

Technology Innovation News Survey

Entries for June 16-30, 2015

Market/Commercialization Information

QUESTIONS AND ANSWERS [FROM] EPA'S REMEDIAL ACQUISITION FRAMEWORK (RAF) WEBINAR

U.S. Environmental Protection Agency, Washington, DC.
Federal Business Opportunities, 2015

Following the Remedial Acquisition Framework (RAF) Updated Overview webinar held May 13, 2015, EPA compiled the questions and comments submitted during the webinar into a 24-page response to the remedial contracting community. Answers to all questions submitted are provided, although duplicate questions were combined into one question and answer. Additional questions may be submitted when the next draft solicitations are released; however, a pressing question can be submitted to the respective contracting officer identified in FedBizOpps for each suite of contracts. One significant post-webinar change is that rather than procuring Design and Engineering Services on an individual regional basis, EPA has decided to combine groups of regions, similar to the way the Remediation Environmental Services and the Environmental Services and Operations will be procured. CLIN One will consist of Regions 1, 2 and 3; CLIN Two will consist of Regions 4, 5, 6 and 7; and CLIN Three will consist of Regions 8, 9 and 10.

<https://www.fbo.gov/utills/view?id=610f3f38123f051add7714426aa8243>

U.S. EPA SMALL BUSINESS INNOVATION RESEARCH (SBIR) SOLICITATION WEBINAR

U.S. Environmental Protection Agency, National Center for Environmental Research, 2015

An informational webinar on U.S. EPA's 2015-2016 SBIR Phase I solicitation will be held August 13, 2:00-3:00 PM ET, to discuss this year's solicitation topics and how to apply via FedConnect. EPA SBIR program experts will be available for a Q&A session following the presentation. Register to participate at <http://epa2015sbir.eventbrite.com>. The webinar login URL and password will be contained in the registration confirmation email. A copy of the presentation and Q&A will be posted at www.epa.gov/ncer/sbir for those who cannot attend the webinar. EPA's 2015-2016 SBIR Program Solicitation is anticipated to open in August 2015 for Phase I awards of up to \$100,000 to demonstrate proof of concept of an innovative environmental technology. Seven topic areas are of current interest: (1) Air and Climate; (2) Integrated Cookstove-Heating-Electricity Generation for Small Homes; (3) Manufacturing; (4) Toxic Chemicals; (5) Water; (6) Building Materials; and (7) Homeland Security. Successful Phase I awardees are eligible to receive Phase II funding, up to \$300,000 for two years, through an additional application process. <http://epa.gov/ncer/events/#081315>

DOD-NASA SOLUTIONS MEETING

Office of the Secretary of Defense, Rapid Reaction Technology Office, Falls Church, VA.
Federal Business Opportunities, FBO-4988, Solicitation RRTO-20150720-W-DOD-NASA, 2015

The DoD Rapid Reaction Technology Innovation Outreach Program and NASA's Johnson Space Center will conduct a Solutions Meeting in Houston, Texas, in October 2015. The Solutions Meeting provides selected innovative companies with an opportunity to make short technical presentations to government representatives about their technologies and products, with the potential for pilot projects or experimentation to ensue if a technology appears to match specific agency needs. Within the list of innovative technologies and capabilities sought are the following needs within the area of Environmental Sensing:

- Improved gas chromatography/mass spectrometry.
- Autonomous/miniaturized atmospheric monitors for constituent gases.
- Real-time VOC analysis.
- Anomaly detection.

Companies interested in participating in the Solutions Meeting may submit an application by or before 5:00 PM EDT, August 13, 2015, via email to osd.pentagon.osud-atl.mbx.rcto-innovation@mail.mil. Only one application is permitted per company. <https://www.fbo.gov/spg/ODA/OSD/RRTO/RRTO-20150720-W-DOD-NASA/listing.html>

TECHNOLOGY/BUSINESS OPPORTUNITY: MERCURY ABATEMENT FIXATIVE

Department of Energy, Idaho National Laboratory (DOE Contractor), Idaho Falls, ID.
Federal Business Opportunities, FBO-4999, Solicitation INL-TD-15-006, 2015

Idaho National Laboratory, operated by the Battelle Energy Alliance LLC under contract with U.S. DOE, is seeking industry partners to license, further develop, and commercialize a unique method to remove mercury vapor from a selected environment. License rights may be issued on an exclusive or nonexclusive basis and may include specific fields of use. INL may also be available to assist in further R&D of this technology under a sponsored research agreement. Using new and unique chemistry, this novel technology has been developed primarily for the removal of mercury vapor for application in contaminated site cleanup or possibly in the processing of spent compact fluorescent bulbs. It has been tested at bench scale, and additional development will be required to demonstrate a pilot-scale process. U.S. Patent Application is being explored. Companies interested in commercializing this technology should provide a written statement of interest to the Commercialization Manager by email. <https://www.fbo.gov/spg/DOE/INFEEL/ID/INL-TD-15-006/listing.html>

