

Ed Kunce from the MA DEP, presents Paul Kostecki with a certificate of recognition for 20 years of Soils conferences.



## After 20 Years, Soils Conference Still Ahead of the Curve

“There are resources and technical information available here that you can’t find anywhere else,” insists Dawn Oliveira of Environmental Compliance Services. Her sentiments echo those of many that have traveled from far and near to attend the 20th Annual International Conference on Soils, Sediments and Water at the University of Massachusetts Amherst. Throughout the Exhibition Hall, everyone agrees the conference has earned a reputation for its strong technical focus, featuring data-driven presentations and workshops that represent the leading edge in environmental science and technology.

Since its early days, the conference agenda has informed the environmental remediation efforts of the Massachusetts DEP and the EPA. “What started with a group of Ph.Ds providing informal assistance to the EPA has turned into an international conference that’s current, fresh, and utilizes a scientific advisory board that drives a technically top-tier conference,” said Edward Kunce of the MA DEP as he presented a plaque to co-Director Paul Kostecki in recognition of his twentieth successful conference.

Kostecki agrees. It’s the experience and expertise of the scientific advisory board that keeps this conference ahead of the curve. Others add that the co-Directors’ ability to follow trends and adapt the agenda accordingly has made the conference an enduring success. “Paul and Ed Calabrese have worked extremely effectively over the years, keeping their ears to the ground to identify what’s hot and what’s important, keeping things current,” says Clifford Bruell, UMass Lowell professor of Environmental Engineering and co-Director of this year’s conference.

“It’s the people,” Kostecki points out. “The reason this conference has gone on for so many years is, thanks to the participation of many people, we’ve been able to identify and focus in on the new ideas.” After two decades, the conference has matured from a bright idea pursued passionately by a small group of farsighted and energetic researchers to an essential institution within the environmental remediation community. “Like any good organization,” Kostecki says, “it’s really the collective sum of the energy that people are willing to put into it.” And the people keep coming. More than half of all attendees return from previous years.

This year, an international group of nearly 1,000 environmental professionals, researchers and students attended the conference. “It’s a unique opportunity for collaboration between academic and private sectors,” says Frank Sweet of ENSR International. “You can’t find this type of forum anywhere else in the region and maybe nowhere else in the country,” he said.

Positioned at the confluence of academic research and industrial application, the conference attracts a large group of environmental remediation professionals, like four-year veteran Phil Sheridan of United Technologies, because the solutions-oriented research presented here has the potential for immediate use in the field. After one day at the conference, Sheridan says, he’s already acquired valuable technical information on how to more effectively apply oxygen and hydrogen release compounds to accelerate the biodegradation of soil and groundwater contaminants.

Generating solutions that move the field ahead is what the conference is all about. Science and technology evolve rapidly and on many fronts. The new ideas that will shape the future of



### Conference Co-Directors

**Paul T. KostECKI, Ph.D.**

**Edward J. Calabrese, Ph.D.**  
Environmental Health Sciences  
School of Public Health  
University of Massachusetts  
Amherst, MA

**Clifford Bruell, Ph.D.**

Center for  
Environmental Engineering  
Science & Technology  
University of Massachusetts  
Lowell, MA

For more information contact  
the Conference Coordinator:

**Denise Leonard**

Environmental Health Sciences  
N344 Morrill Science Center  
University of Massachusetts  
Amherst, MA 01003  
413-545-1239  
e-mail:

dleonard@schoolph.umass.edu

or visit our web site at

**www.UmassSoils.com**

Articles by Loren Walker  
Design & Layout by Dina Polizzi

## Scientific Advisory Boards

The tremendous success of past conferences has been the result of the dedication and hard work of our Scientific Advisory Board (SAB) members and this year's conference is no exception. The SAB evaluates abstract submissions, recommends invited papers and presenters, advises on special sessions and activities and generally serves as conference ambassadors encouraging colleagues to participate and attend. The creation of the SAB is the first crucial step in conference development, and care is taken to insure philosophical, scientific, regulatory and geographical balance.

### General

Nader Al-Awadhi, *Kuwait Institute for Scientific Research*

Akram N. Alshawabkeh, Ph.D., *Northeastern University*

Ernest C. Ashley, P.G., *Camp, Dresser & McKee, Inc.*

Alan J M Baker, *The University of Melbourne*

Ralph S. Baker, *TerraTherm, Inc.*

Ramon M. Barnes, Ph.D., *University Research Institute  
for Analytical Chemistry*

Michael Battle, *EA Engineering, Science & Technology*

Bruce Bauman, *American Petroleum Institute*

Mark Begley, *Environmental Management Commission*

Gary Bigham, *Exponent Environmental Group*

Scott R. Blaha, *GE Global Research Center*

Carol de Groot Bois, LSP, *Bois Consulting Company*

Clifford Bruell, *University of Massachusetts Lowell*

Peter Cagnetta, *SIAC*

Barbara Callahan, Ph.D., *University Research*

Robert H. Clemens, *AMEC Earth & Environmental, Inc.*

Andrew Coleman, Ph.D., *Electric Power Research  
Institute*

Janine Commerford, *MA Department of Environmental  
Protection*

Abhijit V. Deshmukh, *University of Massachusetts  
Amherst*

Mary Donohue, *Environmental Forensics*

James Dragun, *The Dragun Corporation*

John W. Duggan, *Wentworth Institute of Technology*

Mohamed Elnabarawy, *3M (retired)*

Timothy E. Fannin, *US Fish and Wildlife Service*

Samuel P. Farnsworth, *AMEC Earth &  
Environmental, Inc.*

Linda Fiedler, *US EPA*

Kevin T. Finneran, *GeoSyntec Consultants*

John Fitzgerald, *Massachusetts DEP*

Millie Garcia-Surette, MPH, *MA DEP, South East Region*

Connie Gaudet, Ph.D., *Environment Canada, Soil &  
Sediment Quality Section*

Steve Goodwin, Associate Dean, *University of  
Massachusetts Amherst*

Michael Gorski, *MA DEP*

Peter R. Guest, *Parsons*

Eric Hince, *Geovation Technologies, Inc.*

Ihor Hlohowskyj, *Argonne National Laboratory*

Duane B. Huggett, *Pfizer, Inc.*

Barry L. Johnson, *Assistant Surgeon General (ret.)*

Evan Johnson, LSP, *Tighe & Bond*

William B. Kerfoot, *Kerfoot Technologies, Inc.*

Stephen S. Koenigsberg, *Regenesis Bioremediation  
Products*

Bill Kucharski, *Ecology & Environment, Inc.*

Cindy Langlois, *Journal of Children's Health*

Steven C. Lewis, Ph.D., DABT, *University of Medicine  
& Dentistry of New Jersey*

