

THE ARIZONA HYDROLOGICAL SOCIETY

NEWSLETTER



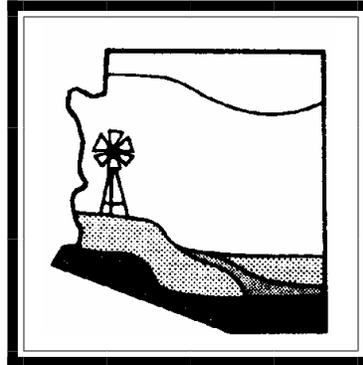
INTEGRATED EARTH OBSERVATION SYSTEMS CONTINUE TO GAIN MOMENTUM AT BOTH NATIONAL AND INTERNATIONAL LEVELS

The following article is introduced by an excerpt of an August 17, 2004, EPA press release. The article itself is an April 2004 NOAA announcement which can be viewed online, complete with graphics, at <http://www.magazine.noaa.gov/stories/mag130.htm>. LKB

“EPA Administrator Michael O. Leavitt and Vice Admiral Conrad C. Lautenbacher, Administrator of the National Oceanic and Atmospheric Administration (NOAA) today discussed the potential benefits to states of the planned Global Earth Observation System of Systems (GEOSS). The proposed worldwide network could help predict natural disasters and save lives.

In April, Administrators Leavitt and Lautenbacher visited Tokyo to participate in the Earth Observation Summit II, where ministers and ambassadors from 44 nations and 26 international groups agreed to work together to create the global monitoring system...”

April 5, 2004 — It has been almost a year since retired Navy Vice Adm. Conrad C. Lautenbacher, Ph.D., undersecretary of commerce for oceans and atmosphere and NOAA administrator, publicly announced the United States’ intention to lead an international effort towards a comprehensive, integrated, and sustained Earth observing sys-



tem to provide a deeper understanding of the complex systems of Planet Earth. “The forces of societal change and global development present new challenges for the world’s leaders — challenges that will require future advances in our existing observing systems to the next level of Earth observation,” explained Lautenbacher at the recent meeting of the Group on Earth Observations held in South Africa. Lautenbacher is effectively rallying the international community to join together

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SYMPOSIUM UPDATE 2004

-by Gary Burchard
Symposium Co-Chair,
Metro Water District

The AHS 2004 Symposium, “The Value of Water,” is now only days away. If you haven’t yet made up your mind whether to attend, this will convince you. In addition to the 15 symposium planners, many people have worked diligently over the past year to provide you an enjoyable and informative experience. We have a record seventy-seven speakers who will present papers, and 14 posters will be featured. Two keynote speakers and two lunch speakers will address the entire assembly of participants. Twenty-two exhibitors will show you the latest they have to offer the hydrologic community. Additionally, the planning committee has

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UPDATE ON 2004 ANNUAL AHS SYMPOSIUM SPONSORS/EXHIBITORS

-by Mike Block
Symposium Fundraising Chair,
Metro Water District

In addition to the fantastic sponsors we thanked in the July and August newsletters, we are pleased to announce those many other organizations which have renewed or become sponsors/exhibitors to this year's annual symposium! Presently, the Symposium Planning Committee has raised more than 3 percent above its sponsorship goal of \$30,000.

The Symposium Committee appreciates the renewal by URS Corporation as a Corporate sponsor. We also appreciate Phelps Dodge becoming a Corporate sponsor this year.

We have 21 confirmed exhibitors which include our Society and Corporate sponsors. New exhibitors include Arizona Geological Society, Columbia Analytical Services, and Prosonic Corporation. The new total leaves only one exhibit space left inside the ballroom foyer. If you are interested in exhibiting contact me to secure this space.

Thanks to Brown and Caldwell for sponsoring the Wednesday Night Ice Breaker and to Hydro Geo Chem for sponsoring the Thursday Dinner. Thanks also to Malcolm Pirnie, Oglebay Norton Industrial Sands, and Castro Engineering for becoming Break sponsors.

