

HazTech

T R A N S F E R

Great Plains/Rocky Mountain Hazardous Substance Research Center

KC conference draws experts, builds partnerships

By Alison Sawyer

Establishing true partnerships, working toward sustainability, and improving accountability and performance: These were all topics highlighted at the 12th annual Conference on Hazardous Waste Research held at the Kansas City Airport Hilton, May 20-22.

The conference attracted approximately 250 participants. Co-sponsors included the U.S. Environmental Protection Agency (EPA), the Waste-management Education & Research Consortium (WERC), the National Mine Land Reclamation Center (NMLRC), and the National Institute of Environmental Health Sciences (NIEHS). Fifteen cooperating supporters from federal, state, and private organizations also helped with this event.

R2D2 Session

On May 19, the Research and Re-education for Displaced Defense (R2D2) Program sponsored a special evening session on mining, mine lands, and environmental research and infrastructure needs.

This event served as a forum to discuss science/engineering-based environmental research and development. It focused on methods to field resulting technologies pertinent to active or historic mining operations. (More information on this event appears in another article on page 6.)

Opening Session

On May 20, Larry Erickson, director of HSRC, welcomed conference participants. The co-sponsoring organizations also gave welcomes and an overview of current activities and future projects. Tim Ward, Associate Director, WERC; Paul Ziemkiewicz, Director, NMLRC; Michael Sanderson, U.S. EPA, Region 7; and Beth Anderson, NIEHS, each gave welcoming remarks and an overview of their organizations.

Thomas Houlihan, liaison from White House Office of Science and Technology Policy to the Interagency Environmental Technologies Office, gave the first plenary address. Houlihan discussed the National Environmental Technology Strategy, the Future and the Role of Research. He highlighted the National Science and Technology Council's strategy results, which includes moving forward in the areas of performance, flexibility, and account-



Center Director Larry Erickson, left, congratulates Patrick Gilcrease, Colorado State University, who received the Karen Morehouse Best Paper Award for the 1996 Conference.

ability. Participants can access the Internet site at www.gnet.org. Louis Licht of Ecolotree, Inc., gave the second opening address and said that the essence of sustainability is living in a cyclic lifestyle.

Exhibits

Twelve organizations exhibited their publications and expertise at the conference. Conference participants were able to talk to each organization, and find out what programs and services each one provides. Exhibitors included Allied Signal, Bingham Environmental Technologies, Inc.,

continued on page 2



Tom Houlihan

On page...

Articles

Update on center activities5
Mining technology forum6
Environmental design contest...7
attracts 30 teams.....

Regular features

Consortium directory.....3
Project profile4
Director's column.....7
Calendar.....8

July 1997

CETCO, Ecology & Environment Inc., Great Plains/Rocky Mountain Hazardous Substance Research Center, Hydro-Logic, Inc., Metcalf & Eddy, Inc., Midwest Research Institute, and the Waste-management Education & Research Consortium.

Best Paper Award presentation

Larry Erickson presented the Karen Morehouse Paper Award during the Tuesday luncheon. This award goes to the team of researchers who had the best paper at the previous year's conference. This year's winning paper was entitled "Bioremediation of Solid TNT Particles in a Soil Slurry Reactor: Mass Transfer Considerations," by Patrick C. Gilcrease, Vincent G. Murphy, and Kenneth F. Reardon of the Department of Chemical and Bioresearch Engineering and Center for Environmental Toxicology and Technology, Colorado State University, Fort Collins, Colorado. The paper appears in the Proceedings of the 11th Annual Conference on Hazardous Waste Research.

Luncheon addresses

Luncheon speakers were from organizations who play an important role in the technology development cycle. On Tuesday, LTC Stan Hunt gave an overview on how the Air Force Center for Environmental Excellence (AFCEE) integrates new technologies from the research and development community into cleanup and compliance practices at Department of Defense sites. AFCEE's interest is in field-ready technologies or applied aspects of research, that can be demonstrated at a network of bases designated for this purpose.