Cleanup News

MIRROR LAKE CLEANUP EFFORT IS "GAME-CHANGER"

Howard, A.
Delaware State News, 2 Mar 2015

The health of Mirror Lake had been in decline for several decades owing to stormwater runoff and sedimentation, invasive plant species, and contaminants (e.g., PCBs) in bottom sediments that accumulate in fish. In 2014, the Delaware Department of Natural Resources and Environmental Control (DNREC) applied 70 tons of SediMite, an activated carbon product, to the lake sediments. This application is expected to result in the reduction or removal of the fish consumption advisory in the lake and the St. Jones River downstream to Court Street in Dover within three to five years. Dr. Rick Greene of DNREC's Division of Watershed Stewardship said there was a 60% improvement, and the lake is well on its way to achieve a 70-90% reduction of contaminants within three to five years. The project marked the largest application of SediMite anywhere in the country to date, and also was the first state-funded sediment remediation project of its kind. <http://delaware.newszap.com/centraldelaware/138490-70/mirror-lake-cleanup-effort-is-game-changer>

Earlier news:

<http://www.dnrec.delaware.gov/News/Pages/DNRECs-remediation-and-restoration-of-Mirror-Lake-in-Dover-gets-under-way.aspx>

HEALTH AND SAFETY MANAGEMENT OF LEAD IN SOIL IN U.S. AIR FORCE BASES

De Jesus, Ricardo, Master's thesis, Kansas State University, 55 pp, 2014

U.S. Defense activities have cleaned up more than 700 firing ranges across the country in recent years. This paper offers suggestions for soil Pb management programs and discusses cleanups of Pb-contaminated soil conducted at Shaw AFB, Beale AFB, and the Tyndall

Elementary School at Tyndall AFB. <http://krex.k-state.edu/dspace/handle/2097/18660>

REVISED FULL-SCALE REMEDIAL DESIGN, ELI LILLY & COMPANY

Indiana Dept. of Environmental Management, 34 pp, 2015

This full-scale remedial design was developed as part of the corrective measures study process at the Evonik Corporation's Tippecanoe Laboratories site, located at 1650 Lilly Road in Lafayette, Tippecanoe County, Indiana (formerly owned and operated by Eli Lilly and Company). Based on current site conditions; the success of prior remedial measures for benzene, chlorobenzene, and other constituents of concern; and evaluation of applicable remedial response measures, a targeted spot treatment program utilizing in situ chemical oxidation (sodium persulfate catalyzed with calcium peroxide) followed by enhanced biodegradation (10% modified COGAC™ solution) and monitored natural attenuation in three discrete source areas is proposed as appropriate for implementation of a remedial response. The results of bench- and pilot-scale treatability studies, as well as current groundwater conditions, have been utilized to refine the conceptual remedial designs. [*Note: the design report begins on page 7 of the PDF file.*]
http://www.in.gov/idem/files/notice_2050413_hw_evonik_corp.pdf

Demonstrations / Feasibility Studies

IN SITU REMEDIATION OF AROMATIC AMINES USING AN ENGINEERED PHYTOREMEDIATIONSM SYSTEM (ENPHYSYSSM)

Akudo, C., W. Campbell, L. Day, R. Copeland, and G. Booth.

The Third International Symposium on Bioremediation and Sustainable Environmental Technologies, 18-21 May 2015, Miami, Florida. Abstract only, 2015

A limited-scale phytoremediation system is being implemented at a former waste oil recycling facility in the Southern United States where soil and groundwater are affected by 2,4- and 2,6-toluenediamine (TDA). Groundwater contamination is found ~18 ft bgs. The Engineered PhytoremediationSM technique combines conventional phytoremediation mechanisms (e.g., phytodegradation and rhizodegradation) with groundwater hydraulic containment utilizing 25 TreeWell® units within an engineered remedial approach. The pilot system is designed to overcome difficult characteristics in a small portion of the site, including wind-thrown trees and uptake of only shallow perched water by the existing trees. ORC® was added to the backfill in 10 of the TreeWell units to provide an aerobic environment for TDA biodegradation. Sweetgum and cypress trees, two native plant species, were selected for their deeper root systems and substantial canopy. Design and implementation were completed in 2013, with transducers installed into select units to monitor groundwater elevation trends. In addition to monthly tree assessments, a pre-existing network of monitoring wells and piezometers supports evaluation of system performance and groundwater cleanup. Evaluations conducted to date show the rooting networks have reached the water table. The similar water elevation trends between the TreeWell units and the site monitoring wells indicate that the units are hydraulically connected to the target sandy water-bearing zone.