A special thanks to Pima Community College for being an advertiser at the Student Career Workshop on Friday afternoon.



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in building "a system of systems" that will provide the tools needed "to take the pulse of the planet." Just as medical doctors must understand the pulse, blood pressure, and temperature of their patients (as well as the interrelation of these vital signs) to make an accurate diagnosis, so too should the Earth be viewed as an interrelated and complex living system.

Lautenbacher speaks from a somewhat unique perspective as head of what might be described as the United States' "operational ecosystem science agency." NOAA itself operates a complex network of observing systems consisting of satellites and an extensive surface network of towers, balloons, buoys, and aircraft. But Lautenbacher knows that NOAA — or the United States for that matter — alone cannot create a global observing system. As a result, his message and involvement in Earth observations has gained momentum at both the national and international levels:

- Domestically, Lautenbacher is one of three co-chairmen on the National Science and Technology Council's Committee on Environmental and Natural Resources, which is developing a multi-year plan for U.S. observational activities, through an Interagency Working Group on Earth Observations. IWGEO has 15 agencies working together to develop the U.S. national plan, as well as the U.S. inputs to the international effort.

- Internationally, Lautenbacher serves as the U.S. representative (co-chair) to an intergovernmental working group on global

Earth observation systems (known as GEO), along with representatives of the European Commission, Japan, and South Africa. GEO strives to monitor global climate and environmental systems at the international level and has five working subgroups (i.e., architecture, capacity building, data utilization, user requirements, and outreach and international cooperation).

First-Ever Global Earth Observation Summit

The U.S.-hosted Earth Observation Summit held almost a year ago (July 31, 2003) in Washington, D.C., was the first step in bringing together high-level ministers of the G-8 industrial countries (plus Russia, other interested nations, and international institutions) to discuss the kind of political commitment that will be needed to build a comprehensive and integrated Earth observing system. As a result of the historic meeting, 34 nations, plus the European Commission, joined the United States in adopting a declaration calling for action in strengthening global cooperation on Earth observations. Today that number has grown to 46 participating countries.

The declaration also established the ad hoc intergovernmental group on global Earth observations (GEO). Meeting for the first time immediately after the Summit, GEO agreed to design a framework for a 10-year implementation plan for a global EOS, which will soon be presented at a second ministerial level Summit meeting on April 25, 2004, in Tokyo. Two other deliverables will also be presented at this meeting: 1) the GEO Subgroup Reports to the



GEOSS CONTINUED FROM
PAGE 2

Earth Observation Summit II, technical documents, which will serve as the foundation for developing the 10-year implementation plan and 2) a communiqué, which will communicate the ministerial agreement. Since its first meeting, GEO has met two more times in both Italy and South Africa to work on steps required for connecting and sustaining observing systems, data management and standards, and incorporating user requirements.

A recent example of international cooperation towards establishing a global Earth observing system took place during the last GEO meeting in South Africa. On Feb. 26, 2003, a group of researchers departed from Cape Town with NOAA's Jim Farrington (Atlantic Oceanographic and Meteorological Laboratory) and University of Cape Town's Pieter Truter for a 20-day expedition where these two countries jointly deployed 12 Argo profiling floats, 10 surface drifters, and approximately 240 XBT's on the way to Newark, NJ. One objective of this trip is to train South African personnel on the deployment of these instruments. This, and other projects like it, will help to further understand the Earth's ocean and will be a key component of a comprehensive global observing system.

Three Imperatives Behind Earth Observation

There are three imperatives — social, economic, and scientific — that drive the need for building an integrated Earth observation system:

Social: As populations move from rural areas to urban centers (especially along the coast), there has been a dramatic shift in the distribution of goods, services, and land use, which in turn has increased competition for access to resources (such as water, arable land, and improved living conditions). These changes call for a quantum improvement in such products as precipitation forecasts for food production, warnings of natural disasters, seasonal forecasts for climate and drought, etc.

