ITRC Training Courses – Course Overviews & Instructor Biographies
The 5th Environmental Technology Symposium and Workshop, Charlotte, North Carolina, March 24-28, 2003

COURSE TITLE: ***Advanced Techniques on Installation of Iron Based Permeable Reactive Barriers and Non-Iron Based Barrier Treatment Material***
March 25th (Tuesday 9:00 a.m. to 11:00 a.m.)

Presentation Overview:
Construction techniques for excavation and barrier wall emplacement have improved dramatically, and careful attention to barrier design and construction is critical to long-term performance monitoring. This second ITRC training course on permeable reactive barrier walls responds to requests to provide more detail and describe advances in the science and engineering to design, install, maintain, and monitor reactive barrier systems. The training is designed for state and federal regulators and industry consultants, but this new information will interest site owners and community stakeholders as well.

The curriculum uses case studies describing long-term performance of iron-based systems to train students to design them according to the heterogeneities of the subsurface. The training does not focus on the basic science and engineering of barrier systems but does present up-to-date information from industry and state regulators. The course also describes non-iron barrier systems, the material most commonly used, and the mechanisms encouraging a reduction in contaminant concentrations with in the systems.

Three documents created by ITRC's Permeable Reactive Barriers Team and the Remediation Technologies Development Forum support this course: *Regulatory Guidance for Permeable Barrier Walls Designed to Remediate Chlorinated Solvents* (2nd ed., PBW-1, 1999), *Regulatory Guidance for Permeable Reactive Barriers Designed to Remediate Inorganic and Radionuclide Contamination* (PRB-3, 1999), and *Design Guidance for Application of Permeable Barriers to Remediate Dissolved Chlorinated Solvents* (PBW-2, 2000).

Instructors:
Matthew Turner has a B.S. in Biology and a M.S. in Environmental Science. With 15 years experience in the environmental field, he is currently employed by the New Jersey Department of Environmental Protection as a Case Manager in the Site Remediation Program. He is a member of the Interstate Technology and Regulatory Council Workgroup where he has served as the leader of the Permeable Barrier Wall Subgroup since 1997. He is also a participant in the Remediation Technology Development Forum's Action Team on Permeable Reactive Barriers.

Scott D. Warner is a Principal Hydrogeologist at Geomatrix Consultants, Inc. with 16 years experience and expertise in hydrogeology, geochemistry, and innovative soil and groundwater treatment technologies. He has a B.S. in engineering geology from U.C.L.A. and M.S. in geology from Indiana University. Mr. Warner has provided consultation to the U.S. Department of Energy, the U.S. Department of Defense, the U.S. Environmental Protection Agency, and many private companies on innovative remediation technologies, including the use of bioremediation, permeable reactive barriers, and related technologies. He has also provided expert witness work with respect to litigation involving environmental remediation and geochemistry. Mr. Warner is a registered geologist/hydrogeologist in California and Washington and is the co-editor of the recently published American Chemical Society Book Chlorinated Solvent and DNAPL Remediation: Innovative Strategies for Subsurface Cleanup.

Arun Gavaskar is a Research Leader/Group Leader in the Environmental Restoration Department at Battelle, Columbus, Ohio. He has a background in chemical engineering and environmental technology, and has worked for thirteen years in the remediation and industrial pollution prevention areas. His current research interests include the remediation of a variety of groundwater, soil, and sediment contaminants, namely, DNAPL and dissolved-phase chlorinated solvents, heavy metals, and PCBs/dioxins. He also co-chaired the Second International Conference on Remediation of Chlorinated and Recalcitrant Compounds at Monterey, California in May 2000. *(Please note: Arun Gavaskar was replaced on-site at the symposium by Neeraj Gupta, Research Leader, Environmental Restoration Department, Battelle Memorial Institute)*

Mr. Mike Duchene is a senior engineer at EnviroMetal Technologies Inc. (ETI) with more than 10 years consulting engineering experience in the environmental field. He received both his Bachelors of Applied Science and Masters of Applied Science in Civil Engineering from the University of Waterloo. He joined ETI in October 1999. Prior to joining ETI, Mike worked primarily as a design engineer and designed and operated several groundwater remediation systems. At ETI, his responsibilities include managing various engineering aspects of the design and installation of PRBs. Mike is primarily involved in assisting clients in the detailed design of PRBs including detailed assessments of groundwater hydraulics, assessment and specification of potential construction techniques, and construction QA/QC protocols. He is also involved in the development and evaluation of innovative construction methods and the interpretation of chemical and hydrogeological performance data for completed PRBs.

COURSE TITLE: ***Systematic Approach to In Situ Bioremediation in Groundwater: Nitrates, Carbon Tetrachloride & Perchlorate***
March 25th (Tuesday 9:00 a.m. to 11:00 a.m.)