Dave Ludwig, *Blasland, Bouck & Lee, Inc.*

Ronald J. Marnicio, Ph.D. P.E., *TetraTech FW, Inc.*

Rick McCullough, *MA Turnpike Authority*

Chris Mitchell, *ENSR*

Robert Morrison, Ph.D., *DPRA, Inc.*

Ellen Moyer, Ph.D., P.E., *Greenenvironment, LLC*

Willard Murray, Ph.D., P.E.,

Lee Newman, Ph.D., *University of South Carolina*

Gopal Pathak, *Birla Institute of Technology*

Brad Penney

Frank Peduto, P.E., *Spectra Environmental Group*

Ioana G. Petrisor, Ph.D., *DPRA Inc*

David Reckhow, *University of Massachusetts Amherst*

Corinne E. Schultz, *RED Technologies, LLC*

Nicholas P. Skoulis, Ph.D., DABT, *Arch Chemicals, Inc.*

Frank Sweet, *ENSR International*

Christopher Teaf, Ph.D., *Florida State University*

James C. Todaro, *Alpha Analytical Labs*

Allen D. Uhler, *Newfields – Environmental Forensics  
Practice, LLC*

Mark Vigneri, *Environmental Remediation and Financial  
Services, LLC*

A. Dallas Wait, Ph.D., *Gradient Corporation*

Richard Waterman, *EA Engineering, Science, and  
Technology, Inc.*

Jason C. White, Ph.D., *The Connecticut Agricultural  
Experiment Station*

Katie Winogroski, *3M*

Peter Woodman, Ph.D., *Risk Management Incorporated*

Baoshan Xing, Ph.D., *University of Massachusetts*

Ed Zillioux, Ph.D., *FPL Environmental Services*

### Federal

John Abraham, *HML Consultants*

John Cullinane, *US Army Engineer Waterways Exp. Sta.*

John Glaser, *US Environmental Protection Agency, ORD*

Stephen J. Grady, *US Dept of the Interior, USGS*

Leslie Karr, *Naval Facilities Engineering Service*

Lynn Kucharski, *AMEC Earth and Environmental*

Jeffrey Marqusee, *SERDP and ESTCP*

Paul Rakowski, *Naval Facilities Engineering Command*

Mike Reynolds, Ph.D., *USA – Cold Regions Research and  
Engineering Laboratory (CRREL)*

Brian D. Rogers, *Department of the Army*

Alex Sherrin, *US EPA, Boston*

Michael Sivak, *US EPA, Region 2*

Mike Sowinski, *DPRA, Inc.*

Henry H. Tabak, *US EPA, ORD*

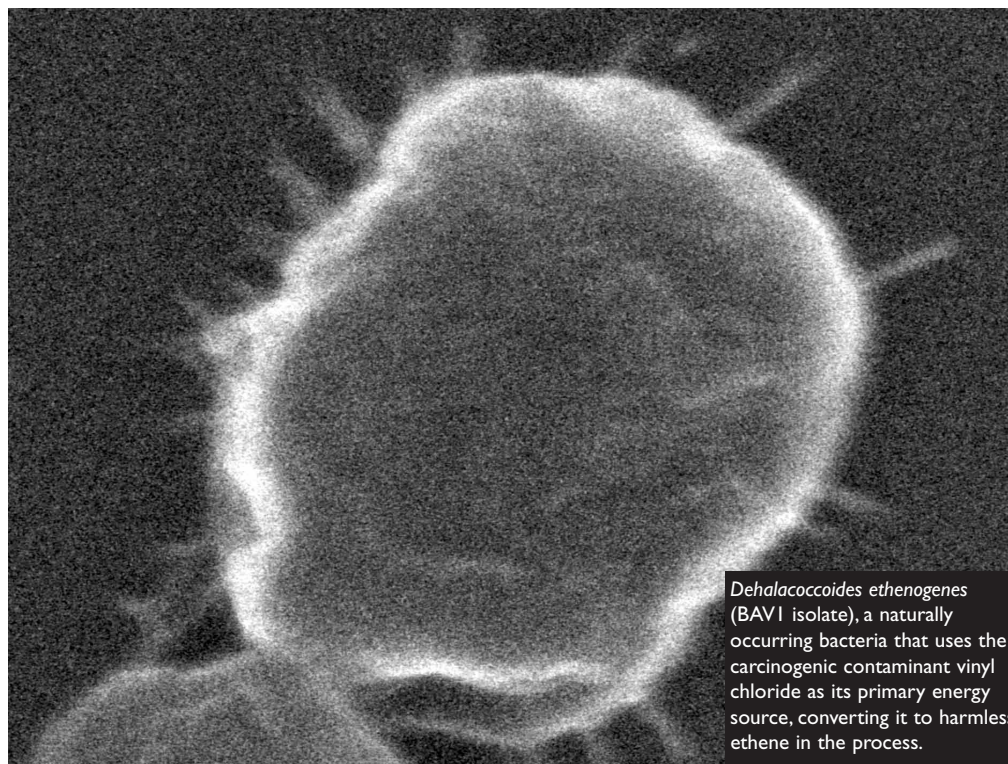
## Biotech Methods for Intelligent Site Management

*“We’re now in a position to answer questions about the third line of evidence, the microbial ecology.”*

It has long been recognized that microorganisms play an important role in the decontamination of environmental pollutants because certain naturally occurring microbes have an astounding ability to convert dangerous toxins into harmless compounds. This in situ approach to the bioremediation of environmental contaminants, a formerly marginalized approach to site cleanup, has experienced a biotech renaissance. Speakers at this year’s Environmental Biotechnology Platform Session described some of the many ways that genomics, cellular characterization and other biotech methods have helped to bring the so-called “third line of evidence” to the fore.

“Today we have the opportunity to do things we couldn’t do previously,” says Stephen Koenigsberg of Regenesys Bioremediation Products. Over the past twenty years, advances in molecular biology have provided environmental scientists with a whole new set of wonderful tools, he says. “With these new tools we’re now in a position to answer questions about the third line of evidence, the microbial ecology. We want to ask the microbes who they are, where they are and what contaminants they eat. Software traditionally used to depict the location of contaminants in an aquifer can also be input with data on microorganism concentrations derived from biotech-based analytical methods in order to visualize the microbial ecosystem of a contaminated site. That’s bug mapping,” Koenigsberg explains.

Until recently, the biotech methods developed during the 1980s and ‘90s were not



*Dehalococcoides ethenogenes* (BAVI isolate), a naturally occurring bacteria that uses the carcinogenic contaminant vinyl chloride as its primary energy source, converting it to harmless ethene in the process.

user friendly and largely unavailable for use in the environmental cleanup industry. Today there is a wide variety of sampling and analytical tools that make it relatively easy, fast and cost-effective to monitor the bioremediation activity of microorganisms.

“Genomic technologies are leading to explosive advances in this area,” says Eric Hince of Geovation Consultants. “They’re now coming into an age where they’re acceptable for costs that are reasonable,” Hince notes. “It’s just a matter of getting people to understand these tools and to start using them more consistently. Then we’ll start making some real leaps forward.”

Already, leaps have been made. Using biotech methods, Koenigsberg and his colleagues at Georgia Tech isolated a naturally occurring bacteria that uses the carcinogenic contaminant vinyl chloride as its primary energy source, converting it to harmless ethene in the process. News of their discovery was published in a 2003 issue of the journal *Nature*. Highly specif-

ic genetic tests designed to identify the presence and expansion of these key organisms in relation to engineered bioremediation have also been developed and published in *Applied and Environmental Biotechnology*.

However, not all bacteria can sustain themselves on toxic substances alone. Some require “food” in the form of oxygen or hydrogen substrates. “The objective is to assess the microbial ecology, augment it if necessary, and then maintain it with substrate applications (oxygen or hydrogen depending on whether the bacteria are aerobic or anaerobic). It’s about better monitoring to ensure effective remediation of the site. That’s intelligent site management,” Koenigsberg said.

“Get to know your microbes. They are the ones doing the heavy lifting,” Koenigsberg insists. “So, get to know them intimately. It’s more information and information is power – *scientia est potentia*.”

Environmental Engineers assess depleted uranium contamination cleanup efforts at the China Lake Naval Air Weapons Station in southern California's high desert.