Economic: The potential economic benefits of an Earth observation system are enormous. With more than \$3 trillion of U.S. GDP (about one-third of the nation's economy) affected by climate and weather (including agriculture, energy, construction, finance, insurance, real estate, retail and whole sale trade, manufacturing, and the travel and transportation industry sectors) there are powerful economic, as well as environmental, incentives for gaining a greater understanding of these phenomena. Fortunately, the return on investments in Earth observation systems to date has brought great benefits to the general public. Just imagine, the return on investment which could be achieved for a fully networked global EOS.

Science: A truly integrated Earth observation system will be needed to provide the sound science necessary to make policy decisions in the global context of social and economic change. Sound science begins with observations and is based on robust data sets that are consistent and standardized.

Benefits and Blind Spots

Most people today are aware of the benefits of satellite, aircraft, and ground-based measurements that document environmental changes. Existing operational data acquisition, analysis, and distribution systems already constitute an essential — but far from complete — source of information for scientific studies and assessments of the global Earth system and climate. However, there are too many individual data sets and limited observation systems that lack integration and consistency. Additionally, there are many "blind spots," such as data in the upper atmosphere and on the oceans in the Southern hemisphere. Sustained data from these "blind spots" will be essential to unraveling the complexities of such entities as the carbon cycle, water cycle, and numerous other biological processes (including more accurate predictions of climate change, crop production, energy and water use, disease outbreaks, and natural hazards). The bottom line is that the entire globe needs to know much more about how the planet works. Furthermore, with the difficult social and economic issues facing the world today, we must all move beyond the separate disciplines of science (i.e., chemistry, physics, biology, geology) toward a "big picture" view of life on Earth.

Existing Observations Systems

One of the best examples that can be used as a smaller-scale model for what is needed in order to establish a fully integrated global observing system is what has been accomplished in un-

CHAPTER NEWS



FLAGSTAFF

-by Nancy Riccio
Plateau TechComm

SUMMER MEETING SCHEDULE

The Flagstaff Chapter is still on summer break. Talks and meetings will resume again in the fall.



PHOENIX

-by Lee-Anna Walker
Archaeological Consulting Services, Ltd.

AUGUST & SEPTEMBER MEETINGS

Because chapters are preparing for the 2004 Annual AHS Symposium in September, there will not be monthly dinner meetings during August and September. We plan on seeing you in Tucson instead! Regular monthly dinner meetings will resume on October 12 at Macayo's when our next speak will be Joost deJong who will present "Climate Change, a New Challenge for Water Management in the Netherlands." Watch next month's newsletter for an abstract and more details.

PHOENIX BOARD MEMBER CHANGES

Christie O'Day has been nominated and accepted a position on the Phoenix board for the remainder of Julie Rutkowski's term. Thank you Christie!

2005 PHOENIX CHAPTER BOARD NOMINATIONS

Believe it or not, it's time to start thinking about 2005 Phoenix

Chapter and Corporate Board nominations! If you are interested in becoming an officer or wish to nominate someone in the Phoenix Chapter, please contact Katy Brantingham, KBrantingham@arcadis-us.com



TUCSON

-by Phil Bredfeldt
Clear Creek Associates

AUGUST & SEPTEMBER MEETINGS

The Tucson Chapter will not hold regular monthly meetings during August or September. We invite you all to attend the AHS Annual Symposium to be held in Tucson on September 15-18 (see related article on page 1).

OCTOBER MEETING

Please note early meeting!!!

Tuesday, October 5, 2004

Time:
6:30 PM No Host Social Half-Hour
7:00 PM Dinner
8:00 PM Presentation

Location:
Viscount Suite Hotel
4855 East Broadway Blvd.
Tucson
(Between Swan and Rosemont on the north side of Broadway)

Cost: The buffet dinner is \$15.00 for AHS members and \$20.00 for non-members.

