U.S. ENVIRONMENTAL PROTECTION AGENCY

TechDirect, October 1, 2017

Welcome to TechDirect! Since the September 1 message, TechDirect gained 207 new subscribers for a total of 39,427. If you feel the service is valuable, please share TechDirect with your colleagues. Anyone interested in subscribing may do so on CLU-IN at https://clu-in.org/techdirect . All previous issues of TechDirect are archived there. The TechDirect messages of the past can be searched by keyword or can be viewed as individual issues.

TechDirect's purpose is to identify new technical, policy and guidance resources related to the assessment and remediation of contaminated soil, sediments and groundwater.

Mention of non-EPA documents or presentations does not constitute a U.S. EPA endorsement of their contents, only an acknowledgment that they exist and may be relevant to the TechDirect audience.

> Funding Opportunities

Pre-Solicitation for EPA 2017-2018 Small Business Innovation Research (SBIR) Phase I. U.S. EPA contemplates awarding about 12 firm-fixed-price contracts of $100,000 each under the SBIR Program Phase I during FY 2018. Among the six topic areas identified by the Agency, the needs for feasibility-related research or R&D efforts on per- and polyfluoroalkyl compounds may be of particular interest to the cleanup community: removal of PFOA/PFOS from drinking water, removal of PFOA/PFOS from wastewater, and remediation of PFAS-contaminated soil and sediment. The anticipated release date of the solicitation is October 17, 2017, with proposals likely due December 7, 2017. Phase I awards are anticipated by June 30, 2018, each with a 6-month period of performance. For more information, see https://www.epa.gov/sbir/sbir-funding-opportunities.

Request for Proposals: FY 2018 Brownfields Assessment, Revolving Loan Fund, and Cleanup Grants. These brownfields grants may be used to address sites contaminated by petroleum and hazardous substances, pollutants, or contaminants (including hazardous substances co-mingled with petroleum). Assessment grants are funded over three years. Applicants may apply for up to $200,000 in hazardous substances funding or up to $200,000 in petroleum funding. Community-wide Applicants applying for both hazardous substances funding and petroleum funding may request a combined total up to $300,000. Assessment Coalition Applicants may apply for up to $600,000 in hazardous substances funding and/or petroleum funding. Revolving Loan Fund (RLF) Grants are funded over five years. Applicants, including RLF Coalitions, may apply for up to $1,000,000 in hazardous substances funding and/or petroleum funding. Cleanup Grants are funded over three years. Applicants may request funding to address either a single brownfield site, or multiple brownfield sites, within each proposal. An applicant may request up to $200,000 in each proposal and can submit up to three cleanup proposals. The proposal submission deadline is November 16, 2017, and a webinar to assist in preparing proposals will be held on Thursday, October 5, 2017, at 1:30pm ET. For more information and application instructions, see https://www.epa.gov/brownfields/announcing-new-request-proposals-fy-2018-brownfields-assessment-revolving-loan-fund-and.

> Upcoming Live Internet Seminars

ITRC Geophysical Classification for Munitions Response - October 3, 2017, 1:00PM-3:15PM EDT (17:00-19:15 GMT). This training class and supporting guidance document explain the process of geophysical classification, describe its benefits and limitations, and discuss the information and data needed by regulators to monitor and evaluate the use of the technology. This document and training also emphasize using a systematic planning process to develop data acquisition and decision strategies at the outset of a munitions response effort, as well as quality considerations throughout the project. Stakeholder issues that are unique to munitions response are also discussed. After this training class, participants will: understand the technology and terminology, be ready to engage in the planning process to address quality considerations throughout a project, find tools to transfer knowledge within organizations and to stakeholders, and start to transition mindset to decisions that leave non-hazardous items in the ground. An audience who understand current munitions response tools and procedures (for example, geophysical surveys, sensors, data analysis) will benefit most from this document and training. For more information and to register, see http://www.itrcweb.org or https://clu-in.org/live.

ITRC Issues and Options in Human Health Risk Assessment - A Resource When Alternatives to Default Parameters and Scenarios are Proposed - October 5, 2017, 1:00PM-3:15PM EDT (17:00-19:15 GMT). After participating in this ITRC training course, the learner will be able to apply ITRC's Decision Making at Contaminated Sites: Issues and Options in Human Health Risk (RISK-3, 2015) document when developing or reviewing site-specific risk assessments by: identifying common issues encountered when alternatives to default parameters and scenarios are proposed during the planning, data evaluation, toxicity, exposure assessment, and risk characterization and providing possible options for addressing these issues; recognizing the value of proper planning and the role of stakeholders in the development and review of risk assessments; and providing information (that includes links to additional resources and tools) to support decision making when alternatives to default approaches, scenarios and parameters are proposed. For more information and to register, see http://www.itrcweb.org or http://clu-in.org/live.