Tim Ward, Associate Director of the Waste-

management Education & Research Consortium (WERC), gave the Wednesday luncheon address. He discussed WERC's approach of moving forward in commercializing environmental technologies. Since its inception, WERC has sponsored a peer-reviewed, applied research program focused on development of environmental technologies. Over a seven year period, approximately \$14 million has been invested in advancement of state-of-the-art methods, procedures, and techniques for effective waste management and environmental restoration. In addition to the research program, WERC also provides educational opportunities for both students and professionals.



LTC Stan Hunt, Air Force Center for Environmental Excellence, delivers a luncheon address on "Innovative technologies, partnerships and AFCEE."

Poster award presentations

Stan Grant, Associate Director of Great Plains-Rocky Mountain, HSRC; Beth Anderson, of National Institute of Environmental Health Sciences, North Carolina; and Tim Ward, of WERC, judged over fifty poster presentations at the conference. They announced the poster winners on Wednesday, May 22. The judges based their ratings on the students' scientific approach, knowledge of the subject, presentation style, and communication techniques.

Best Poster Award:

J.C. Ziegler, J.P. Turner, Y.A. Osman, J. Chase, and L.A. Bulla, The University of Wyoming, Laramie, "Soil Hydraulic Conductivity Reductions Caused by Ultramicro Bacteria."

Poster of Merit Awards:

P.J. Rice, J.C. Anhalt, J.R. Coates, Iowa State University, Ames, Iowa; and T.A. Anderson, Clemson University, Pendleton, S.C., "Phytoremediation of Atrazine- and Metolachlor-Contaminated Water with Submerged and Floating Aquatic Plants."

N. Gulensoy and P.J.J. Alvarez, The University of Iowa, Iowa City, "Substrate Specificity of Aromatic Hydrocarbon Degradors."

This year, the judges chose an individual to receive the Emerging Scientist Award. Amy L.



Amy Ryser, a Wamego (Kan.) High School junior, and one of her advisors, Peter Kulakow of Kansas State University, pose with the project that earned her the Emerging Scientist Award.

Ryser, a student at Wamego High School, Wamego, Kan., received this special recognition. Ryser is advised by P.Kulakow, A.P. Schwab, and M.K. Banks, Kansas State University, Manhattan.

An award for special non-technical poster was given to: W.M. Griswold, G.L. Godfrey, and P.T. Yazzie, Haskell Indian Nations University, Lawrence, Kan.

Short courses

Faculty and students working with hazardous substances in the laboratory and on field sites were able to attend an 8-hour HAZWOPER (Hazardous Waste Operations Training) on Monday, May 19. Participants learned the significance of personal protection equipment, developed safety plans, and performed hands-on activities with instrumentation and monitoring. Stanley Grant, and Larry Satzler of Kansas State University instructed the course.

The Acid Mine Drainage Short Course was held on Monday, May 19, and covered effective acid mine drainage (AMD) control technologies, performance histories, and their application to common problems in the industry. Paul Ziemkiewicz, Director of the National Mine

Land Reclamation Center, West Virginia University, was the instructor.

Workshops

Application of Chelating Agents for Removal of Heavy Metals from Soils was held on Thursday, May 22. This workshop focused on selection of suitable chelating agents based on the complexation, selectivity, recoverability, and biostability of chelating agents. Techniques and results of equilibrium modeling were presented.

The seminar, entitled Prepared Bed Bioremediation of Contaminated Soils, addressed ex situ prepared bed treatment of contaminated soils for risk management. Prepared bed land treatment units were addressed with regard to design approaches, management, monitoring, and performance evaluation.

Abstract Book

Abstract books from the conference are available at the Center's Internet site and upon request by contacting Carla Wolfe, Great Plains/Rocky Mountain Hazardous Substance Research Center, Kansas State University, 101 Ward Hall, Manhattan, KS 66506.