# ***Navy Seeks Innovative Solutions to Environmental Concerns***


*"The Navy has long been a supporter of the Soils, Sediments and Water Conference, which has earned a reputation as a showcase for the latest in environmental remediation technologies."*

The U.S. Navy is looking for innovative technologies that can be applied to the remediation of contaminated soils, sediments and groundwater at naval facilities. "We have an environmental responsibility," says Stephen Eikenberry, Director of Environmental Support Services at the Naval Facilities Engineering Service Center. "We need to keep our bases as clean as possible and meet the same environmental laws that everyone else has to meet. We're always looking for new approaches to solve problems. We don't have all the solutions. They come primarily from academia and industry."

The Navy has long been a supporter of the Soils, Sediments and Water Conference, which has earned a reputation as a showcase for the latest in environmental remediation technologies and practices. A number of pioneering decontamination methodologies, like in situ bioremediation of MTBE, were first demonstrated by Navy engineers and have been widely disseminated through the annual event. The Navy and the Conference have enjoyed a cyclical relationship, explains Eikenberry. "Navy people contribute papers and make technical presentations, but also attend the sessions to hear what others are doing. It's been a very productive partnership between the Navy and the Conference over the years," he said, "many relationships have stemmed from it."

In order to make sure that they're using the most effective site cleanup methods, the Navy solicits technology abstracts

from private contractors and academic institutions. The Navy calls its Broad Agency Announcement for Innovative Environmental Technologies and Methodologies, "an innovative contracting vehicle providing solutions to the Navy's environmental concerns."

"It's also a way for small and medium-sized contractors to showcase their best technologies," says Eikenberry. Once the technology abstracts are evaluated by Navy engineers, those that pass muster are posted to the DENIX (Defense Environmental Network and Information Exchange) website so the Navy's site remediation project managers (RPM) can access them. If a technology looks like a good match for a site's remediation needs, the RPM requests a detailed proposal from the contractor. "We've identified a number of good technologies this way," Eikenberry notes. "The Broad Agency Announcement is a way to ensure that the Navy has access to the best, most effective leading-edge site remediation technologies available." 



Kostecki with UMass Amherst Environmental Health and Science grad student, Mark Nascarella at China Lake.

# New Ideas for Restoring an Old River



*“We’re looking for affinities between remediation techniques and restoration goals.”*

The Neponset River, an urban waterway in eastern Massachusetts with a history of industrial contamination, has a PCB problem. In spite of recent successful efforts to improve water quality and restore aquatic habitat, the lower portion of the river still has high levels of PCB (polychlorinated biphenyl) contamination. The 2004 Soils, Sediments and Water conference provided Neponset River stewards with a unique opportunity to solicit guidance from some of the nation’s leading environmental remediation experts.



Baker Dam

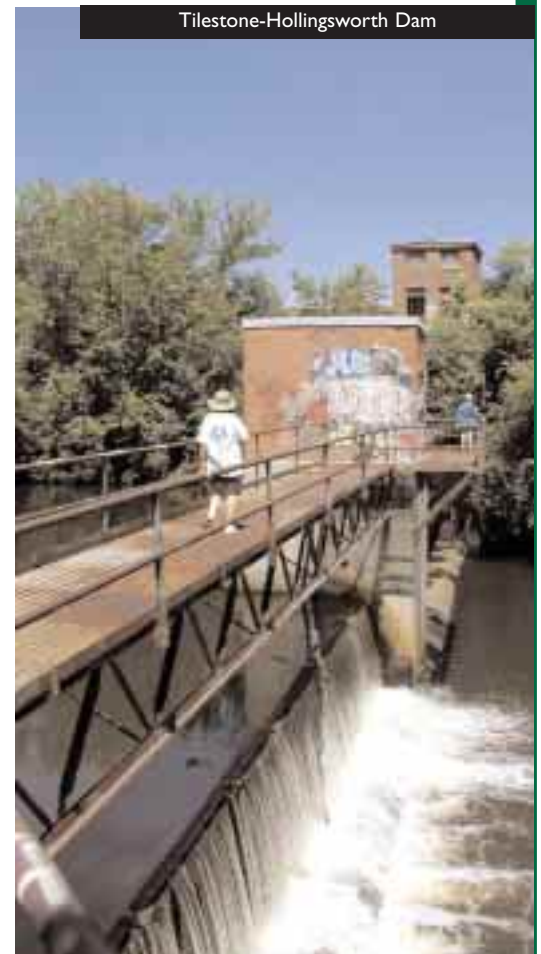
The Tuesday evening workshop, which focused exclusively on the Lower Neponset, was intended to be part of “a nationwide talent search to look for innovative and cost-effective solutions to treat contaminated sediments and achieve ecological restoration of the Lower Neponset,” according to Karen Pelto, of the Massachusetts Riverways Program, a statewide initiative dedicated to promoting the restoration, protection and ecological integrity of the Commonwealth’s

watersheds (rivers, streams and adjacent lands). “The purpose of the workshop,” said Pelto, was “to bring the experts’ experience with remediation and restoration to bear on the question of how to restore and decontaminate the Lower Neponset River.”

The Neponset River has supported communities along its banks for centuries. Since the early 17th Century, industrialists have been attracted to the Neponset because of its manageable size and close proximity to Boston. The flow of its waters provided the energy for the country’s first water-powered grist mill, first gunpowder mill, and first paper mill, among others. As early as 1750, the river had earned a reputation as a highly polluted waterway fouled by untreated sewage and industrial discharges.

However, over the past several decades, the water quality of the Neponset River has improved dramatically. According to the Neponset River Watershed Association, the river and its tributaries are the cleanest they have been in more than 300 years. Nevertheless, a U.S. Geological Survey assessment of the river found elevated levels of PCBs in the soft sediment impounded behind the river’s two dams and a source of PCBs that continues to contaminate the waterway. Rob Breault, of the USGS and others involved with the restoration effort are looking for expert counsel on how to decontaminate the river without destroying habitat.

“Remediation is not without consequences,” says David Ludwig of BBL Sciences. Pelto agrees. “Some remediation practices are so destructive,” she said. “You’ve really got to think about the habitat needs of the species you’re trying to restore. So, we’re looking for affinities between remediation techniques and restoration goals.”



Tilestone-Hollingsworth Dam

*“Remediation is not without consequences.”*

# Managing Decision Uncertainty

*“Managing decision uncertainty is the way to build self-correction into the environmental contamination assessment system”*



Triad site assessment method leads to discovery of groundwater contamination source, an unsecured vat containing dichlorobenzene (photo by Jeong Seop Shim) at a Brownfield Redevelopment Site. Several days of intensive groundwater testing (50 grab samples from 40 locations) led investigators to the source of dichlorobenzene contamination. Sampling conducted by S2C2, Inc.

Smarter, faster, better technologies and work strategies are the goal of a new approach to hazardous waste site remediation. The three-pronged approach, called Triad, emphasizes systematic project planning, dynamic work strategies and real-time measurement technologies. The EPA-endorsed Triad approach was the subject of an evening workshop on managing decision uncertainty for better cleanup projects.

“Managing decision uncertainty is the way to build self-correction into the environmental contamination assessment system,” says Deana Crumbling of the EPA Office of Superfund Remediation and Technology Innovation in Washington, D.C. Making decisions and adapting to new information during site assessment and cleanup is an unavoidable part of the process, Crumbling explained during her presentation. Mother Nature is messy and idealized models usually don’t reflect the real world.