Phytoremediation and PhytoForensics: Mother Nature can Detect and Mitigate Pollutants…with Elegance - October 10, 2017, 1:00PM-3:00PM EDT (17:00-19:00 GMT). Phytoremediation is the field of looking to use plants to mitigate environmental pollutants and human exposures. As plants are efficient, key components in local and global water, carbon and energy cycles, they can influence pollutant transport and availability in many different ways. In this presentation, methods of using plants to prevent human exposure to pollutants will be presented and discussed so share fundamental concepts and case studies of applications. Novel methods of using plants as environmental sensors will also be presented, known as Phytoforensics. As plants interact actively and intimately with the subsurface environment, new analytical and remote sensing methods have been developed to use plants as biosentinels. Using plants in these roles, leads to some unique challenges when looking at typical measures of efficacy for remediation, and the unique aspects of plants also creates new combinations of benefits where we concurrently gain ecosystem services at the same time we are mitigating potential human exposure or environmental damages. Novel integration of plants in urban design can particularly bring multiple, values to our society. Example applications of these techniques in the Superfund program will also be highlighted. For more information and to register, see http://clu-in.org/live.

Adverse Outcome Pathways: Session I - Introduction to the Adverse Outcome Pathway Framework - October 11, 2017, 1:00PM-3:00PM EDT (17:00-19:00 GMT). The NIEHS Superfund Research Program (SRP) is hosting a seminar series focused on adverse outcome pathways (AOPs), which are structured ways to represent biological events leading to adverse

health effects. In the first session, U.S. EPA staff will provide an introduction and overview of AOPs and discuss the AOP Knowledgebase, which is designed to house descriptions of the biological mechanisms underlying chemical toxicity in a structured manner. The AOP framework was developed as a means for organizing biological and toxicological knowledge concerning the linkages between molecular-level perturbations of biological systems by stressors and the apical hazards (e.g., disease in humans, reduced survival, growth, reproduction in wildlife) that can result. As such, the AOP framework can help support greater use of mechanistic or pathway-based data in risk assessment and regulatory decision-making. Daniel Villeneuve, Ph.D., will introduce the AOP framework, major principles that guide the development and description of AOPs within the AOP-knowledgebase, and will give examples of some prominent applications of AOPs. Stephen Edwards, Ph.D., will discuss the design of the AOP Knowledgebase and how this supports both AOP development and use. It will include the assembly of AOP networks and their importance when using AOPs. It will also consider methods for developing AOP networks in an automated fashion to complement the expert-driven AOP development efforts within the AOP knowledgebase. For more information and to register, see http://clu-in.org/live.

ITRC Groundwater Statistics for Environmental Project Managers - October 12, 2017, 1:00PM-3:15PM EDT (17:00-19:15 GMT). Statistical techniques may be used throughout the process of cleaning up contaminated groundwater. It is challenging for practitioners, who are not experts in statistics, to interpret, and use statistical techniques. ITRC developed the Technical and Regulatory Web-based Guidance on Groundwater Statistics and Monitoring Compliance (GSMC-1, 2013) and this associated training specifically for environmental project managers who review or use statistical calculations for reports, who make recommendations or decisions based on statistics, or who need to demonstrate compliance for groundwater projects. The training class will encourage and support project managers and others who are not statisticians to: use the ITRC Technical and Regulatory Web-based Guidance on Groundwater Statistics and Monitoring Compliance (GSMC-1, 2013) to make better decisions for projects; apply key aspects of the statistical approach to groundwater data; and answer common questions on background, compliance, trend analysis, and monitoring optimization. ITRC's Technical and Regulatory Web-based Guidance on Groundwater Statistics and Monitoring Compliance (GSMC-1, 2013) and this associated training bring clarity to the planning, implementation, and communication of groundwater statistical methods and should lead to greater confidence and transparency in the use of groundwater statistics for site management. For more information and to register, see http://www.itrcweb.org or https://clu-in.org/live.

