduced in 1970 by Mobile Research. Since that time, though the analog tool provided limited information, this ultrasonic logging tool has been used for imaging borehole features and measuring the orientation and distribution of fractures. While the ATV itself has not undergone any major design changes since its original development, recent upgrades have led to a renewed interest in borehole imaging. New systems have been developed which convert ATV analog data to a digital format. Due to the digitization, a sophisticated software package developed by the Stanford Geophysics Department can be applied to attain much improved information from the same data. This interactive software has opened a new dimension in the interpretation of the data attained with the tool leading to its increased use for borehole interpretations associated with environmental work. This advanced analytical software utilizes two and three-dimensional displays of acoustic reflectivity and travel time. Very precise measurements of fracture orientation, aperture width, breakouts, and other borehole features are now possible. The data attained by the ATV can also be used to correct for borehole eccentricity, noise, off-centered tools, or deviated boreholes.

The TL-300 Temperature Logger is a brand new technology offering an advanced system for measuring temperatures in the borehole. The system consists of a logger and a multisensored cable which measure up to 300 different depth points downhole both simultaneously and repeatedly. Logging is conducted manually or through preprogramming of the logger at a rate designated by the operator. During recording of the sampling sessions, the LCD screen on the logger displays a bar graph of depth vs. temperature for the downhole sensors. The data may be played back at varying speeds or may be stored for later analysis. The cable containing the sensors is neutrally buoyant in water and remains highly flexible even at low temperatures; it is comparable to PVC in that it does not absorb water and is not affected by most chemicals or sunlight. The overall advancements of the TL-300 over single sensor temperature logging include: 1) an operator is not required for each temperature run since the logger can be preprogrammed to sample repeatedly at designated times; 2) the data input process is greatly simplified thereby decreasing the chances of measurement error; and, 3) there is increased time efficiency. For example, a 600-foot borehole can be measured in 7.5 seconds.

These technologies all have important implications for investigatory, characterization and remedial work in groundwater, and they are all commercially available. If there is sufficient interest, GRA is considering organizing a forum where these and other new technologies can be presented in depth.

For more information on these technologies, or to express interest in participating in a seminar and/or in continuation of this column, please call Lacey Williams, with GZA Special Wellbore Services at (510) 237-8395, or GRA's newsletter editor.

BRANCH ACTIVITIES

San Francisco Bay Branch

–by Jim Strandberg

The San Francisco Bay Branch will hold its first dinner meeting of 1993 on January 27th, at the Old Spaghetti Factory in Jack London Square. An announcement will be sent to all branch members in early January. The speaker will be Dr. Winona Victory, an EPA Region IX Scientist with the Office of Research and Development. Winona's talk will focus on the activities of the Office of Technology Transfer and Regulatory Support. This office is responsible for making new information available to the public free of charge through means such as an electronic bulletin board. We anticipate that EPA-funded research on new remediation technologies will be of interest to most GRA members. The San Francisco Bay Branch will also develop an organizational structure in January. Officers for 1993 will be appointed and/or elected informally in order to get the branch organized immediately. More traditional elections will be held at the next annual election (late fall of 1993). Any members interested in serving in the 1993 branch management should call Jim Strandberg, Woodward-Clyde Consultants at (510) 874-3041.

Central Coast Branch

–by Coleen Rowe

Regularly scheduled functions of GRA's Central Coast Branch have each been attended by more than 30 professionals and generally consist of a brief business meeting, dinner and keynote presentation. The branch's fourth regular meeting was held on the evening of November 19, 1992 at Mattei's Tavern Restaurant in Los Olivos. The guest speaker was Anthony Nelson, program director of the Geology/Hydrology Group of Metcalf & Eddy. His discussion of the relationships between project participants involved in contaminated site remediation was quite intriguing. His lecture stimulated the interest of many in the audience and culminated with a lively question and answer period. The evening was sponsored by Sinclair Well Products.

The next meeting will be held Thursday, January 21, 1993 with Mike Murray of Pacific Offshore Pipeline Co. (POPCO) scheduled as the keynote speaker. Mr. Murray will discuss the legislative process and highlights of important 1992 environmental bills which became law; Frank Dellechaie of the California State Board of Registration for Geologists and Geophysicists will speak at the March meeting.