Topic: "Recent Advances in Characterizing Ground Water Flow and Chemical Transport in Fractured Rock: From Cores to Kilometers" presented by Dr. Allen Shapiro, US Geological Survey, Reston

The National Ground Water Association's Darcy Lecturer, Dr. Allen Shapiro, will be the featured speaker at the Tucson Chapter annual dinner meeting in October. Dr. Shapiro is a research hydrologist at the USGS in Reston, Virginia, specializing in fracture flow and chemical transport in fractured rock.

(from the NGWA website) [His] lecture discusses fractured rock aquifers, which provide water for domestic use, locations for isolating hazardous and toxic waste, and sites for foundations and infrastructure.

For these issues, the dimensions over which the characterization of ground water flow and chemical transport needs to be conducted can range from meters to kilometers. Critical to the evaluation of these problems is how formation properties may vary over increasingly larger dimensions. Theoretical methods of scaling formation properties may not be successful in their application to fractured rock, because of the structural complexity and extreme variability in the hydraulic properties of bedrock environments.

The influence of the physical dimensions of the problem on the magnitude of formation properties is viewed through the synthesis of laboratory studies,

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TUCSON NEWS
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controlled field-scale experiments, and the interpretation of ambient ground water flow and the spatial distribution of dissolved constituents, gases, and isotopes using ground water flow and chemical-transport modeling.

Cost for the buffet dinner is \$15.00 for AHS members and \$20.00 for non-members.

RSVP to Anne Kramer Huth at (520) 743-8343 or akramer@hwr.arizona.edu by September 28. Payment is due in advance and should be made by Friday, October 1. Mail checks payable to the Tucson AHS Chapter to Anne at: 4213 W Winter Wash Dr Tucson, AZ 85745

OCTOBER DINNER SPONSORSHIPS

There may still be sponsorship opportunities available for your business. For a complete description of the various sponsorship options, please see the Tucson News section of your August newsletter (or contact me if you no longer have it). For more information, please contact Chapter Vice President Anne Huth (akramer@hwr.arizona.edu) or Chapter President Bill Petroustson (bill.petroustson@amec.com).

Remember, your sponsorships will help AHS enhance its educational endeavors. Proceeds from our dinner meeting will provide addi-

tional funds for the Halpenny Intern Scholarship Fund. 2005 NOMINATIONS by Bill Petroustson, Tucson AHS Chapter President

You still have time to submit your nomination for next year's Tucson Chapter officers! Nominate yourself or nominate someone who you believe would be an excellent candidate to serve as President, Vice-President, Treasurer, Secretary, Chapter Director, Student Director, Corporate Board member, or Student Liaison. No special skills or experience are needed, just a desire to be involved!

To obtain a nomination form, go to the Tucson Chapter portion of the AHS website (www.azhydrosoc.org). Return your completed nomination form by email to bill.petroustson@amec.com or fax to Bill Petroustson at (480) 785-0970. Nominations will be accepted up until October 8 for the November election.

For more information about officer duties, please contact Bill Petroustson at (520) 323-6151,



WATER NEWS FROM AROUND THE WORLD

Here are some interesting drips and drops from around the west and the world. LKB

HEY! YOU! GET OFF OF MY CLOUD

A July 15, 2004, Reuters piece gives the old song a whole new meaning. As areas of China suffer through extended

drought, cloud seeding has become a common practice, especially near large cities. This is not without a different kind "fallout."

The *China Daily* has reported that there is controversy between regions; some feel one area's success with rainmaking intercepts moisture meant for another. In cities in central Henan province, the debate is particularly heated. Meteorological officials in Zhoukou were accusing their counterparts in Pingdingshan of harvesting moisture that would have likely drifted their way.

ARID SAUDI ARABIA IS STRUGGLING TO CUT WATER USE

In another Reuters piece, written by Dominic Evans in March, it appears that water officials are beginning to rethink the way water is used in the kingdom. In the hopes of reducing future infrastructure costs, Saudi Arabia is pushing a major conservation drive with the goal of drastically reducing its domestic water use.