Consortium Directory

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http://www.engg.ksu.edu/HSRC/home.html

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*—research

**—technology transfer



Midwest Research Institute cooperating supporters discuss their work in the exhibit hall.



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Chelating agents rid soils of heavy metals

By **J. Patrick McDonald**

Soils contaminated with heavy metals are a common problem at hazardous waste sites. Since the metals bind tightly to the soil matrix, they can present complex problems including risks due to direct contact exposure and leaching into groundwater. Removing heavy metals from contaminated soils can be a difficult problem.

Three researchers of the Great Plains/Rocky Mountain Hazardous Substance Research Center (HSRC) are working on a soil washing solution to this problem. Andrew Hong and Robert Okey, both of the University of Utah, and Shankha Banerji at the University of Missouri-Columbia are studying chelating extraction of heavy metals from contaminated soils. Metal chelators in solution provide an excellent soil wash for heavy metal-contaminated soils. Unlike acid washes, chelators require only mild pH. The metals can be extracted selectively (by carefully choosing the chelator and the pH) and subsequently recovered.

Research findings

A method based on equilibrium calculations was developed for assessing the potential of chelating agents toward extractive remediation of heavy metals-contaminated soils, with emphasis on the recoverability of the metals and the chelators. One hundred and ninety pre-screened chelating agents were assessed for their extraction and recovery potential towards six target metals.

The developed approach is supported by experimental results using test chelators SCMC, ADA, and PDA for the extraction and recovery of copper, zinc, cadmium, and lead from soil. Results indicate that chelators and pH can be selected to enhance recovery of specific metals. Subsequent recovery of the metals can also be achieved.

Potential development

This research provides critical information for the design of soil washing systems used to remediate soils

contaminated with heavy metals. The research is of particular interest at sites where metal recovery is a concern. The research may also have application wherever industrial heavy metal extraction is needed.

Principal investigators

P.K. Andrew Hong, Associate Professor, Department of Civil and Environmental Engineering, University of Utah; Robert W. Okey, Research Associate Professor, Department of Civil and Environmental Engineering, University of Utah; and Shankha Banerji, Professor, Department of Civil Engineering, University of Missouri-Columbia.

Publications

Andrew Hong, Ting-Chien Chen, and Robert Okey, "Chelating Extraction of Copper from Soil with S-Carboxymethylcysteine," *Water Environment Research*, 1995, 67, 971-978.

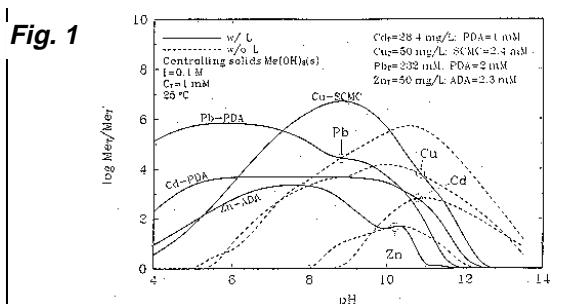
Edward Macauley and Andrew Hong, "Chelating Extraction of Lead from Contaminated Soil," *J. Hazardous Materials*, 1995, 257-270.

Andrew Hong and Ting-Chien Chen, "Extractive Recovery of Cadmium from Soil Using Pyridine-2,6-dicarboxylic Acid," *Water, Air, and Soil Pollution*, 1996, 86, 335-346.

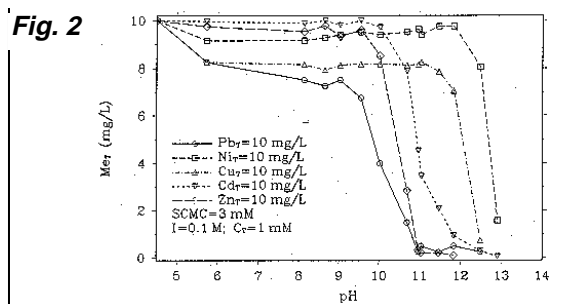
Andrew Hong, Ting-Chien Chen, and R. Okey, "Chelating Extraction of Zinc from Soil with N-(2-acetamido)iminodiacetic Acid," *ACS Symposium Series 607*, 1995, Chapter 17, 21-223.