Central Coast Branch meetings are held bi-monthly on the third Thursday of the month. Please contact Coleen Rowe of Hoover & Associates at (805) 965-3045 for details.

Southern California Branch

–by John J. Allen, Esq.

GRA's Southern California Branch held its fourth meeting on November 18, 1992. The keynote speaker was John J. Allen, a partner in the international law firm of Graham & James. Mr. Allen, who heads the firm's Environmental Practice Group, gave an overview of this year's significant environmental legislative accomplishments and shortcomings on both the federal and state level, emphasizing those areas of interest to us as groundwater professionals. The following is a brief summary of Mr. Allen's remarks.

. . .overview of this year's significant environmental legislative accomplishments and shortcomings. . .

Federal Legislation

On the positive side, the 102nd Congress managed to adopt a Comprehensive Energy Bill which includes provisions encouraging the use of alternative fuels and allows states authority to regulate certain types of low level radioactive waste disposal. The Central Valley Project in California received a substantial boost when Congress passed the Reclamations Projects Authorization and Adjustments Act intended to reform water distribution rights and procedures (largely to the benefit of urban citizenry and to the detriment of western agricultural and cattle interests). EPA also received appropriations for FY1993 from the tight-fisted legislators, getting a $6.89 billion authorization (less than the amount requested but enough to ensure maintenance of all major programs including CERCLA).

Congress did not get to three of the major environmental regulatory programs in this country. RCRA reauthorization efforts died amidst controversies over whether and how to allow for local restrictions on interstate transportation and disposal of solid and hazardous waste. The next session is expected to pick up this issue and to also focus on pollution prevention and waste minimization topics (for example, requiring manufacturers to minimize packaging and maximize recyclability of their products). In addition, the old concerns about exemptions for mining waste and the new problems posed by the judicial invalidation of EPA's mixture on "derived from" rules will be up for consideration. CERCLA is also due for reauthorization, and the process will trigger a major reexamination of the present program's effectiveness (or lack thereof) and its liability provisions (particularly the issues of municipal and lender liability).

Finally, the Clean Water Act is likely to undergo Congressional scrutiny, particularly in the areas of pollution, prevention, regulation of nonpoint source runoff, permit fees, wetlands and the state revolving loan fund for upgrading POTWs.

Congress could, but probably will not, address the thorny problem of requiring soil and groundwater cleanups to meet MCLs despite the lack of technology to do this, but will look more to watershed planning and less to technology-based plant effluent controls.

California

While the state legislature enacted no major environmental programs in its session, it made some significant changes to existing programs. For example, legislation by Senator Calderon and Assemblywoman Tanner added to the existing AB 2588 Air Toxics program by setting guidelines for health based risk assessments which are required by those facilities whose emissions rank them as "significant health risks"; requires these facilities to work with the local air districts to develop and implement

plans for the phased-in reduction of these emissions; and expands the Air Resource Board's ability to identify and list air toxics for which inventories must be conducted annually.

Permit-by-Rule (PBR) legislation was also adopted and includes a five tiered system intended to help manufacturers and others who utilize certain types of simple on-site treatment of certain waste streams. The intent was to eliminate the burdens associated with the initial PBR efforts last year; however, the extent to which this will occur depends on the regulation DTSC will adopt to implement the program. Unlike the stormwater discharge program, where the SWRCB made major revisions to lighten the monitoring plan requirements and even created an exemption procedure for some otherwise-covered entities, the revised PBR program may not be as simple as intended.

Most important to those involved in state Superfund cleanups was the adoption of SB 2056 (another Senator Calderon effort), which significantly alters the liability provisions of this state program. The bill clarifies the state's ability to recover treble damages, establishes the right of private citizens to sue under its provisions to recover their response costs (ala CERCLA) and gives those private parties the right to seek treble damages from non-settling and non-participating PRPs, subject to prenotification to the state and to sharing with the state on any treble damage recoveries.