Triad copes with the inherent heterogeneity of the environment by employing an approach resembling the scientific method in which a good, thoroughly deliberated hypothesis is essential. In Triad, the hypothesis takes the form of a conceptual site model (CSM), which is constructed based on cleanup goals and what is known about the contaminated site. The CSM is then “tested” in the field once site assessment and remediation efforts commence.

“A good Triad approach is one that successfully employs an ‘if-then’ approach,” says David Miller of the Environmental Assessment Division of Argonne National Laboratory. If data gathered on-site support the CSM, then the remediation activities continue as planned. If the data contradict the CSM, then just like an experimenter’s hypothesis, the CSM must be updated and remediation activities redirected to reflect the new information.

Proponents can cite a litany of examples in which the Triad approach has reduced the time and expense of site cleanup: brownfields in New Jersey, an Army base in Virginia, a power plant in Connecticut, an agricultural site in Washington, and the list goes on.

The EPA expects to institutionalize Triad, and the agency anticipates that its principles will guide the way that data are collected and analyzed for future site cleanup decisions. However, the Triad approach represents a paradigm shift away from conventional approaches to project management. At the close of her presentation, Crumbling, cited an English economist who remarked that a paradigm shift is never without resistance. “The difficulty lies, not in the new ideas, but in escaping the old ones,” she concluded.

For more information on Triad see: [www.triadcentral.org](http://www.triadcentral.org)

## After 20 Years *continued from page 1*

environmental science and engineering are as likely to come from established companies and distinguished professors as from emerging companies and young researchers. Here, status and influence are eschewed in favor of solid research and effective technologies. “Since its inception, the objective of the conference has been to enhance environmental research,” says Kostecki, “and that’s why it has been so successful; it’s an incubator for ideas.”

“I really feel this is the best conference in the industry in terms of mixing different viewpoints from the academics, the private sector and the regulatory sector,” says Eric Hince of Geovation Consultants. “The conference organizers have been very disciplined in not allowing it to disintegrate into an infomercial type of forum. As a supporter, it doesn’t matter how much I contribute; I’m not going to dominate the agenda, and nor does anyone else. I think that really distinguishes this conference.” When asked if he’ll be back next year Hince quickly replies, “Absolutely.”

Looking to the future, conference founders Calabrese and Kostecki are focused on sustainability. The Soils, Sediments and Water Conference has become a valued resource within the environmental science and technology community. Their priority now is to ensure that it continues to serve that community and to move the field ahead. Ideas to ensure future sustainability include holding a World Congress on Contaminated Soils in cooperation with other like-minded groups and establishing a soil sciences institute at UMass Amherst. An international event would bring attention to the global scope of environmental contamination and a soil science institute would be both a valuable resource for the University as well as a command and control center for future conferences, the co-Directors say.

“What I see in ten years is a hand off,” Kostecki says, “to the next generation. The conference has provided such a good service to the field over the years. The most important thing now is to bring in the young researchers who will take the reigns and continue to move the field ahead.”

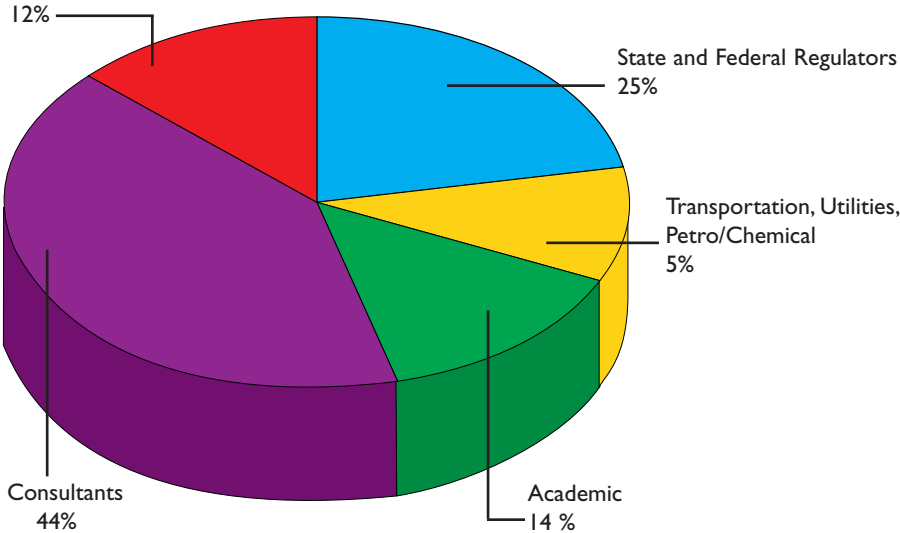
# 2004 Conference Statistics

• 13 Workshops • 142 Platform Presentations • 90 Poster Presentations • 46 Exhibitors • over 950 Attendees

*The 2004 conference attracted a wide variety of professionals from an extensive array of companies, agencies, and institutions.*

## Partial breakdown of the numbers:

Others including Environmental Labs, Recycling, Turf Services, Pharmaceuticals, the Press, Computer Software

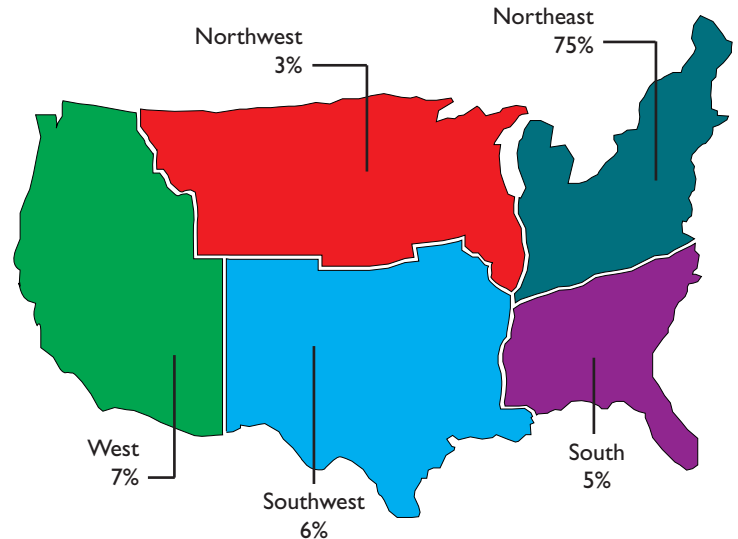
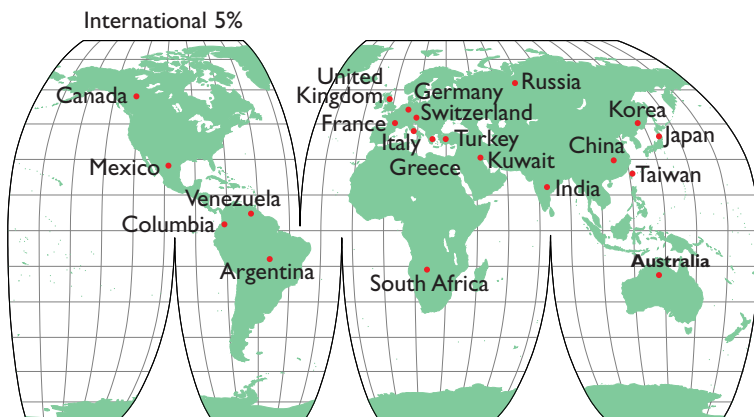


- State agency attendees: 152 from 44 agencies in 20 states
- Federal/Military attendees: 80 from 19 states
- Petro/Chemical, Transportation and Utility Industry attendees: 31 from 22 companies in 15 states
- Academic attendees: 124 from 53 institutions in 23 states
- Consulting industry attendees: 187 companies from 34 states
- Repeat attendees since 2001: Nearly 40% in 2004

## Regional and International percentages for 2004

### Countries for past five years:

Argentina, Australia, Belgium, Brazil, Bulgaria, Canada, China, Colombia, Czech Republic, France, Germany, Greece, Hungary, India, Iran, Italy, Japan, Jordan, Kazakhstan, Kuwait, Malaysia, Mexico, New Zealand, Poland, Romania, Russia, Singapore, South Africa, South Korea, Switzerland, Syria, Taiwan, Thailand, The Netherlands, Turkey, United Kingdom, and Venezuela.