ERTP Presents…High Performing Teams: Participating, Leading, Coaching - October 17, 2017, 1:00PM-3:00PM EDT (17:00-19:00 GMT). In this webinar we will explore the definition, development, dynamics, and characteristics of "High Performing Teams". There are multiple developmental stages that teams progress through to become high performing; many team members are unaware of these stages. We will examine the behavior and characteristics of the team in these stages as well as the leadership required to maximize team performance in each stage. During the webinar, we will discuss: the traits and qualities the team needs to become high performing and the responsibility of the team members; the attributes and behaviors that team members need to bring to the team to allow the team to perform successfully; the skills required to lead the team and the concept of shared leadership. High Performing Teams: Participating, Leading, Coaching is intended for those looking to discover styles, skills, and techniques to help their teams become the most productive and efficient they can be. This webinar could be of benefit to those working under the Incident Command System (ICS) to ensure effective coordination throughout the Incident Management Team (IMT) during a response to an incident. For more information and to register, see http://clu-in.org/live.

Military Munitions Support Services - MMRP Explosive Safety - October 19, 2017, 1:00PM-3:45PM EDT (17:00-19:45 GMT). This session will discuss updated safety developments when dealing with scrappers, underwater issues and the 3 R's. For more information and to register, see http://clu-in.org/live.

Ecosystem Services Approaches and Tools for Contaminated Site Cleanup - October 24,

2017, 1:30PM-3:00PM EDT (17:30-19:00 GMT). Ecosystem services are nature's contributions to human health and well-being. Examples include areas for outdoor recreation, pollination of food crops, and flood mitigation. In performing our work to protect the environment through contaminated site cleanup, we are learning that we also have the opportunity to protect and revitalize ecosystem services in a measurable way. Join us to learn about efforts by several EPA programs to understand how we may consider ecosystem services in managing contaminated site cleanups. This webinar presents an ecosystem services evaluation framework that resulted from a cross-EPA office collaboration, and summarizes how two quantitative evaluation tools, EPA EnviroAtlas and Service Providing Area (SPA) maps, were piloted at Superfund sites. You will also hear from Superfund site managers who will share insights on how they are considering ecosystem services during cleanup and are implementing innovative approaches for ecological revitalization at their sites. An understanding and quantification of ecosystem services may be helpful to ecological risk assessors and remediation project managers working on sites with existing ecosystems and/or sites with ecological reuse options. For more information and to register, see http://clu-in.org/live.

ITRC Geospatial Analysis for Optimization at Environmental Sites - October 26, 2017, 1:00PM-3:15PM EDT (17:00-19:15 GMT). The purpose of ITRC's Geospatial Analysis for Optimization at Environmental Sites (GRO-1) guidance document and this associated training is to explain, educate, and train state regulators and other practitioners in understanding and using geospatial analyses to evaluate optimization opportunities at environmental sites. With the ITRC GRO-1 web-based guidance document and this associated training class, project managers will be able to: evaluate available data and site needs to determine if geospatial analyses are appropriate for a given site; for a project and specific lifecycle stage, identify optimization questions where geospatial methods can contribution to better decision making; for a project and optimization question(s), select appropriate geospatial method(s) and software using the geospatial analysis work flow, tables and flow charts in the guidance document; with geospatial analyses results (note: some geospatial analyses may be performed by the project manager, but many geospatial analyses will be performed by technical experts), explain what the results mean and appropriately apply in decision making; and use the project manager's tool box, interactive flow charts for choosing geospatial methods and review checklist to use geospatial analyses confidently in decision making. For more information and to register, see http://www.itrcweb.org or http://clu-in.org/live.

SERDP & ESTCP Webinar Series Platforms for Underwater and Near-Shore Munitions Survey - November 02, 2017, 12:00 PM ET (9:00 AM PT). SERDP and ESTCP have launched a webinar series to promote the transfer of innovative, cost-effective and sustainable solutions developed through projects funded in five program areas. The webinar series targets Department of Defense and Department of Energy practitioners, the regulatory community and environmental researchers with the goal of providing cutting edge and practical information that is easily accessible at no cost. Dr. Dan Steinhurst will present on the results of efforts to return the Marine Towed Array (MTA) to service and validate the new electromagnetic imaging array's design for UXO detection and classification in the underwater environment. Dr. Gregory Schultz will discuss the near-shore deployment of geophysical sensor arrays from remotely and autonomously operated platforms. For more information and to register, see http://serdp-estcp.org/Tools-and-Training/Webinar-Series.