Not addressed by the legislature, but on the minds of many, are the problems posed by the major regional Superfund sites in the San Gabriel and San Fernando Valleys. Property owners, lenders and industrial/manufacturing firms in the area are burdened by the specter of CERCLA liability for cleanup of two aquifers which lie beneath tens of thousands of acres of commercial and residential land. Previous efforts to adopt a legislative program to focus on the cleanup and avoid the CERCLA liability sand trap have not succeeded; however, the site of the areas involved and the potential economic impact to those within them are too great to ignore and the existing liability system is not appropriate for dealing with the situation.

THE FUTURE

In spite of the new administration, Mr. Allen sees a continuing shift away from the "command and control" environmental legislation of the 1970s and 80s and an increasing focus on "market-based" incentives to achieve program goals. This is driven largely by the continuing economic circumstances, a recognition of the limits of traditional top down regulation, and an awareness of the impact existing programs have on the ability of U.S. business to compete in a global market. The up-coming Congressional debate on the North American Free Trade Agreement (NAFTA) will focus on the first and last of these factors, and the continued movement of manufacturers to Mexico and elsewhere will also drive environmental compliance efforts in this direction.

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The Southern California Branch meetings are scheduled for the third Wednesday of odd numbered months. The next meeting is scheduled for January 20, 1993, at which Dr. Robert L. Stollar, hydrogeologist and author of "Contaminant Hydrogeology," will discuss the remedial approach utilized at a Superfund site contaminated with dissolved trichloroethylene (TCE). The site is underlain by a perched zone which overlies an unconfined sole-source aquifer.

Sacramento Branch

–by David Von Aspern

As described in the previous HYDROVISIONS issue, the Sacramento Branch has formed a Technical Standards and Guidance Committee. John Phillips and Dennis Nakamoto attended the November 1992 meeting held in Stockton concerning San Joaquin County's *Proposed Revised Well Standards (Rules and Regulations)*. The meeting was attended by approximately 50 persons, many of which were either water well drillers or farmers. The group met until 10:00pm but was only able to review about one-half of the proposed ordinance! Another meeting is tentatively scheduled for January 27th, 1993. The County intends to compose a new draft of the proposed ordinance, incorporating comments that have been received to date. For more information, please contact John at (916) 925-4789 or Dennis at (916) 371-5821.

With the arrival of 1993 came the need to make provisions for establishing new branch leadership. To that end, a Sacramento Branch Nominating Committee was established, being chaired by Carl Hauge. The committee recommended a slate of officers, as described below; ballots will be distributed with the next dinner meeting announcement. The ballots will include space for write-in candidates.

The Nominating Committee candidate recommendations are:

John Phillips	President
Dennis Nakamoto	Vice President
J.C. Isham	Secretary
David Von Aspern	Treasurer
Noel Lerner	Member-at-Large
Jane Faria	Member-at-Large

The fifth dinner meeting of GRA's Sacramento Branch was a joint event with the Sacramento Chapter of the Association of Engineering Geologists (AEG), and was held at the Royal Hong King Lum restaurant in downtown Sacramento. A whopping 111 persons attended! The evening was sponsored by Wheeldon & Associates of Placerville, California; brief AEG and GRA business meetings were held. The event was hosted with a Christmas flair, complete with decorations, an enhanced Chinese dinner menu and a door prize drawing; prizes were donated by 22 Sacramento area firms and included a diversity of gifts ranging from a custom made Christmas wreath, tickets to The Nutcracker, a Sacramento Kings game and the movies, a Sony Discman, bountiful food baskets, several bottles of wine and cash prizes! Perhaps the most pleasing aspect of the evening, made possible by the joint nature of the event and in tune with the holiday season, was the occurrence of cheerful greetings made among colleagues that hadn't seen each other in months or even years.

George Wheeldon and Carl Hauge team-presented an excellent program entitled "Groundwater Resources in Hard Rock: Availability

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What do you Owe...