### Countries for 2004

Australia, Bulgaria, Canada, India, Italy, Jordan, Kazakhstan, Mexico, Romania, South Korea, Taiwan, and the United Kingdom.

# The Foam Means it's Working



Corinna, Maine.  
Soil Contaminated with 1,2,4 trichlorobenzene



Sulfuric acid and sodium persulfate tankers



Tanker containing 50% hydrogen peroxide for Fenton's Reagent



Containment trench around tankers



Protective equipment area

An Army Corps of Engineers team led by Dr. Ian Ogersby evaluates the in situ chemical oxidation (ISCO) of contaminants at a superfund site in Corinna, Maine. Two ISCO reagents, persulfate and Fenton's reagent, are evaluated in side-by-side tests.

Chemical oxidation is a fast-acting approach to contaminated site cleanup. Seen as an alternative to the plodding and costly pump-and-treat process, In Situ Chemical Oxidation (ISCO) is an emerging technology that can rapidly reduce groundwater contaminant concentrations when applied at highly contaminated sites or source areas. This year's ISCO Platform Session featured experts from industry and academia who discussed the intricacies of ISCO chemistry and showcased the latest methodologies.

*"This isn't just ivory tower research. What we're doing experimentally, they're applying in the field."*

Because it is an in situ remediation technique, ISCO can be applied without major site disturbance and can be used to treat parts of the subsurface, like the soil beneath buildings or storage tanks, that would normally be inaccessible. Oxidants

(e.g. permanganate, Fenton's Reagent, ozone, persulfate) injected into the subsurface of a contaminated site initiate a chemical reaction that destroys a variety of groundwater contaminants, including chlorinated solvents, polyaromatic hydrocarbons and petroleum products.

The ISCO reaction naturally evolves gases that cause foaming in the groundwater. The foam can sometimes be seen as it rises up through cracks and crevasses to the soil surface, reminiscent of that famous frothing science fair project, the baking soda and vinegar volcano. Though it may look a little odd to the untrained eye, as one session speaker said, "the foam means it's working."

Interest in the ISCO session has been increasing steadily since it first appeared in the conference agenda several years ago. The novelty and effectiveness of ISCO methods has stimulated the interest of many conference-goers, and the challenge of refining this relatively new technique is common ground for conversation among ISCO researchers and remediation engineers. Unlike in the controlled conditions of a laboratory, an in situ chemical reaction can be influenced by the myriad environmental variables of the subsurface. The complications inherent to this technique



Scott Crawford, B.S., M.S. UMass Lowell



Deepti Krishnan Nair, M.S. UMass Lowell



Dr. Brant Smith

*“Soils really control the situation.”*



were summed up succinctly in the title of a presentation by Ian Ogersby, of the U.S. Army Corps of Engineers: “ISCO Technology Overview – Do You Really Understand the Chemistry?”

*“ISCO can be applied without major site disturbance and can be used to treat parts of the subsurface, like the soil beneath buildings or storage tanks, that would normally be inaccessible.”*

The primary challenge is choosing the right oxidant for the right job, according to Mark Kauffmann of ENSR International. “For example, if you have a small source area, you can pick something that’s really quick and reactive with only a short radius of influence,” Kauffmann explains. “If you need something to hit a longer plume, you’ll want to use a slower acting oxidant.” In addition to plume size, the kind of contaminant and soil type influence the choice of oxidant.

“Soils really control the situation,” says Clifford Bruell, UMass Lowell Professor of Environmental Engineering and Confer-

ence Co-Director. “Soils may have a higher fraction of organic carbon, they may vary in their soil chemistry or mineralogy, they may have a high concentration of iron, a high pH or a low pH. All of these things really throw a monkey wrench into the problem; it’s not straightforward.”

Bruell sees ISCO as a good example of effective technology transfer from academic institutions to industrial applications. Innovative approaches to the remediation of environmental contaminants in soils and groundwater is something he and his colleagues at the University have been talking about for more than twenty years. Now some of those people, including former students, are in the private sector. And these companies, Bruell says, “are very interested in our in situ chemical oxidation experiments because they’re implementing the same thing in the field. It’s tied in. We work hand-in-glove on some of these operations. So, this isn’t just ivory tower research that has no real application; what we’re doing [experimentally] they’re applying in the field.”

*“Interest in the ISCO session has been increasing steadily since it first appeared in the conference agenda several years ago.”*



Dr.s Ian Osgersby, Clifford Bruell, and Richard Watts



Andy Boeckeler from Nobis Engineering



Deepti and Scott with ferrous sulfate and citric acid



Batch tanks used to prepare injection solutions (e.g., Fe<sup>2+</sup>), lines then connected to batch tanks



Lines carrying chemicals to injection wells



Sulfuric acid injection pump used to acidify aquifer



Injection well screened 30-35 ft below ground surface (BGS)



Sulfuric acid injection in progress



Injection system by Kara Kelly, B.S., M.S. UMass Lowell

Adventus Americas, Inc.  
Alpha Analytical Labs  
AMEC Earth & Environmental  
ATC Associates, Inc.  
CEM Corporation  
Columbia Analytical Services, Inc.  
Creamer Environmental, Inc.  
Dewind One-Pass Trenching  
DEXSIL Corporation  
Digital Globe  
EA Engineering, Science, and Technology  
Eastern Analytical  
ENSR International  
EnviroDirectory New England  
Environmental Remediation and  
Financial Services, LLC  
ESS Laboratory  
Geovation Technologies, Inc.  
Groundwater & Environmental  
Services, Inc. (GES)  
H&P Mobile GeoChemistry  
Innov-X Systems, Inc.  
inVenture Technologies  
ISOTEC  
Kerfoot Technologies, Inc.  
LSP Association  
Microbial Insights, Inc.  
Microseeps, Inc.  
Naval Facilities Engineering Command  
Niton LLC  
Panther Technologies, Inc.  
Prosonic Corporation  
Regenesi Bioremediation  
Remediation Service Int'l (RSI)  
Rock Ware, Inc.  
Rusmar Incorporated  
Sanborn, Head & Associates, Inc.  
Shaw E&I, Inc.  
Sheeting Solutions  
Solinst Canada, Ltd.  
State Geologist,  
University of Massachusetts  
Strategic Diagnostics, Inc.  
Taylor & Francis, Inc.  
Technology Alliance Partnership (TAP)  
TerraTherm, Inc.  
Titan Scientific  
US EPA Technology and Field  
Services Division  
Waterloo Barrier Inc.  
W.L. Gore & Associates, Inc.



University of New Hampshire student Alison Watts accepts her award for best student presentation from Fayaz Lakhwala, Director of Engineering for Adventus Americas, Inc.