Mining Sites Webinar Series
Matching Biochar Characteristics with Metals-Contaminated Soils to Effectively Reduce Metal Bioavailability at Mining Sites - November 7, 2017, 1:00PM-3:00PM EST (18:00-20:00 GMT). There are approximately 500,000 abandoned mines across the U.S., which pose a considerable, pervasive risk to human health and the environment due to possible exposure to the residuals of heavy metal extraction. Historically, a variety of chemical and biological methods have been used to reduce the bioavailability of the metals at abandoned mine sites. Biochar is emerging as a novel soil amendment for agriculture and environmental applications that can be used to increase soil carbon, adjust soil pH, supply and retain nutrients, reduce heavy metal bioavailability, improve soil water holding and infiltration, sequester carbon, and provide refugia for soil organisms. Biochar is a charcoal-like, carbon-rich, porous byproduct of thermal pyrolysis or

gasification. What makes biochar unique is that its properties are tunable, meaning that they can be manipulated or adjusted to optimize the benefits of using it as a soil amendment. It has the potential to complex and immobilize heavy metals to reduce bioavailability in situ. Simultaneously, biochar can improve soil conditions for plant growth and promote the establishment of a soil-stabilizing native plant community to reduce offsite movement of metal-laden waste materials. Because biochar properties depend upon feedstock selection, pyrolysis production conditions, and the activation procedures used, they can be designed to meet specific remediation needs and specific soil remediation situations. However, techniques are needed to optimally match biochar characteristics with metals contaminated soils to effectively reduce metal bioavailability Ongoing research at Formosa Mine in Oregon and other sites to immobilize heavy metals from tailings and revegetate the soil will be presented. For more information and to register, see http://clu-in.org/live.

> New Documents and Web Resources

New Focus Area: Per- and Polyfluoroalkyl Substances (PFASs). The objective of this focus area is to provide an overview of the current understanding of per- and polyfluoroalkyl substances (PFASs), particularly perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS), regarding their major historical and current uses; scientific information about their sources, chemistry and analysis, potential human exposure and associative adverse health outcomes, and environmental fate and transport; and progress in site investigation techniques and cleanup alternatives for environmental media affected by PFASs at levels of concern. View and use at https://clu-in.org/pfas.

Superfund Remedy Report, Fifteenth Edition (EPA 542-R-17-001). The Superfund Remedy Report (SRR), Fifteenth Edition, was published by the EPA Office of Superfund Remediation and Technology Innovation (OSRTI) in August 2017. The report focuses on Superfund remedial actions selected in fiscal years 2012, 2013 and 2014, and on remedy trends since 1982. The report includes remedies selected in 308 decision documents (Records of Decision [RODs], ROD amendments, and Explanations of Significant Differences with changes to remedy components) signed in this three-year period. The SRR compiles data on overall remedy selection and remedies for source materials (such as soil and sediments), groundwater, surface water and air related to vapor intrusion. The report also analyzes media and contaminants for sites with remedies. The appendices summarize all of the remedy components selected for sources and groundwater in each decision document signed in 2012, 2013, and 2014 (August 2017, 165 pages). View or download at https://clu-in.org/asr/.

Ecosystem Services at Contaminated Site Cleanups (EPA 542-R-17-004). The Engineering Forum, as one of three technical forums within the U.S. Environmental Protection Agency (EPA) Technical Support Project, developed this issue paper to provide cleanup site teams with information about ecosystem services. Ecosystem services produce the many life-sustaining benefits we receive from nature-clean air and water, fertile soil for crop production, pollination, and flood control. Information about ecosystem services may be considered in the characterization of future land use options or the design of a cleanup that is consistent with anticipated ecological reuse, depending on the regulatory authority of the cleanup program. The concepts and tools described in this issue paper are useful in communicating the positive results of cleanup in addition to achieving the goals of cleanup (August 2017, 15 pages). View or download at https://semspub.epa.gov/src/document/11/100000459.

Superfund Optimization Progress Report 2011 - 2015 (EPA 542-R-17-002). The U.S. EPA is continuing to make progress on (1) implementing recommendations for individual optimization events, (2) conducting site-specific technical support, and (3) implementing the elements of the 2012 National Strategy to Expand Superfund Optimization Practices from Site Assessment to Site Completion ("the Strategy"). Status updates are provided in this report for (1) optimization

recommendations for 41 new optimization events conducted during Fiscal Years (FY) 2011 through FY 2015, for (2) 20 optimization events with outstanding recommendations recorded in previous progress reports, and for (3) 25 technical support projects conducted during FY 2011 through FY 2015. Project highlights are provided for both optimization and technical support events (June 2017, 75 pages). View or download at https://semspub.epa.gov/src/document/11/196740.