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out these opportunities at least once each year by voicing your interest to your manager. In most instances, managers will respond positively to an enthusiastic appeal for additional education, whether inside or outside the company. If the continuing education course is provided by an outside organization, however, its cost to your manager will normally be higher than for an in-house program. To lessen the cost differential, offer to put on one or more office seminars on important elements of the program you have attended. In addition, demonstrate to your manager that the personal contacts that you made at the seminar can help your office staff in one or more difficult problem areas. Most course leaders, for example, routinely offer their on-going advice to course attendees on specific problems. If you seek expansive advice from this resource, however, you should expect to be charged accordingly. Frequently, your fellow course attendees have already solved problems you are currently facing and are willing to share their experiences. Thus, it is not sufficient to merely attend the course and successfully assimilate the information. You have an obligation to share that information as widely as possible and to utilize your course contacts to benefit your office staff.

The second way to increase your value to your organization, especially as an environmental consultant, is to take charge of securing your own business opportunities. If you develop the ability to obtain your own clients, your value to the organization will rise astonishingly, because inevitably you will probably secure more business than you can do yourself. You will then become what is known as a "rain maker" for your organization. As a result, your job security is enhanced far beyond what you could achieve merely by your own managerial or technical skills.

If you work for a state, regional, or local agency, your ability to work on specific projects in which you have an interest lies in your skill in selling your ideas and expertise to those individuals responsible for assigning these projects. Thus, just like your consultant colleagues, you must learn to market your skills. The only difference is the "client" ordinarily works for the same organization you do.

It's not difficult to learn to sell yourself. You start with your current clients — those you know who are already pleased with the quality of your work. Just ask for additional work at the appropriate time. You'll be surprised at how often the client will respond favorably. To impress people you don't know requires more effort in terms of preparation. Learn to speak about your skills but only in how they meet specific client needs. Place yourself in positions where potential clients can hear or read about you, such as at professional conferences and public forums. Over time, proper preparation plus exposure will usually guarantee success. But don't underestimate the energy required to achieve results. You will have to seize opportunities that frighten many people because they don't believe sufficiently in what they have to offer other people. Belief in yourself is critical if you expect anyone else to believe in you. But if you are willing to make the effort and take some chances, the rewards will be greater than you might imagine and, as a result, your personal growth will accelerate dramatically.

Last of all, become a part of the solution for your organization, not part of the problem. No organization is perfect, or even near perfect, because it is made up of individuals whose collective skills are rarely adequate to meet all the challenges facing the organization. When a problem arises, however, in which you have a personal interest, it is not sufficient merely to identify the problem and lay the responsibility for solving it on someone else's door step. If resolution of the problem is important to you, study it well enough so you can propose an array of potential solutions to the individuals who must take appropriate action. Then work with these people to resolve the problem even if none of your solutions prove to be appropriate in light of all the facts.

Occasionally you will be rebuffed in your well-intentioned efforts to assist the organization in problem solving. For a variety of reasons, responsible individuals may not handle your suggestions as positively as you might like. But be realistic and try to place yourself in their position. For example, your concern may be only one of a myriad of problems they are facing simultaneously, and the surrounding circumstances are much more difficult than you imagined. Thus, your suggestions may be superficial in light of the greater complexity. Furthermore, responsible individuals sometimes lack the skill or courtesy to tell you why your ideas in this instance are not helpful. The greatest danger here is that you will personalize this rejection. That is, you will believe *you* are being rejected, not your idea. This is an enormous difference that often times becomes muddied in times of controversy. Single or even multiple rejections of your ideas should not deter you from an on-going obligation to help your organization. Eventually you will be heard and make a positive contribution. As a result, you will be thought of as someone who makes the organization run better.

Pursuit of the three objectives discussed above will not guarantee that you reach every goal you desire. But even minimal success in all three will bring remarkable results in your ability to help your organization achieve its objectives. And as your organization reaches its objectives, you will be amply rewarded because you have played such a vital role in its success. Thus, our obligation is to maximize our value to the organization first. Thereafter, we can legitimately expect our organization to reward us consistent with our efforts. But the first move is up to us!

Dr. Driscoll is Vice President for Training and Professional Development with Geraghty & Miller, Inc., in Minneapolis, MN.

COMMITTEE REPORTS

Newsletter Committee

"The Tire Track Mystery"

GRA members as of the fall 1992 HydroVisions issue may recall an approximate three-inch wide black mark on the last page of the newsletter. The last issue was mailed at the first class postal rate to ensure that GRA members received their newsletters prior to the 1992 Annual Meeting and Conference. Much to our surprise, however, the first class-mailed newsletter was postmarked with black ink in such a way that it reminded one of tire tracks running across the page!