## ***Students in the Spotlight:***

### **Student Awards Sponsored by Adventus Americas**



**A**dventus Americas, Inc., an international remediation biotechnology firm, sponsored three \$500 awards for the best student presentations. The winning students and their presentation themes were:


- Paula Bernasconi (Northeastern University); "Development of a Genetically Engineered Seaweed that can Detoxify TNT in Marine Waters"
- Sarah Strycharz (University of South Carolina); "Development of a Genome-Wide Screening Method to Identify Gene Candidates Involved in the Degradation of Halogenated Hydrocarbons Using Ion Chromatography"
- Alison Watts (University of New Hampshire); "Uptake of Polycyclic Aromatic Hydrocarbons in Spartina Alterniflora - Evaluating Risk in Salt Marsh Vegetation"

The 2004 Student Awards were judged by: Fayaz Lakhwala, Adventus Americas; Carol Bois, Bois Consulting; Evan Johnson, Tighe & Bond, Inc; and Corinne Schultz, Unity Environmental Technologies, LLC.

Dr. Fayaz Lakhwala, Director of Engineering for Adventus Americas lead the panel of judges to select the winners. "These young

environmentalists all displayed superb thought-leadership and presentation skills. Selected the winning themes was extremely difficult. As Adventus continues to develop the next generation of remediation biotechnologies, it is our privilege to have a chance to recognize the important role a partnership with the academic community and public sector organizations can play."

Dr. Paul Kosteck, conference co-Director and Vice Provost for Research at UMass Amherst, offered a metaphorical perspective. "Our determined Boston Red Sox had to wait 86 long years for their chance to shine on a national stage. This exciting conference only had to run for 20 years before a far-sighted technology provider like Adventus recognized the value of stepping up to the plate and making this program a reality."

Adventus Americas, in conjunction with the Northeast Regional Environmental Public Health Center and the UMass School of Public Health, will sponsor the 2005 Student Presentation Award Program. 

# Conference Addresses Terrorism's Environmental Impact

*"The conference is a forum where specialists can share ideas and engage in collaborative problem solving."*

Within weeks of September 11th 2001, the Congressional Subcommittee on Water Resources and Environment held hearings on the environmental effects of terrorism. The committee's agenda was to review ongoing efforts to prevent, prepare for, and respond to any future terrorist attacks. The environmental devastation of war zones has long been recognized. Today, it must also unfortunately be acknowledged that intentional environmental contamination is a potential terrorist weapon.

To address the pressing issues of terrorism's environmental consequences, the UMass Amherst Security, Emergency Preparedness and Response Institute (SEPRI) sponsored a Homeland Security Thread at this year's conference, which included a platform session on Environmental Terrorism and a workshop on Policy Issues in Inter-Agency Cooperation. SEPRI is a multi-disciplinary institute charged with fostering the development of new scientific and technological methods to strengthen the nation's Homeland Security stance.

"Everybody has a piece of the puzzle," says SEPRI Managing Director Barbara Pearson. SEPRI's mission is enhanced through participation in this year's Soils, Sediments and Water Conference, Ms. Pearson explains, because "any act of terrorism will have an impact on the environment and these [conference attendees and speakers] are the environmental experts." In order to respond quickly to a terrorist attack, SEPRI encourages the experts to consider potential environ-

mental vulnerabilities. "It's important for the environmental experts to be thinking ahead of time about how to mitigate the environmental degradation that might result from a man-made (terrorist) contamination event," she said.

Of course, a good defense is still the best offense. Klaus Nüsslein, of the Microbiology Department at UMass Amherst, opened the Environmental Terrorism session with a discussion of innovative biosensor technologies for the environmental detection of microbial weapons. Nüsslein reported on a biosensor system, which can detect the presence of specific microbial pathogens down to a concentration of 500 cells/ml. The biosensor was developed through an interdisciplinary collaboration between the microbiology and polymer science departments at UMass Amherst and is based on a NASA-developed quartz crystal microbalance.

Juan Reyes, Director of the U.S. Homeland Security Department's Office of Safety and Environment, participated in the evening workshop on Inter-Agency Cooperation. Mr. Reyes stressed that collaboration between academic researchers, industry and agencies is essential to homeland security. Connections need to be made and relationships forged in advance because when an event occurs there won't be any time to connect.

Homeland Security and terrorism's environmental impact will continue to be a thread in future conferences. There is much work to be done in order to devel-

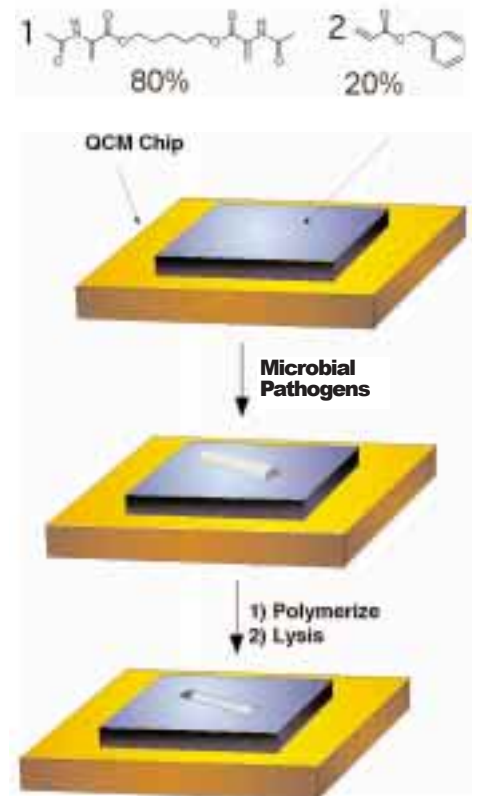


Major Stephen Davis speaks about WMD Consequence Management during the Environmental Terrorism Session.

op the technologies and methods necessary to prevent or rapidly respond to an incident of environmental contamination caused by a terrorist attack. The conference is a forum where specialists can share ideas and engage in collaborative problem solving. "It's a way to bring the experts into the loop," says Pearson, "SEPRI is a work in progress and the conversation is just beginning."



Schematic of microbial biosensor developed by UMass Amherst microbiologist Klaus Nüsslein



# Poster Presentations, An International Perspective



Carol Bois (Bois Consulting) studies one of 90 posters on display

The 90 posters presented at this year's conference included 16 international offerings. Posters were delivered by representatives from Australia, Bulgaria, Canada, India, Italy, Jordan, Kazakhstan, Mexico, Romania, South Korea, Taiwan, and the United Kingdom, demonstrating clearly that environmental science and engineering is a field without borders.

Among the many international attendees who presented posters this year was Adnan Massadeh, Faculty of Pharmacy with the Jordan University of Science and Technology Department of Medicinal Chemistry and Pharmacognosy. Dr. Massadeh made the trip to Amherst from Irbid, Jordan's second largest city, where he devised an elegant method for deducing environmental contamination levels based on the concentration

of pollutants contained in road dust samples. Massadeh analyzed the copper and zinc levels of dust samples from two of Irbid's heavily trafficked roads. He presented the results of the study, which suggest vehicle exhaust emissions and asphalt paving material as sources of the trace metal contamination, during the Tuesday evening poster session.

"The international presenters and attendees here at the Conference are representative of the tremendous activity we're seeing in the field of environmental remediation around the world," said co-Director Paul Kostecki. "We are very pleased to welcome them this year and hope to see ever increasing international representation in the years to come." ~



## Where were you when the Red Sox beat the Yanks?

**B**ELIEVE IT! Soils Conference celebrates 20th Anniversary at UMass Amherst and THE RED SOX BEAT THE YANKEES in New York to win the American League Championship Series and make history. "They got there with the most unbelievable comeback in baseball history," said ESPN, "shaming the New York Yankees."