Ting-Chien Chen and Andrew Hong, "Chelating Extraction of Lead and Copper from an Authentic Contaminated Soil Using N-(2-acetamido)iminodiacetic Acid and S-carboxymethyl-L-cysteine," *J. of Hazardous Materials*, 1995, 41, 147-160.

Ting-Chien Chen, Edward Macauley, and Andrew Hong, "Selection and Test of Effective Chelators for Removal of Heavy Metals from Contaminated Soils," *Canadian Journal of Civil Engineering* 1995, 22, 1185-1197.



This chart shows the degrees of complexation of various chelating agents toward metals as a function of pH.



This chart demonstrates the sequential release of multiple metals from the SCMC chelator as pH is gradually increased.

HSRC *Update* on center activities

Water quality workshop

Ben Whiting, environmental science and conservation instructor at Sinte Gleska University, conducted a workshop in water quality analysis techniques at the Kickapoo Nation's Environmental Office near the Delaware River in Kansas on June 3. The eight-hour laboratory and field session examined the setup and operation of a small-scale wet laboratory for water quality analysis including drinking water diversion from a surface water source. Participants from area tribal nations were invited to attend as well as representatives from other Kansas environmental agencies. The workshop was sponsored by the Kickapoo Nation, the Natural Resources Department at Haskell Indian Nations University, the Haskell Environmental Research Studies Center, and the Environmental Protection Agency.

Seminar series completed

The final program in the "All Things Are Connected—The Sacred Circle of Life" seminar series was broadcast via satellite April 22. "Air—Ensuring Quality for the Future" began with a pre-edited segment featuring activities of the Navajo Nation's Air Quality Control office, followed by a panel discussion involving Native American environmental professionals. George Tiger, host and producer of Inside Native America, moderated the program. Joining Tiger were Ella Mulford (Navajo), environmental specialist and president of Redhorse, LLC, an environmental consulting firm; Gerald Wagner (Blackfeet), director of Environmental Programs for the Blackfeet Nation, Browning, Wyo.; and Joe Young (Prairie Band Potawatomi), an attorney working with the Forest Band Potawatomi Nation of Wisconsin.

TOSC to continue beyond pilot

The Technical Outreach Services to Communities (TOSC) program, after a successful three-year pilot program, will grow into a continuing program of the HSRCs. The program, which provides technical assistance to citizens coping with hazardous waste cleanups in their communities, was funded as a three-year pilot project through the HSRCs by EPA's Community Involvement and Outreach Center.

The recommendation for continuation of the program came after a positive report from the TOSC evaluation project completed by researchers at Michigan State University*. The report, in addition to evaluation of six case studies, identified seven national program recommendations and seventeen

recommendations for regional efforts.

In order to effectively move from the pilot to a full program, EPA established a work group consisting of the five HSRC TOSC coordinators, EPA regional Community Involvement Coordinators, and citizen activists who had worked with the TOSC pilot. The work group is nearing completion of its appointed tasks and has developed several work products that will assist in the transition.

As TOSC expands, we will be able to serve several additional sites in need of assistance. In order to bring balance back to the program, we will be focusing most heavily on EPA Region VII.

**Evaluation of the Technical Outreach Services for Communities Pilot Program*, Final Report to the U.S. Environmental Protection Agency, Office of Exploratory Research Hazardous Substance Research Centers Program and the U.S. Environmental Protection Agency Superfund Community Involvement and Outreach Center, November 1996.