Your newsletter editor immediately followed up with the postal service concerning this matter (well, it was almost immediate, as he first listened to a couple days worth of soothing music before dropping in on the postal service). As it turns out, the opening of the new General Mail Facility in West Sacramento, California brought with it the "next generation" of mail processing equipment. Apparently, the postal service in the past has had some difficulty canceling all the postage that is sometimes placed nearly all the way across the upper edge of flat mail pieces. Consequently, the postal service developed their new, tire track-like automated cancellation equipment, capable of printing large black marks that become nothing less than an aberration when placed on items like HydroVisions. Try as he might, your editor was unable to convince several different layers of postal service bureaucracy that at least a partial postage refund was in order.

The previous newsletter also contained the "Address Correction Requested" provision available through the postal service. We were overwhelmed by the number of newsletters returned, each of which required the payment of additional postage before being released. With this in mind, and more importantly with our duty to serve the membership in mind, particularly with respect to distributing GRA mail as quickly and efficiently as possible, **please keep us informed of current mailing addresses and other vital information**. Please mail this information to GRA, P.O. Box 355, Davis, CA 95617-0355, or telephone Ms. Wendy Ernst at (916) 661-0884. Thank you for your diligence in this regard.

Please also keep in mind that this is the last HydroVisions to be "mass mailed" (see President's Message, this issue). So, if you're not yet a GRA member, take advantage of the application for membership contained in this newsletter.

BRANCH ACTIVITIES

Continued from page 13

and Land Use Planning in the Sierra Nevada Foothills," which was responsible in large part for the success of the evening. Carl Hauge spoke first, highlighting both the technical aspects of the occurrence of groundwater in fractured rock and statistical information derived from DWR foothill groundwater studies, through the use of informative overhead transparencies. Mr. Hauge explained the fracture system characteristics controlling groundwater development. These include fracture aperture (opening size), spacing or density, fracture interconnection over a large area, fracture orientation (steeply vs. gently dipping fractures) and soil cover (affecting storage and water infiltration).

Mr. Wheeldon discussed systematic approaches to the evaluation of groundwater resources designed to ensure adequate groundwater supplies. His presentation included color slides and a synopsis of an intriguing, major study performed by his firm for a 400-acre foothill subdivision, the developer of which desired to sell 75 large lots with operating water supply wells. Mr. Wheeldon illustrated how within the project area well production ranged from three to 120 gallons per minute. The majority of wells in the project area were completed to depths of 300 to 400 feet; the higher volume wells were found to occur when completed above a 400-foot depth. Mr. Wheeldon expressed the highly variable nature of groundwater supplies of foothill regions, indicating that one who practices there will not be dealing with the standard hydrologic formulas.

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ANNOUNCEMENTS

"BUYING AND SELLING WATER IN CALIFORNIA"

Topic of January 29, 1993 UCSB Seminar

Issues surrounding a new voluntary state water marketing plan, allowing California public and private water users to buy and sell water, will be the topic of an all-day seminar co-sponsored by the University of California, Santa Barbara Extension and the Santa Barbara law firm of Hatch and Parent.

The seminar, "Water Marketing: Current Issues and Opportunities," will be held 9:00am to 4:00pm at Fess Parker's Red Lion Resort in Santa Barbara. It will examine the overall issue of water marketing in California, how public and private water users can make financially sound water transfers, and the legal, environmental and regulatory factors to consider when buying and selling water.

Scott S. Slater, partner with Hatch and Parent is serving as the seminar coordinator; he may be contacted at (805) 963-9231. The cost for the seminar is $165, which includes lunch and a course syllabus. Six units of MCLE credit are available. For details call (805) 893-4143 or contact Diane Rumbaugh for additional information at (805) 493-2877.

GRA operations at this time are solely based on membership dues and contributions by sponsors. Financial support is being sought to establish the new Association in an effective and timely manner to address the many issues related to California's groundwater resources which are facing us today.

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