Vice Minister of Water and Electricity, Abdullah al-Hussayen, said the ministry is dispensing conservation kits to over 30% of Saudi households, or about 1 million houses. Kits include a displacement bag to reduce toilet flush and special aerator taps to cut water flow. A media campaign is being waged as well.

Hussayen said the government is also reviewing price tariffs for water, which is either pumped from deep wells or produced by costly desalination. According

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WATER NEWS CONTINUED FROM PAGE 5

to him, the average household water bill is the equivalent of buying five cans of soda, or about \$1.25, and may not even cover the cost of reading the meter.

Interestingly, domestic water use in Saudi Arabia is just a drop in the bucket, so to speak. The vast majority of water use is agricultural. Groundwater, the sole source of irrigation water, is pumped at the rate of about 20 billion cubic meters per year. Agriculture is heavily subsidized, a fact that critics have been questioning since the oil boom in the 1970s.

"You need to examine whether you need to produce the whole domestic consumption of wheat, or perhaps make do with half," Hussayen said.

STUDY SAYS POLLUTION MAY ADD TO DROUGHT

Closer to home, a *Las Vegas Sun* (Molly Ball, 7/19/04) item discusses why dirty air might make a drought worse.

Scientists with Nevada's Desert Research Institute say airborne pollutants, principally sulfates and nitrates, traceable to coal plants in Western states could be reducing the amount of water in snowfall over the Rockies and other western ranges. Randy Borys, director of the institute's Storm Peak Laboratory in Steamboat Springs, Colorado, says, "We have documented cases where half of the water was not snowing out of clouds because of air pollution".

Already measured declines in snowfall due to the drought, and

warmer temperatures causing earlier melt of mountain snowpacks, has severe implications for water management. When factoring in possible effects of airborne pollutants, the picture gets even uglier.

The problem seems ironic. Because precipitation begins its long fall to earth by moisture coalescing around some nucleus, it would seem that more small particles would create more potential nuclei. Here's the rub — a drop has to reach a certain size before it gets heavy enough to fall. If you have twice as many potential nuclei but the same amount of moisture, drops will be "competing" for water. The resulting smaller drops are more likely to stay in the atmosphere as clouds rather than fall as precipitation.

Borys notes that this effect alone will not produce a drought, the result of a much bigger set of factors. It can however exacerbate an already existing one.

Ken Albright, director of resources for the Southern Nevada Water Authority, says, "If this is true, it poses new questions for water managers throughout the region on the global relationship between industry and human interaction with the environment. This is huge."

According to Energy Argus, many new coal-fired power plants are currently being proposed in Nevada, Colorado, Utah, Wyoming, Arizona, and New Mexico. If even a few of those plants are built, Vickie Patton, of the nonprofit Environmental Defense said, "the Western airshed would experience a significant rise in the two pollut-

ants that are singled out in the DRI study, not to mention a staggering and unmitigated addition of greenhouse gases."

As for Borys, he hopes that his work will show that air pollution has wide-ranging effects that must be considered in any resource management. "Air pollution knows no boundaries," he added, citing oil fires in Kuwait and dust storms in Mongolia that produced effects literally across the globe. "We're all in the same soup, so to speak. Everyone needs to take responsibility to make sure we do our part to maintain our environ-



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derstanding, forecasting, and modeling the El Niño phenomenon. It took intense international cooperation and 20 years to build, but the major investments in predictive capability — and the observing platforms that provide the data — have proven to be of immense economic and social benefit. Understanding El Niño and its influence on the atmosphere requires the ability to observe the physical state of the oceans and atmosphere on a continuing basis. This was achieved by using a combined satellite and in-situ observing system consisting of a moored array, the TAO array, and complementary subsurface observations spanning the Tropical Pacific. Resulting observations are then used to produce seasonal forecasts of the impact of El Niño on North America. In fact, NOAA successfully predicted the very large 1997-1998 El Niño — six months in advance — thanks to Earth observation systems. The next step is to expand and build upon these pieces to diagnose mid-term and long-term climate effects —



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and climate is just one piece of the puzzle. Future observing systems should include sensors capable of unraveling the mysteries of the wide variety of physical, chemical, geological, and biological cycles.