HSRC Web site popular

The GP/RM Web site, www.engg.ksu.edu/HSRC, has been helpful to many professionals. Hits at this specific site at KSU have exceeded 67,000 in the past year. Approximate distributions of users is as follows: edu—28 percent, com—18 percent, net—14 percent, de (Germany)—12 percent, gov—4 percent, and other—24 percent. It appears many are using key word searches to find specific papers and reports. The good news is that we have found an inexpensive method to distribute copies of our annual report, conference proceedings, and other products throughout the world. Suggestions on how we can make this site more user friendly and beneficial are welcome. These may be sent to Pat McDonald or Carla Wolfe at the center office.

Call for proposals

The Great Plains/Rocky Mountain Hazardous Substance Research Center is accepting proposals for both research and technology transfer projects for the May 1998-May 1999 funding cycle.

Deadlines are Aug. 15, 1997, for the research proposals and Sept. 15, 1997, for the training and technology transfer proposals. Copies of Calls for Proposals may be obtained by calling or writing the GP/RM HSRC, 101 Ward Hall, Kansas State University, Manhattan, KS 66506-2502;

Mining technology needs discussed at KC forum

By Blase A. Leven

As part of ongoing efforts to focus research and technology development activities on timely, relevant issues, the HSRC, together with WERC and NMLRC, recently conducted a special event entitled "Mining, Mine Lands, and the Environment—Research and Infrastructure Needs." This event was held on the evening prior to the official start of the 12th Annual Conference on Hazardous Waste Research in Kansas City, Missouri. Panelists and audience members from research, government, and industry groups discussed environmental technology needs for active and historic mining activities. The event involved approximately 60 participants, began with a reception, and consisted of presentations and discussions among panelists and audience members. Throughout the event, a number of recurring themes prevailed in several topic areas.



Joe Galetovic, Office of Surface Mining Technology Transfer, addresses the group during the panel presentation.

Environmental research and technology development needs

Passive, inexpensive technologies are necessary to declassify or detoxify mining byproducts and enable beneficial reuse, resale, and waste minimization. Techniques for re-establishing water-holding capacity, pH, and nutrient levels in mine spoils are necessary to support vegetation and self-sustaining ecosystems—within the life of mine reclamation

bonds. Also, new plugging materials and techniques are required to mitigate physical hazards associated with abandoned mining areas.

Industry and regulators need accurate prediction tools to quantify possible impacts and probable outcomes of planned mining and restoration activities. These tools must accommodate limitations due to sparse data (and a lack of related variability information), to adequately identify and simulate subsurface reactions that control contaminant movement. Such tools will simplify permit preparation, review and approval activities, and possibly enable less complicated monitoring strategies. Associated cost savings can be redirected to executing reclamation/pollution prevention plans.

Many mining laws are applied on a national scale and are not tailored to geographic areas. Reg-

ulatory standards which account for specific geographic and geologic circumstances are necessary. Decision support systems to help resolve conflicting regulations, public opinion, and combinations of both are also needed.

Concentration-based environmental regulatory standards do not currently address bioavailability and ecosystem response from different forms (species) of contaminants (particularly metals). These standards also do not address natural habitat variations over time which affect contaminant concentrations and are very difficult to measure. Methods to predict and measure ecosystem responses, using reliable biological assessment techniques, may provide for more realistic, effective regulatory standards. Field measurement capability for any regulatory standard is a must.

Infrastructure to address technology needs

Industry, regulators, and researchers agree that new technologies are needed to effectively address and regulate environmental issues at active and historic mining sites, and that funds to conduct this research are limited. Collaborative, applications-oriented research and technology development among federal, state, and private organizations is key to maximizing use of these limited funds. Many of the organizations represented by panelists at this session currently have these capabilities and are developing partnerships to effectively address these challenges. Significant conjecture exists regarding how to finance additional mining-related environmental research and technology development activities.

Electronic data and document exchange across organizational and functional boundaries can save time and effort in mine reclamation planning and permitting. The Department of Interior Office of Surface Mining (OSM) is sponsoring development and training for electronic permitting techniques to speed development, transfer, and review of permit applications among involved field, lab, contractor, corporate, and regulatory organizations, using consistent computer formats and protocols. The OSM is working to facilitate this and other information exchange/training among mining industry and regulatory groups.