On Wednesday October 20th, as conference-goers were settling into one last night of workshops and networking, the Red Sox were settling into their groove. After suffering a 19 to 8 drubbing by the Yanks in Game 3, the Sox turned the tide with a Game 4 victory on Sunday and never looked back.

Boston built up a head of steam with two more wins, then exploded in Wednesday's Game 7 with a stunning 10-3 victory that quieted the Yanks and sent the Sox screaming off to St. Louis where they would sweep the Cardinals and finally reverse the curse. Spontaneous celebrations erupted across New England. Hordes of UMass students poured out of their dorms to hail the champs and revile the Yanks.

In response to reports of raucous celebrating on campus that kept some attendees up all night, conference co-Director Paul Kostecki said, "We're happy to share our 20th Anniversary moment in the sun with the boys from Boston. Go Red Sox!" ~

### CONFERENCE SERIES BOX SCORES

Day 1(10/18): BOS 5, NYY 4

Day 2(10/19): BOS 4, NYY 2

Day 3(10/20): BOS 10, NYY 3

# The Perchlorate Challenge

*"The growing concern over perchlorate was officially acknowledged by the EPA in 1999, but just finding it is very difficult"*

Whether it comes from rocket fuel, organic Chilean fertilizer, or natural deposits, soils and groundwater impacted by perchlorate may pose health risks to sensitive populations. Although further research is required to determine exactly what concentration of perchlorate contamination exceeds safe levels, suggestions of interrupted nervous system development and thyroid tumors are enough to cause concern. During this year's Perchlorate Platform Session, speakers commented on the nature of the chemical and the challenges involved with detecting and treating perchlorate-contaminated sites.

Perchlorate taints water in at least 22 states, and a little bit goes a long way. One metric ton of perchlorate can contaminate 32 billion gallons of water, equivalent to all the water in Arizona's Lake Mead.

"It dissolves easily in water," says Paul Rakowski of the Naval Facilities Engineering Command (NAVFAC) and moderator of the Perchlorate Session, "which means it can move very quickly and it takes a long time to degrade." And when contaminated water is used to irrigate fields, perchlorate may find its way into various crops and agricultural products.

Platform Session speakers reported on a variety of methods for treating perchlorate-contaminated water, including in situ treatments that exploit naturally-occurring perchlorate-reducing bacteria and ex situ methods involving ion exchange. However, the currently available methods are very complex and costly, according to Harry Van Den Berg of ENSR International.

The growing concern over perchlorate was officially acknowledged by the EPA in 1999 when the agency added it to the Unregu-


lated Contaminant Monitoring Rule list. But, "just finding it is very difficult," notes Rakowski.

The EPA-approved method for detecting perchlorate in drinking water is limited in its specificity and sensitivity, says Ed Corl of NAVFAC's Atlantic Division. The approved method can detect perchlorate to a concentration of 4 parts per billion (ppb), but regulatory agencies in some states have already listed provisional action levels as low as 1 ppb. Therefore, Corl says, "the currently approved method may not meet data quality objectives for some studies."

The concern over perchlorate has prompted researchers to develop highly sensitive detection methods. New analytical techniques involving liquid chromatography and mass spectroscopy can detect perchlorate at concentrations well below the provisional 1 ppb action level, reports Jim Krol, a Senior Application Chemist with the Massachusetts-based Waters Corp. And improved analytical methods have significantly increased the frequency of perchlorate detection. "Our analytical techniques for finding it have become more specific," says Rakowski. "Now we seem to be finding more widespread low levels of perchlorate."

The source of some contaminated sites are manufacturers and users of perchlorate salts: military bases, aerospace installations and defense contractors that build rockets. Perchlorate salts are also used to manufacture roadside flares, airbag inflators, metal finishing and matches. However, a portion of the perchlorate found in the U.S. is believed to be naturally occurring.


One confirmed natural source of perchlorate is the sodium nitrate fertilizer derived from Chilean caliche, a crusty, nitrate-rich sediment found in the Atacama desert of northern Chile. "Perchlorate plumes from natural sources seem to be coming primarily from the liberal use of Chilean caliche-derived fertilizer [in the U.S.] between 1900 and 1950," says Paul Hatzinger of Shaw Environmental, "but there may also be other natural sources of perchlorate as yet unknown."

"As we go through the scientific process, we will discover that there is an impact from natural perchlorate as well as man-made perchlorate," says Rakowski. This will have to be taken into consideration when planning remediation efforts, he said. 

## Proceedings Published, Soils Conference Between the Covers

Proceedings from the International Conference on Soils, Sediments and Water will be published by the renowned scientific publishing company, Springer (visit [www.springeronline.com](http://www.springeronline.com) for order information).

The proceedings will be published under the title, "Contaminated Soils, Sediments and Water Volume 10," edited by Edward Calabrese, Paul Kosteci and James Dragun. This edition will contain more than 30 technical papers, covering a wide range of environmental issues, including: Environmental Fate; Heavy Metals; Modeling; MTBE and Oxygenates; Regulatory; Remediation; Risk Assessment and Remedial Approaches Toward Restoration and Management of Contaminated Rivers; and Site Assessment.

Authors contributing to this volume come from government agencies, academic institutions, the consulting community and industrial companies. This important volume documents the state of environmental science and provides perspective on where we as an industry have come from. This and preceding volumes of Contaminated Soils, Sediments and Water, consolidate the valuable technical information presented at this conference in order to stimulate the scientific, engineering and consulting alliances and widespread collaboration that will continue to move our field ahead. 

# Luncheon Speaker Roundup



Juan Reyes discusses the Health and Environmental program of the Dept. of Homeland Security.



William Kucharski describes the environmental effects of Iraq's invasion of Kuwait.



Rick McCullough explains how the Mass Pike Authority responds to environmental incidents.

All three of this year's featured luncheon speakers have at least one thing in common – huge responsibility. The speakers offered insights from their experience managing large-scale environmental programs. Their presentations ranged in scope from regional to international: environmental incident response of the Massachusetts Turnpike Authority; the environmental health and safety mission of the U.S. Homeland Security Department; and the international effort to redress environmental devastation caused by Iraq's invasion of Kuwait preceding the Gulf War.

## TUESDAY

### *Meeting the Challenge: Standing Up a Safety, Health and Environmental Program at the Department of Homeland Security*

In addition to the Herculean task of defending the nation's borders, the Homeland Security Department's Office of Safety and Environment has an environmental protection mandate. **Juan J. Reyes**, Director of the U.S. DHS Office of Safety and Environment, discussed the activities of the newly established office. His unit leads the effort to remediate parts of the delicate southwest desert ecosystem degraded by borderland smugglers who drive illegal roads through environmentally sensitive areas like the Cabeza Prieta National Wildlife Refuge. Reyes also described the Department's ongoing effort to convert Federal Law Enforcement Training Center firing ranges into "total containment" facilities in order to decrease their environmental impact. Total containment ranges employ non-toxic, "green" bullets and have environmental decontamination systems installed to reduce to incidence of environmental lead exposure. These are just two examples of the Department's continuing commitment to the environment, he said.