NOAA has contributed significantly to both national and global observing systems, especially those pertaining to the oceans and atmosphere. Specifically, NOAA's geostationary and polar orbiting satellites provide continuous coverage of North and South America and its adjoining oceans 24-hours a day, and these space assets are complimented by an extensive surface network of towers, balloons, buoys, ships, and aircraft.

Which Pieces Are Missing?

NOAA has been working to organize itself so that its mission can be achieved in a way that looks at the "whole Earth system." As part of this effort, NOAA is collecting an inventory of all of its observing systems and creating the NOAA Observing System Architecture to document and identify ways to evolve them in an integrated manner. Thus far, NOAA has found that it has 102 separate observing systems measuring 521 different environmental parameters. By understanding its existing observing systems and how they are structured to meet mission goals (such as climate change), NOAA hopes to provide a basis upon which its systems can easily be integrated with other agency observing systems and international programs. In the meantime, NOAA will continue to operate, sustain, and enhance existing national

observation programs — monitoring sea level, estuarine reserves, and of shoreline change to name just a few. NOAA is also committed to continued cooperation with its international partners and efforts to assist developing countries with the capacity building required to participate in this effort.

NOAA applauds similar efforts by other organizations. The World Meteorological Organization for example, has played a pioneering role in the global coordination of geophysical and meteorological experiments that have helped to create the operational foundations for the worldwide monitoring of atmospheric chemical composition and climate variability. Other monitoring systems in development include Global Ocean Observing System, Global Climate Observing System, Global Atmosphere Watch, and the Global Terrestrial Observing System. The Committee on Earth Observation Satellites and the Integrated Global Observing Strategy have also made significant contributions to this effort.

Data Management & Super Computers

Perhaps the most important, but easily neglected components of an integrated information system for planet Earth are the areas of data management and high-performance computing capacity. In order to realize the full benefits of an integrated global EOS, there needs to be the capacity to standardize, analyze, exchange, store, and disseminate new and historic data and information on a free and open basis. Supercomputers are also needed to model the complex ecosystem-based processes that define the world.

NOAA applauds the latest developments in this field, such as Japan's Earth Simulator, and has also upgraded its own weather and climate supercomputers. Specifically, NOAA's new computer system has more than twice the processing power of the Class VIII supercomputer it replaced. Making more than 450 billion calculations per second, it is poised to give the NOAA National Weather Service the ability to improve local and national forecast accuracy, as well as extend watch and warning lead times for potential severe weather. Yet this is only the beginning — the development of a fully integrated Earth observation system will require sustained investment in this and other data management and high-performance computing tools.

The social, economic, and scientific benefits of an integrated Earth observation system can only be achieved as an international effort. Only by building upon existing systems, and working cooperatively on a global scale will it be possible to meet the challenges associated with planning and developing such a system. The combined global observations of terrestrial, ocean, and atmospheric phenomena around the globe will move the world closer to providing "sound science for sound decisions" to national and international decision-makers. At the third meeting of GEO in South Africa last February (2004), Deputy Minister Sonjica of South Africa's Ministry of Arts, Culture, Science, and Technology lauded the work of GEO as "finding solutions to human problems." A benefits-centric approach is helping to achieve that goal of a comprehensive Earth observation sys-



**SYMPOSIUM UPDATE
CONTINUED FROM PAGE 1**

afforded four non-profit organizations the opportunity to display at our event.

You may develop yourself professionally at three workshops on Wednesday, September 15. You may also choose from three unique field trips on Saturday, September 18 to see how various hydrologic issues are addressed in the field.