Flexible, usable regulations that can accommodate new technologies are necessary, and regulators need fast access to information on successful new and promising technologies currently (or formerly) under development. Coordinated Internet pages, repository listings (and inventories), and resource centers can provide this access. Such mechanisms should link resources with applicable

continued on page 7

In December 1996, a renewal proposal was submitted to EPA for the Great Plains/Rocky Mountain Hazardous Substance Research Center. A peer-review panel of environmental professionals visited Kansas State University March 18-20, 1997, after reviewing the renewal proposal and other documents, publications, and reports on the activities of the center. While on campus, they listened to presentations, visited laboratories, viewed posters, and met with university administrators, principal investigators, students, and staff. They prepared their report on March 20 which contained a summary statement and several specific recommendations. Conclusions and recommendations from the summary statement are as follows:

"The Peer Review Panel's opinion of the technical quality and management capabilities of the Great Plains/Rocky Mountain Hazardous Substance Research Center's activities over the past eight years was very favorable. The center's research is considered to have made important contributions to the areas delineated in its proposals; productivity of most of its funded investigators is of high quality; the training and technology transfer program is effective; and the management of the center is in the hands of a capable and dedicated director and staff."

HSRC universities place well in Environmental Design Contest

Thirty teams from 20 universities won more than \$60,000 in cash prizes at the 1997 Environmental Design Contest held April 8-11 at New Mexico State University.

For the seventh year, the Waste-management Education & Research Consortium (WERC) hosted nearly 200 university students and over 60 judges, including Blase Leven of the Great Plains/Rocky Mountain HSRC, for a unique competition that combined real-world waste management and remediation problems and students' creative solutions.

This year, students tackled actual problems from public and private sites in Idaho, Colorado, and Washington. Teams could choose to solve an environmental challenge using one of three approaches: Task I—develop a system capable of taking waste samples from a large radioactive waste tank; Task II—cleanup of contaminated groundwater; and Task III—cleanup of plutonium-contaminated filters.

Montana Tech, an HSRC consortium university, took first place overall honors, \$10,000 in prize money and the Rust Geotech traveling trophy. Montana Tech won first place in Task II and second place in Task III. Other HSRC universities receiving awards were Michigan State and Oregon State Universities.

The winners were determined by judges' ratings

"The panel considers the center to have been an effective expenditure of EPA funds and the panel strongly recommends EPA continued funding of the center. In addition, the timing of such funding should be sensitive to the uninterrupted support of students on the various center projects."

Two examples of specific recommendations follow: "The center should establish a mechanism to provide a needed balance among basic research, applied research, and technology demonstration projects"; and "Research workshops and seminars should be held to recruit faculty from member institutions to identify critical needs and develop research focus areas." Efforts are being made to implement many of the recommendations.

This positive peer review report reflects the dedication and efforts of faculty, staff, students, advisory committee members, and cooperators who have participated in center activities; and the support of university administrators and research program staff. I want to thank all who have contributed to the activities of the center—its success is a result of a team effort.

Larry Erickson
Center Director

based on a written report, and oral and poster presentation and a working bench-scale model. Experts tested the resulting samples of the bench-scale models to assess potential success of design concepts..

So well designed are the student-generated solutions that many of them have been implemented at federal and industrial sites throughout the country.

Mine technology forum

continued from page 6

information across industry and institutional boundaries.

Conclusions and acknowledgments

Due to interest in and positive response to this session, future HSRC conferences will include similar events. This event was sponsored by the Research and Re-education for Displaced Defense Personnel (R2D2) program, and was one of several professional development opportunities for students in this program. A more detailed summary of this session, including names and contact information for participating panelists, will be published in the *Proceedings of the 12th Annual Conference on Hazardous Substance Research*, to be available by mail, or on the Internet at:
<http://www.engg.ksu.edu/HSRC/Publications.html>.