## WEDNESDAY


### *United Nations: How they Dealt with Iraq's Environmental Terrorism*

Kuwait is in the midst of a lengthy and uncertain quest to collect millions of dollars in damages from Iraq for environmental devastation caused during the 1990 invasion. Kuwait now suffers from contaminated groundwater, spoiled coastal areas and hundreds of square miles of

land rendered lifeless by tarcrete deposits. Tarcrete, created by the soot rained down from hundreds of burning oil wells, forms an asphalt-like layer on the soil. "Even after regime change, Iraq is liable under environmental law for direct loss and environmental damage as a result of their actions," explains **William A. Kucharski**, Program Manager of the Kuwait M & A Program for the international environmental consulting firm Ecology & Environment, Inc. Kucharski described some of the challenges facing Kuwait: the enormity of the destruction; the environmental degradation of groundwater, soils and coastal areas; the scale of a proper cleanup project and the impediments coming from the UN. The UN, says Kucharski, may be setting a bad precedent for environmental terrorism remuneration because of the way it is handling Kuwait's claims. "So far the UN has secured only one quarter of the total damages owed by Iraq," he said.

## THURSDAY

### *Mass Pike Emergency Preparedness and Response to Environmental Incidents*

**Rick McCullough** is a juggler, a skillful multitasker. As Director of Environmental Engineering for the Massachusetts Turnpike Authority, he depends on his ability to keep a lot of balls in the air. Between 40 and 50 reportable environmental incidents take place on the highway each year. The Mass Pike Authority is always on call to respond to these incidents and rapidly initiate the cleanup process. McCullough also discussed the Mass Pike Emergency Preparedness Plan. More than 20 departments were involved in the development of the plan, which included an analysis of all potentially vulnerable features of the highway (e.g. bridges, tunnels and tolls), a strategy for addressing the consequences of a terrorist attack, and the establishment of an emergency operations control center in Boston. The plan was reviewed in accordance with the Federal Emergency Management Agency's Capability Assessment for Readiness to ensure sufficient response capability should an incident occur along the heavily populated Mass Pike corridor. In the future, McCullough plans to use a GIS-based system to better identify and coordinate all of the agencies, localities, private industries and other entities that abut the linear landscape of the Mass Pike. 

# Following the Vapor Intrusion Path

*“Vapor intrusion modeling permits rapid assessment of a large number of sites so that investigators can focus on the homes and buildings that are at greatest risk”*

Even deep below the ground, hazardous volatile chemicals don't stay put. Groundwater fouled by chlorinated solvents or other volatile organic compounds is the beginning of a long and circuitous path through the subsurface that, in the worst-case scenario, ends with the accumulation of potentially harmful toxic vapors in homes and other buildings. This is the so-called vapor intrusion pathway.


In extreme cases, vapors may accumulate to levels that pose serious health safety hazards. But, not all homes and buildings located near a contaminated site are at risk. How to best determine which dwellings and occupied building are most likely to be impacted by hazardous vapor intrusion was the theme of a two-day workshop sponsored by the EPA's Office of Solid Waste and Emergency Response (OSWER). More than one hundred attendees from state and federal regulatory agencies and private environmental consulting firms participated in the OSWER Workshop at this year's International Soils, Sediments and Water Conference.

Workshop speakers and attendees discussed the vapor intrusion state of the science and offered recommendations for improving the OSWER draft guidance document entitled, “Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils.” The OSWER vapor intrusion guidance document is intended to be used as a tool to aid users in determining whether a vapor intrusion pathway is complete and, if so, whether the completed pathway poses an unacceptable risk to human health. The Workshop, according to Henry

Schuver of OSWER, was an opportunity to improve the draft guidance document and make it a more useful tool by bringing together the people who produced the document with the environmental professionals responsible for on-the-ground assessment of vapor intrusion cases.

The idea that vapors from contaminated groundwater could have negative health effects is relatively new. Concrete evidence of vapor intrusion was recently discovered near contaminated sites in New York, Colorado and California, and that generated a lot of activity within the environmental remediation community, says Schuver. Since the vapor intrusion issue has taken center stage, there has been “improved comprehensiveness in assessing human exposure to contaminated sites,” he said. But, with this improved comprehensiveness comes another challenge: how to assess the risk at hundreds of sites across the country where vapor intrusion is a potential health hazard.

Indoor air quality is the concern, but because volatile chemicals are common in a variety of household products including paints and glues, indoor air sampling is not sufficient to assess the impact of vapor intrusion from contaminated groundwater. Instead, environmental professionals use a complicated model to predict indoor air concentrations of hazardous chemicals based on known groundwater data. The modeling method permits rapid assessment of a large number of sites so that investigators can focus on the homes and buildings that are at greatest risk of experiencing negative health effects from vapor intrusion. However, some residents in the impacted communities have expressed concern that the vapor intrusion model is too complex and prone to misuse.

The OSWER Workshop on Vapor Intrusion is one way to address these concerns. By bringing together such a large group of professionals, researchers and community advocates, the organizers hope to significantly improve the procedure for evaluating the vapor intrusion risk. 



## See You In 2005

Please join us for the 21st Annual Conference on Soils, Sediments and Water, October 17-20, 2005, at the University of Massachusetts at Amherst.

The 2005 conference theme, Expediting and Economizing Cleanups, will be supported by the development of a strong and diverse technical program in concert with a variety of educational opportunities available to attendees. Live equipment demonstrations will augment the exhibition section, which brings real-world application to the technical theory as well as case studies presented during the platform sessions. Focused workshops will provide attendees with practical information that will impact their job performance immediately.

The conference promises to be an exciting opportunity for all those concerned with the challenge of developing creative, cost-effective assessments and solutions that can withstand the demands of regulatory requirements.

### 2005 Preliminary Agenda:

#### GENERAL SESSIONS

- bioremediation
- chemical analysis
- cleanup standard setting
- environmental fate and modeling
- hazard exposure and risk assessment
- heavy metals
- hydrocarbon identification
- innovative technologies
- jet fuel contamination
- regulatory programs and policies
- site assessment/field sampling
- soil chemistry
- standard remedial technologies/corrective actions
- case studies on any of the above

#### SPECIAL SESSIONS

- acid mine drainage
- arsenic
- bioindicators
- biotechnology
- chlorinated hydrocarbons, pesticides (PCBs, etc.)
- containment
- contamination at military installations
- dioxin
- ecological risk assessments
- environmental forensics
- MECs
- mercury
- MTBE
- perchlorate
- phytoremediation
- radionuclides
- railroad sites
- risk based cleanups (RBCA)
- state regulatory programs
- sediments

For information contact:  
Denise Leonard at 413-545-1239  
or [info@UMassSoils.com](mailto:info@UMassSoils.com)

ENSR International

Environmental  
Remediation and  
Financial Services, LLC

MA DEP

Massachusetts Riverways  
Program

Regenesis Bioremediation  
Products

US EPA, ORD, National  
Risk Management  
Research Laboratory

AMEC Earth and  
Environmental Inc.

American Petroleum  
Institute

BBL

U.S. Army Engineer  
Research and  
Development Center

US EPA, Office of  
Superfund Remediation  
and Technology  
Innovation (OSRTI)

3M

Adventus Americas

Alpha Analytical Labs

DPR, Inc.

EA Engineering, Science &  
Technology

Geovation Technologies,  
Inc.

K-V Associates

LSP Association

New York DEC

Security, Emergency  
Preparedness and  
Response Institute  
(SEPRI)

Tighe & Bond, Inc.

# The Exhibit Hall and Reception

Theories and concepts presented during platform sessions intersect with practical application in the Exhibit Hall. Conference-goers network and check in with developers of the latest in environmental remediation technologies. Researchers, CEOs, regulatory officials, engineers – everybody passes through the Exhibit Hall. Don't miss this opportunity to showcase your business. Reserve a space now. Contact Denise Leonard at 413-545-1239.