The Society will recognize two current interns and award three scholarships to deserving students. The Society will award its single highest honor, the Lifetime Achievement Award, during lunch on Friday. Oh, and please remember our two evening celebrations: the ice-breaker on Wednesday evening at La Placita Village and dinner at the Z Mansion on Thursday evening, complete with musical and magical entertainment. For a more detailed summary of events at the symposium, please see the AHS web site: <http://www.azhydrosoc.org/Symposium.html>.

Please also participate in the Annual Meeting on Thursday at 5:15 PM where members will be asked to provide their input into the Society's goals and activities.

The Symposium venue, the Radisson Hotel City Center Tucson, may be reached at (520) 624-8711. Rooms are filling quickly, so please make your lodging arrangements as soon as possible. (By the time you read this, the reserved block will have been released back to first-come-first-served basis.) For more information about the hotel, you can visit

<http://www.radisson.com/tucsonaz>. Remember to enter the promotional code "hydro" to obtain the AHS discount rate.

If you haven't yet registered, please fax your registration form to Cindy Martinez and bring your payment to the site. That way we can have an accurate head count for food planning and we won't have any "checks in the mail" while you're standing at the registration desk. You may register online anytime at the above Symposium web site. If you need a copy of the Symposium registration form or have general questions, please check <http://www.azhydrosoc.org/Symposium.html> or contact me at either (520) 575-8100 or gburchard@metrowater.com or Peter Livingston at (520) 909-7956 or bosqueeng@msn.com. I wish you a safe trip to Tucson, and I look forward to seeing you there. ☺



**EMPLOYMENT
OPPORTUNITIES**

Wildermuth Environmental, Inc. is currently recruiting for several positions.

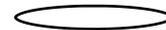
Hydrogeologist: The candidate should be either a Licensed Hydrogeologist or a Certified Engineering Geologist, with a preference given to the former. The candidate will manage test-hole drilling, monitoring well installation projects, groundwater resource evaluation, and basin management projects.

Hydrogeologist/Groundwater Modeler: The candidate will conduct groundwater modeling related investigations to support groundwater basin and watershed scale management programs.

Hydrologist/Surface Water Modeler: The candidate should have a BS degree in Civil Engineering or a BS degree in a related field and

experience in hydrology and stormwater modeling. An MS or PhD would be preferred. The candidate will conduct stormwater management studies and recharge master plans using industry standard software and software developed at WEI.

For more information, follow the link: <http://www.wild-environment.com/jobs.htm>



Haley & Aldrich is looking for an Environmental Scientist/ Geologist/Hydrogeologist for its Tucson, AZ office—reference # [31EW48]

Description: Work with project environmental teams on groundwater and soil investigations and remediation. Review, compile, and summarize field monitoring data and laboratory chemistry data. Prepare reports, data tables and graphs, technical briefings.

Requirements: Bachelor's degree in Environmental Science, Geology or Hydrogeology. Up to three years of experience in environmental investigations, including groundwater quality/quantity investigations. Strong written and verbal communication skills required. Attention to detail required. Computer skills required: Word, Excel, Access.

If you would like to be considered for the above position or any other position, please send/fax your resume to the address/fax number below, or send via email to jobs@HaleyAldrich.com. For more information, visit <http://www.haleyaldrich.com/oppsenvscientistgeologisthydro.html>.

Please note in your cover letter or email the job reference number.

**By fax: (617) 886-7687
By mail: Employment
Haley & Aldrich, Inc.
465 Medford St., Ste. 2200
Boston, MA 02129-1400**


**EMPLOYMENT CONTINUED
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Hydrology Department Head: Wood, Patel & Associates, Inc., the #1 ranked Arizona civil engineering firm (Ranking Arizona 2004) seeks a proven professional to lead our Hydrology Department in Phoenix.