Calendar

July 17—Inspector/Management Planner Refresher, Kansas City, KS; National Asbestos Training Center, Barbara Miles, 913-897-8528.

July 31—Project Designer Refresher, Kansas City, KS; National Asbestos Training Center, Barbara Miles, 913-897-8528.

Aug. 4-8—16th Annual Hazardous Waste Summer Institute, Columbia, MO; Univ. of Mo.-Columbia, Virginia Nettleton, 573-882-8880.

Aug. 4-8—Hazardous Waste Site Operations (40-hour), Kansas City, KS; Univ. of Kansas Center for Environmental Education and Training, Shirley Welhoelter, 913-897-8527.

Aug. 8—Contractor/Supervisor Refresher, Kansas City, KS; National Asbestos Training Center, Barbara Miles, 913-897-8528.

Aug. 11-13—Hazardous Materials Emergency Response (24-hour), Kansas City, KS; Univ. of Kansas Center for Environmental Education and Training, Shirley Welhoelter, 913-897-8527.

Aug. 12-13—Environmental Site Assessment Practices for Commercial Real Estate ASTM Standard E 1527 and 1528—St. Louis, MO; Univ. of Mo.-Columbia, Virginia Nettleton, 573-882-8880.

Aug. 12-Oct. 17—Fundamentals of Engineering Examination Review Course; available by interactive television on designated evenings in

several locations in Missouri, or by videotape; Univ. of Mo.-Columbia, Virginia Nettleton, 573-882-8880, or e-mail John Atkinson at atkinsoj@ext.missouri.edu.

Aug. 22—Project Designer Refresher, Kansas City, KS; National Asbestos Training Center, Barbara Miles, 913-897-8528.

Aug. 22—HAZWOPER Refresher, Kansas City, KS; Univ. of Kansas Center for Environmental Education and Training, Shirley Welhoelter, 913-897-8527.

Aug. 28—Contractor Supervisor Refresher, Kansas City, KS; National Asbestos Training Center, Barbara Miles, 913-897-8528.

Aug. 29—Inspector/Management Planner Refresher, Kansas City, KS; National Asbestos Training Center, Barbara Miles, 913-897-8528.

Sept. 4-Oct. 18—Review Course for Civil, Electrical, and Mechanical Engineering Examinations; available by interactive television on designated evenings in several locations in Missouri, or by videotape; Univ. of Mo.-Columbia, Virginia Nettleton, 573-882-8880, or e-mail John Atkinson at atkinsoj@ext.missouri.edu.

Sept. 9-12—Fourth International Petroleum Environmental Conference, San Antonio, TX (cosponsored by GP/RM HSRC); University of

Tulsa, Kerry Sublette, 918-631-3085.

Sept. 11-12—Air and Waste Management Association Midwest Section Technical Conference, Kansas City, KS; Charlie Whitmore, 913-262-8784.

Sept. 15-19—Lead Abatement Training for Supervisors and Contractors, Kansas City, KS; Mid-States Rocky Mountain Regional Lead Training Center, Barbara Miles, 913-897-8528.

Sept. 22-24—Lead Inspector Training, Kansas City, KS; Mid-States Rocky Mountain Regional Lead Training Center, Barbara Miles, 913-897-8528.

Sept. 25-26—Lead-Based Paint Risk Assessment, Kansas City, KS; Mid-States Rocky Mountain Regional Lead Training Center, Barbara Miles, 913-897-8528.

Oct. 3—HAZWOPER Refresher, Kansas City, KS; Univ. of Kansas Center for Environmental Education and Training, Shirley Welhoelter, 913-897-8527.

Oct. 7—Inspector/Management Planner Refresher, Kansas City, KS; National Asbestos Training Center, Barbara Miles, 913-897-8528.

Oct. 8—Contractor/Supervisor Refresher, Kansas City, KS; National Asbestos Training Center, Barbara Miles, 913-897-8528.

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