Presentation Overview:
Several aspects of in situ bioremediation (ISB) are characteristic of all sites, no matter what contaminant is being scrutinized. Many characteristics of a site used to determine the efficacy of ISB are also similar, even though contaminants and breakdown products differ. Once a site has been characterized for ISB efficacy and the contaminants of concern and degradation products have been defined, engineered approaches can be designed, pilot-tested, and possibly deployed.

This training presents a decision tree for reviewing, planning, evaluating, and approving ISB systems in the saturated subsurface. It defines site parameters and appropriate ranges of criteria necessary for characterization, testing, design, and monitoring of ISB technologies. The course is based on the ITRC's *Systematic Approach to In Situ Bioremediation in Groundwater, Including Decision Trees for In Situ Bioremediation of Nitrates, Carbon Tetrachloride, and Perchlorate* (ISB-8, 2002), which describes information needed for any ISB evaluation, provides a flow diagram defining primary decision points, and discusses characteristics used to evaluate monitored natural attenuation or enhanced ISB application as remediation options. It includes examples of how to apply the document, with additional decision trees for nitrate, carbon tetrachloride, and perchlorate.

Instructors:
Bart Faris, is a hydrogeologist with the New Mexico Environment Department's (NMED) Ground Water Quality Bureau. He is the project manager/regulator for multiple contamination sites throughout New Mexico dealing with numerous contaminants. He serves as NMED's water representative for Border Issues with Mexico. Bart is the Interstate Technology Regulatory Council (ITRC) team leader for the In Situ Bioremediation team and was the team leader for the Enhanced In Situ Biodenitrification team. He is also a member of the Technical Advisory Group for the Innovative Treatment and Remediation Demonstration (ITRD) program at Oakridge National Laboratory Y-12 carbon tetrachloride (CT) project. Bart received his B.S in Soil and Water Science from the University of Arizona in 1983, and has published papers on in situ biodenitrification and monitored natural attenuation of CT. Bart has spent over 15 years in Latin America working with community's water resources and agricultural production.

Dimitri Vlassopoulos has been a geochemist with S.S. Papadopulos and Associates in Bethesda, Maryland for 10 years, where he conducts and supervises applied research in contaminant hydrology and in-situ groundwater remediation technologies. His areas of expertise include analysis of the environmental fate and transport of contaminants under natural and engineered conditions, development and application of computer simulation models, and environmental forensic techniques. He received a Ph.D. in environmental geochemistry from the University of Virginia (2000), an MS in Geochemistry from the California Institute of Technology (1993), and an MS in Geological Sciences (1989) from McGill University.

Roy F. Spalding, Ph.D., is a professor with the Agronomy and Horticulture Department at the University of Nebraska-Lincoln. Roy also is a principal at Hydro-Trace Incorporated, a groundwater consulting firm. His university interests surround investigations of mechanisms to prevent and remediate nonpoint agrochemical contamination using state-of-the-art-methods and stable isotope tracers. He has over 100 publications in the

field. An example project is the utilization of *in situ* amended biodenitrification to provide a municipal well with reduced nitrate levels which are in compliance with maximum contaminant levels. His company research is active in volatile organic compound remediation, point source remediation of urea, and ammonia (above ground) and contaminant assessments. Roy received his master from the University of North Carolina in Environmental Sciences and Engineering and Ph.D. from Texas A&M University in geochemical oceanography. Roy is presently an active member of ITRC's In Situ Bioremediation and MTBE teams. Roy also serves on several environmental advisory boards.

COURSE TITLE: ***Natural Attenuation of Chlorinated Solvents in Groundwater: Principles and Practices***
March 25th (Tuesday 9:00 a.m. to 11:00 a.m.)

Presentation Overview:

This training introduces state regulators, environmental consultants, site owners, and community stakeholders to ITRC's *Natural Attenuation of Chlorinated Solvents in Groundwater: Principles and Practices* (ISB-3, 1999), created by ITRC's In Situ Bioremediation Team and the Remediation Technologies Development Forum (RTDF) Bioremediation Consortium. The manual and presentation are based on RTDF research activities and on experience and knowledge of the participating members. The course provides a framework for thinking about natural attenuation based on science, focusing on the basic information needed to determine and document the conditions necessary for natural processes to be an effective part of remediating chlorinated solvents in groundwater.

Instructors:
Paul W. Hadley is a Hazardous Substances Engineer with the California Department of Toxic Substances Control. Paul holds a bachelors degree in biochemistry and a master of science degree in civil/environmental engineering, both from the University of California at Davis. Paul is currently chairperson of the In Situ Bioremediation Task Group of the ITRC Work Group. During his fifteen years in the hazardous waste field, Paul has published more than a dozen articles on issues of risk and remediation at hazardous waste sites.