TVA Kingston Site Case Study: Revitalization of the Wetlands, Embayments and Emory River (EPA 542-F-16-003). In December 2008, a dike containing about 20 million cubic yards of coal ash from power plant operations failed and released over 5 million cubic yards of coal ash into the Emory River and adjacent land. The spill had significant effects on the community and environment. Aquatic organisms and shorelines were buried in coal ash. Cleanup was needed to ensure the protection of human health and the environment. The cleanup process considered ecological revitalization of the site and surrounding area as an integral part of all response activities. A team of biologists, landscape architects, and engineers worked together to integrate plantings and ecological aspects as components of the cleanup activities. An ecosystem was created by planting a mosaic of forested, scrub-shrub, and emergent wetland plant communities, as well as native trees and seeds in disturbed areas. Today, there are frequent bird sightings at the site, including white ibises, cattle egret, and herons (April 2017, 16 pages). View or download at https://clu-in.org/ecotools/case.cfm.

Superfund Research Program (SRP) Research Briefs. To get monthly updates on research advances from the SRP you can subscribe to their Research Brief mailing list at https://list.nih.gov/cgi-bin/wa.exe?SUBED1=SRP-BRIEF&A=1.

New Projects Addressing Issues Associated with Per- and Polyfluoroalkyl Substances (PFASs). Several new projects under SERDP and ESTCP developing technologies for remediation of groundwater contaminated with per- and polyfluoroalkyl substances (PFASs) were initiated to develop technologies for treatment of PFASs mixed with chlorinated solvents. One ESTCP project is developing a treatment train approach. More information at https://serdp-estcp.org/News-and-Events/Blog/New-Projects-Addressing-Issues-Associated-with-Per-and-Polyfluoroalkyl-Substances-PFASs.

Technology Innovation News Survey Corner. The Technology Innovation News Survey contains market/commercialization information; reports on demonstrations, feasibility studies and research; and other news relevant to the hazardous waste community interested in technology development. Recent issues, complete archives, and subscription information is available at https://clu-in.org/products/tins/. The following resources were included in recent issues:

- Remediation and Recovery: International In-Situ Thermal Treatment (I2T2) Symposium, May 30-31, 2017, Banff, Alberta, Canada
- Remedial Action Completion Report for In Situ Source Treatment by Deep Soil Mixing of the Southwest Groundwater Plume Volatile Organic Source at the C-747-C Oil Landfarm (Solid Waste Management Unit 1), at Paducah Gaseous Diffusion Plant, Paducah, Kentucky
- In Situ Treatment and Management Strategies for 1,4-Dioxane-Contaminated Groundwater
- Role of Acidophilic Methanotrophs in Long Term Natural Attenuation of CVOCs in Low pH Aquifers
- Characterization of the Fate and Biotransformation of Fluorochemicals in AFFF-Contaminated Groundwater at Fire/Crash Testing Military Sites
- Risk Evaluations for Existing Chemicals Under TSCA: 1,4-Dioxane, Perchloroethylene, Trichloroethylene, Methylene Chloride, and Carbon Tetrachloride
- AquaConSoil 2017 Book of Abstracts: 14th International Conference on Sustainable Use and Management of Soil, Sediment and Water Resources

EUGRIS Corner. New Documents on EUGRIS, the platform for European contaminated soil and water information. More than 5 resources, events, projects and news items were added to EUGRIS in September 2017. These can be viewed at http://www.eugris.info/whatsnew.asp . Then select the appropriate month and year for the updates in which you are interested.

> Conferences and Symposia

2017 Design and Construction Issues at Hazardous Waste Sites (DCHWS) - West, Denver, CO, October 23-25, 2017. As a result of the resounding success of last year's event and the enthusiastic feedback we received from attendees, the Society of American Military Engineers (SAME), Denver Post is co-sponsoring an expanded version of this event with the U.S. EPA to encourage dialogue and information sharing on design and construction issues relevant to hazardous waste sites in the western United States. The applications of engineering and science associated with cleaning up hazardous waste sites continue to evolve rapidly. Our goal is to facilitate an interactive engagement between professionals from government and the private sector related to relevant and topical issues affecting our field. We will make every effort to mirror all aspects of past conferences in terms of format and spirit. For more information and to register, see https://www.samedmp.org/dchws-west.