The ideal candidate is a 15-year plus veteran and a registered professional engineer. Must demonstrate strong leadership abilities, management, and negotiation skills in the public arena to enhance client relations. Must successfully manage senior staff to meet client requirements, P&L responsibilities, and strategic objectives. Requirements: B.S. in Civil Engineering; demonstrated client and team communications skills. Wood/Patel is a locally owned and operated, 20 year old firm with 150 employees. We enjoy repeat clientele and support a client-centric culture. Fax or email your resume to employment@woodpatel.com or (602) 335-8580.

Clear Creek Associates, PLC has immediate openings for Assistant and Staff-level geologists/hydrogeologists in our Tucson, AZ office.

Candidates for both levels must have at least a BS degree in geology or hydrology. Staff-level candidates shall have 2 to 5 years of experience. Both positions involve significant field work, including drilling and well installation, aquifer testing, and environmental sampling.

For consideration, please mail or fax a cover letter and resume to:
Clear Creek Associates
Attn: Michael Alter
221 N. Court Avenue, Ste 101
Tucson, AZ 85701
Fax (520) 622-4040

www.clearcreekassociates.com

Maricopa County has an opening for an environmental consultant in the Risk Management office.

Salary: \$23.04 - \$33.80/hr

Job tasks: Write proposals and contracts. Review proposals and reports. Oversee contracts. Attend meetings. Make site visits. Maintain files and records. Assist other departments.

Qualifications: B.S. in engineering, geology, environmental science or related field, and five years of related environmental project experience. Extensive knowledge of environmental compliance rules and regulations, developing and managing environmental projects, and related worker safety rules and regulations required. Must also have extensive knowledge of computer programs. AZ professional technical registration (PE or RG) and/or nationally recognized certification (CIH), OSHA 40-hour HAZWOPER and 8 hours supervisor, EPA asbestos, EPA lead, and any other appropriate training is desirable.

Filling Process: No proscribed closing date; position open until filled. County Application Form and Supplemental Screening Questions must be completed. Applications and information may be obtained from:

Maricopa County Human Resources Department
301 W. Jefferson St., Ste. 200
Phoenix, AZ 85003-2145;
Teletype: (602) 506-1008;

2004 MEMBERSHIP DUES

Dues, payable to AHS (\$40.00, \$15.00 for students) should be sent to:

Leilani Bew, AHS Newsletter Editor
 Errol L. Montgomery & Associates, Inc.
 1550 East Prince Road
 Tucson, Arizona 85719
 Phone: (520) 881-4912



Autumnal equinox is September 22.


PEOPLE ON THE MOVE

Dr. Peter Kroopnick, R.G., recently joined ARCADIS G&M in their South Phoenix office as a senior scientist in the company's site evaluation and remediation practice. He eventually hopes to further expand his practice into the ARCADIS Guaranteed Remediation Program (GRiP), in which, for a fixed price, the company commits to perform any remediation necessary to achieve regulatory closure for the site, including known and unknown contamination. Pete, as he is known to his AHS colleagues, came to ARCADIS from Brown and Caldwell in Phoenix. He is active in AHS, currently serving as President of the Phoenix Chapter and Vice-president of the Corporate Board.

Pete is a geochemist and hydrogeologist specializing in the application of fate and transport models to the design of soil and groundwater remediation systems. Pete's recent experience includes conducting Assured Water Supply studies and extensive work on behalf of potentially responsible parties at Federal and State designated Hazardous Waste Sites. He has provided advice and strategic consultation on changes in records of decision, supporting natural attenuation, technical impracticability approaches, and served as a technical expert and witness for counsel.

Pete can be reached at:

Arcadis G&M
8222 South 48th Street
Suite 140

Phoenix, AZ 85044
(602) 659-3235

pkroopnick@arcadis-us.com

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Submittals and comments should be addressed and faxed to Leilani Bew at Errol L. Montgomery & Associates, Inc. by the **15th** of each month. If you learn of something timely after the deadline has passed, call me, and we can discuss it.

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