David W. Major, Ph.D., is a Principal of GeoSyntec Consultants International in Guelph, Ontario, and serves on the Steering Committee of the RTDF Consortium on Bioremediation of Chlorinated Solvents. Dave was one of the first to recognize and document natural attenuation of chlorinated ethenes at a field site, and is currently a Technical Director or Project Manager for a number of studies of natural attenuation of chlorinated solvents. Dave received his Ph.D. in microbiology in 1987 from the University of Waterloo where he studied the anaerobic biodegradation of aromatic compounds in groundwater. Dave has published more than 20 articles regarding the biodegradation of organic compounds in the subsurface.

COURSE TITLE: ***In Situ Chemical Oxidation***
March 25th (Tuesday 9:00 a.m. to 11:00 a.m.)

Presentation Overview:
Using in situ chemical oxidation (ISCO) to remediate groundwater contamination involves injecting oxidants directly into the source zone and downgradient plume. Contaminants potentially amenable to treatment by ISCO include benzene, toluene, ethylbenzene, and xylenes (BTEX); tetrachloroethylene (PCE); trichloroethylene (TCE); dichloroethylenes; vinyl chloride; methyl-*tert*-butyl-ether (MTBE), polyaromatic hydrocarbon (PAH) compounds, and many other organic contaminants. Commonly used oxidant chemicals include permanganate (sodium and potassium), hydrogen peroxide, and ozone. The oxidants react with contaminants, producing innocuous substances such as carbon dioxide, water, and inorganic chloride; however, the full spectrum of reaction intermediates and products is not yet fully understood for all contaminants.

This training familiarizes participants with ITRC's *Technical and Regulatory Guidance for In Situ Chemical Oxidation of Contaminated Soil and Groundwater In Situ Chemical Oxidation* (ISCO-1, 2001), including descriptions of various chemical oxidants, regulatory considerations, stakeholder concerns, case studies, and technical references—information to help understand, evaluate, and make informed decisions on ISCO proposals.

Instructors:
Pat Quinn has been working for the Missouri Department of Natural Resources Hazardous Waste Program as an Environmental Engineer for the past three years. He oversees corrective action activities at numerous RCRA facilities including all phases of work (ie., investigation, monitoring, remediation). In addition to his corrective action oversight duties, Mr. Quinn is the GIS coordinator for the Permits Section and is involved in the creation of a GIS database that is being designed to be used for public information purposes. Mr. Quinn holds a Masters Degree in Civil and Environmental Engineering from California Polytechnic State University, San Luis Obispo. He has conducted research utilizing ozone to remediate contaminated wastewater as part of his masters thesis. Pat co-leads the ITRC In Situ Chemical Oxidation Team with Tom Stafford of Louisiana.

Wilson S. Clayton, Ph.D., P.E., P.G., is a co-founder and Vice President of Aquifer Solutions, Inc., a small woman-owned business specializing in vadose zone and groundwater hydrology and in-situ remediation. Dr. Clayton was previously employed with Groundwater Technology Inc., and then by acquisition with Fluor Daniel GTI, and IT Corporation. Dr. Clayton held positions including Territory Manager, Treatability Laboratory Director, and National Practice Leader for in-situ chemical oxidation. Dr. Clayton holds a Ph.D. in Geological Engineering from Colorado School of Mines. He has published several technical papers related to in-situ chemical oxidation, dealing with oxidant reaction kinetics, subsurface oxidant transport, and other implementation-related topics.

COURSE TITLE: ***Characterization and Remediation of Soils at Closed Small Arms Firing Ranges***
March 26th (Tuesday 8:00 a.m. to 10:00 a.m.)

Presentation Overview:
Remediation of soils at closed small arms firing ranges (SAFRs) presents unique challenges because contaminants exist both as discrete particles and as sorbed compounds dispersed throughout the soil matrix. The form and distribution of particulate lead varies based on range use, size and impact velocity of the round, soil characteristics, and past range-maintenance practices. Removal of the discrete particles as part of remedial activities reduces not only the total lead but also the leachable lead. Unfortunately, however, simple dry screening seldom if ever removes lead particles through all of their size ranges.

This Internet training—based on ITRC's *Technical and Regulatory Guidance for Closed Small Arms Firing Range Remediation Technologies* (SMART-1, 2003)—introduces participants to the various physical (including hydraulic), chemical, and biochemical mechanisms available to treat or stabilize SAFRs, after some unique characterization challenges are overcome.