Groundwater High-Resolution Site Characterization (HRSC), Dallas, TX, November 15-16, 2017. This training course focuses on groundwater characterization and discusses (1) the impacts of subsurface heterogeneity on the investigation and cleanup of groundwater and related media, (2) the need for scale-appropriate measurements and adequate data density, and (3) the tools and strategies that are available to overcome the impacts of subsurface heterogeneity. After taking this course, participants will be armed with information that will allow them to improve their subsurface investigation approaches and develop more realistic and comprehensive conceptual site models (CSM). CSMs developed based on HRSC strategies and tools will decrease site uncertainty, improve the remedy selection process for groundwater remedies, and better enable the evaluation, design, and implementation of targeted in situ and ex situ groundwater remedies. The Groundwater HRSC course is an advanced 2-day course. The recommended audience includes EPA, federal, state, tribal and private industry technical project managers, practitioners and other stakeholders involved in groundwater investigation and remediation. For more information and to register, see https://trainex.org/hrsc.

Registration Now Open! 2017 National Brownfields Training Conference, Pittsburgh, PA, December 5-7, 2017. With the session selection process completed, Brownfields 2017 is set to offer attendees a robust and expansive conference experience. This year's conference programming and speakers will engage attendees on topics at the forefront of today's brownfields and economic development landscapes; challenging both emerging and seasoned professionals as well as a diverse range of brownfields stakeholders to think outside the norms when addressing land revitalization and redevelopment. Take advantage and register during the pre-registration period for the lowest conference registration fees. For more information and to register, see https://www.brownfields2017.org/register/.

Implementing Greener Cleanups Through ASTM's Standard Guide (E2893-16) - A Workshop, Pittsburgh, PA, December 4, 2017. This 90-minute training session is one of three comprising the "Streamlined Practices for Brownfields Site Characterization and Cleanup" pre-conference workshop offered at Brownfields 2017. The session will focus on helping participants engage communities in site cleanup decisions and transforming contaminated sites into community assets while using the core elements of green remediation-energy, air, water, materials and waste, and land and ecosystems. Participants will learn the methods and tools for reducing a project's environmental footprint, the importance of a footprint assessment, how to apply science and engineering principles at a site, and best management practices for site optimization. Green remediation application case studies along with lessons learned will be presented. For more information and to register, see https://www.brownfields2017.org/education/pre-conference-workshops/.

Improving Management of the Brownfields Cleanup Process: Follow the Road Map, Pittsburgh, PA, December 4, 2017. This 90-minute training session is one of three comprising the "Streamlined Practices for Brownfields Site Characterization and Cleanup" pre-conference workshop offered at Brownfields 2017. The session is designed to help Brownfields grant recipients, who are often non-technical stakeholders, learn how to better find and hire the right contractor, integrate innovation, interpret technical reports, prepare contracts, manage the budget, monitor progress, and become more involved in the decision-making process. Grantees will learn to oversee the process for gathering and using environmental data to ensure the data is adequate and appropriate to make a decision. For more information and to register, see https://www.brownfields2017.org/education/pre-conference-workshops/.

Innovative Brownfields Characterization and Cleanup Solutions: Training for Small Business Contractors, Pittsburgh, PA, December 4, 2017. This 90-minute training session is one of three comprising the "Streamlined Practices for Brownfields Site Characterization and Cleanup" pre-conference workshop offered at Brownfields 2017. The session will provide information about innovative technologies and practices for improving and achieving cleanup at Brownfields sites. Participants will learn the application and tools necessary to implement for innovative practices such as incremental composite sampling, high-resolution site characterization, three dimensional visualization and analysis, and the use of conceptual site models to help reduce uncertainties in site cleanup and communicate site conditions better to all stakeholders. Topics will include in situ remediation technologies such as thermal treatment, chemical oxidation/reduction, and enhanced bioremediation. Participants also will learn the use of field tools to assist in the creation of dynamic work plans to allow for-and achieve-faster site cleanup. For more information and to register, see https://www.brownfields2017.org/education/pre-conference-workshops/.

NOTE: For TechDirect, we prefer to concentrate mainly on new documents and the Internet live events. However, we do support an area on CLU-IN where announcement of conferences and courses can be regularly posted. We invite sponsors to input information on their events at https://clu-in.org/courses . Likewise, readers may visit this area for news of upcoming events that might be of interest. It allows users to search events by location, topic, time period, etc.

If you have any questions regarding TechDirect, contact Jean Balent at (703) 603-9924 or balent.jean@epa.gov. Remember, you may subscribe, unsubscribe or change your subscription address at https://clu-in.org/techdirect at any time night or day.