Instructors:
Mr. Gary Beyer has worked for the Texas Commission on Environmental Quality and its predesessor agencies for 17 years in various programs, including RCRA Enforcement, Federal Facilities Remediation, and RCRA Corrective Action Teams. As a consensus builder he helped develop the national model for streamlining the military base closure process while closing Naval Air Station Chase Field in Beeville, Texas. He has overseen the remediation of federal firing ranges at Chase Field and Lackland Air Force Base in San Antonio, Texas. He has worked on the ITRC's Small Arms Range Remediation Team since its inception where he brings his perspective on solving complex regulatory problems regarding the handling of lead and lead contaminated soils.

Rick Patterson started the National Shooting Sports Foundation's facility development program in 1997. He subsequently expanded these efforts with the creation of the National Association of Shooting Ranges (NASR). NASR is dedicated to promoting and protecting target shooting facilities by providing leadership in information, communication and partnerships between ranges, industry and community. The program provides guidance on every aspect of developing and operating a safe and successful target shooting facility. Patterson developed and launched the Facility Development Series of guidance publications, the Rangeinfo Web Site-a comprehensive information resource for range operators and developers-the Range Video Series and the NASR 5-Star rating system. He has also developed successful partnerships with many state and federal wildlife, environmental and occupational health agencies to provide range operators and developers

with guidance and resources on issues such as NEPA compliance, environmental management and employee safety. Prior to joining the NSSF team, Patterson was with Coastal-Mart, the retail motor fuel division of Coastal, a Fortune 50 petroleum refiner. He graduated from Montana State University, cum laude, with a degree in organizational and managerial communication. In his spare time Patterson is Chairman of the Roxbury Conservation Commission, a two-term elected member of the Roxbury Republican Town Committee and an avid fly-fisherman, shooter, hunter and maker of bamboo fly rods. He is a former state champion International Handgun Metallic Silhouette Association competitor (AAA division) and was Chairman of Trout Unlimited's intervention in the successful and precedent-setting Shepaug River lawsuit.

Mr. Mike Warminsky is a Technical Director with over 20 years' experience. In this role, he has extensive experience in identifying, developing, and managing multi-disciplinary remedial projects at both Department of Defense (DoD) and industrial facilities, with the last 7 years dedicated to range remediation. His program management skills are complemented by his extensive hands-on field experience in conducting treatability studies, soil treatment process design and implementation, and environmental construction. He has served as a principal team member on numerous underground storage tank closures, as well as, RCRA, ISRA, and CERCLA remedial construction projects, and was the development team leader for a proprietary soil

COURSE TITLE: ***Training for the Use of Passive Diffusion Samplers for VOAs and Recent Advances in Passive Samplers***
March 26th (Tuesday 10:30 a.m. to 12:30 p.m.)

Presentation Overview:
Passive diffusion bag (PDB) samplers are a simple and inexpensive way to sample groundwater monitoring wells for a variety of volatile organic compounds (VOCs). A typical PDB sampler consists of low-density polyethylene lay-flat tubing filled with distilled, deionized water and heat-sealed at both ends. The bags are suspended by a weighted line at the target horizon in monitoring wells and allowed to equilibrate with the surrounding water. Retrieved after the equilibration period (typically two weeks), the enclosed water is immediately transferred to appropriate sample containers for analysis. Field tests show good correlation between samples obtained with PDB samplers and samples obtained using traditional methods. Currently, the samplers are recommended only for long-term groundwater monitoring of VOCs at well-characterized sites. The number of sites where they can be appropriately deployed is large, and the associated cost savings over traditional methods are significant.

This training summarizes major points of the U.S. Geological Survey document *User's Guide for Polyethylene-Based Passive Diffusion Bag Samplers to Obtain Volatile Organic Compound Concentrations in Wells* (DSP-1, 2001), developed in cooperation with ITRC's Diffusion Sampler Team, and discusses the technical and regulatory considerations associated with deployment of PDB samplers.

Instructors:
George Nicholas is a Supervising Geologist with the New Jersey Department of Environmental Protection. He has over twelve years of experience in overseeing ground water investigations and remedial actions at Superfund sites, RCRA facilities, and privately owned industrial sites throughout the state of New Jersey. He also serves as a Brownfields Coordinator for the NJDEP and works on redevelopment projects with the Hackensack Meadowlands Development Commission and the City of Long Branch. George became involved with the ITRC as a proctor at several of the ITRC Natural Attenuation Training Seminars, and later became the Team Leader for the Diffusion Sampling Team.

Don Vroblesky is a research hydrologist with the U.S. Geological Survey (USGS). He has worked at the USGS for approximately 20 years. He received an M.S. degree and a Ph.D degree at the George Washington University. He has authored or coauthored over 50 published reports on various aspects of ground-water contamination and hydrology. He is the primary developer of PDB samplers for wells and passive vapor diffusion samplers for mapping contaminant-discharge zones to lakes and streams, and he developed a methodology for mapping VOC contamination in ground water using headspace analysis of tree cores.