USING PRE-SCREENING METHODS FOR AN EFFECTIVE AND RELIABLE SITE CHARACTERIZATION AT MEGASITES

Algreen, M., M. Kalisz, M. Stalder, E. Martac, J. Krupaneck, S. Trapp, and S. Bartke.

Environmental Science and Pollution Research, May 2015

This paper illustrates the usefulness of pre-screening methods for an effective characterization of contaminated sites with a case study set at a former Soviet military airbase with likely fuel and BTEX contamination in shallow groundwater and subsoil. A sequence of site characterization methods was applied: (1) phytoscreening with tree cores; (2) soil gas measurements for CH₄ and O₂; (3) direct-push with membrane interface probe and laser-induced fluorescence sensors; (4) direct-push sampling; and (5) sampling from soil and from groundwater monitoring wells. Phytoscreening and soil gas measurements are rapid and inexpensive pre-screening methods. Both indicated subsurface pollution and hot spots successfully. The direct-push sensors yielded 3D information about the extension and the volume of the subsurface plume. This study also expanded the applicability of tree coring to BTEX compounds and tested the use of high-resolution direct-push sensors for light hydrocarbons. Comparison of screening results to results from conventional soil and groundwater sampling yielded in most cases high-rank correlation and confirmation. The large-scale application of non- or low-invasive pre-screening can help to direct and focus more expensive investigation methods. *This paper is **Open Access** at*
<http://link.springer.com/article/10.1007%2Fs11356-015-4649-6>.

SEDIMENT REMEDIATION WITH ACTIVATED CARBON AND BIOCHAR: IMMOBILIZATION MECHANISMS AND LARGE-SCALE FIELD TESTS IN NORWAY

Cornelissen, G., E. Eek, M.T. Schaanning, J.S. Gunnarsson, S.E. Hale, G.D. Breedveld, and A.M.P. Oen. Book of Abstracts:

ContaSed2015 — Congressi Stefano Franscini, Monte Verita, Ascona, Switzerland — 8-13 March 2015, p 57, 2015

In Trondheim, Norway, scientists tested powdered AC alone or in combination with sand or clay as a thin-layer capping material for PAH-contaminated sediment. Several novel elements were included, such as measuring PAH fluxes, no active mixing of AC into the sediment, and the testing of new methods of placing a thin AC cap on sediment, such as AC+clay and AC+sand combinations. In situ sediment-to-water PAH fluxes were measured using recently developed benthic flux chambers. AC capping reduced contaminant flux by a factor of 2 to 10 compared to the control. Pore water PAH concentration profiles showed a reduction factor of 2 to 3 compared to the reference field. Effects of the AC on the benthic macrofauna composition and biodiversity were more modest for AC+clay than AC-only or AC+sand. In the Grenlandfjords, Southern Norway, where authorities are trying to find solutions for extensive dioxin contamination (53 km²), AC was added as a thin-layer cap for a large-scale remediation trial. Thin-layer AC capping showed increasing effectiveness with time, with up to 85% reduction in dioxin fluxes after 5 years and up to 90% reductions in chemical availability (in situ passive samplers) and biological availability (bioaccumulation).

GETTING THE LEAD OUT (AND OTHER TRACE METALS): SOLVING MINE WATER PROBLEMS WITH PEAT-BASED SORPTION MEDIA

Eger, P., SME Annual Conference & Expo — CMA 117th National Western Mining Conference, 15-18 February 2015, Denver, Colorado. Abstracts, p 35, 2015

Pilot tests were run at two mines using peat-based sorption media to remove Pb, Zn, and Cd. The first pilot was designed to model active (pressurized tank) and passive (biocell) approaches; the second contained only a pressurized tank. At the first site, the mine water contained 1,500 µg/L Pb, 100 µg/L Zn, and 1.5 µg/L Cd at pH >7. Both pilots removed over 99% Pb and reduced all metals to below permit values. The biocell operated for about nine months and met the permit limit of 11 µg/L for 15,000 bv. When the pilot ended, over 25,000 bv had been treated, and Pb removal was still over 80%. At the second site, pH was also >7, but Zn was the major parameter of concern. Input concentrations were 465 µg/L Zn, 135 µg/L Pb, and 1.9 µg/L Cd. The peat effectively removed Zn, but after 4,500 bv, Zn concentration still exceeded the permit limit of 160 µg/L. Installation of an additional tank of media achieved successful reduction of all metals below permit limits, thereby extending the lifetime of the initial tank to over 12,000 bv. Treatment costs ranged from 43 to 90 cents per 1,000 gallons; capital costs were less than 50% of those of a standard chemical treatment plant.

Research

ARCHITECTURE, PERSISTENCE AND DISSOLUTION OF A 20 TO 45 YEAR OLD TRICHLOROETHENE DNAPL SOURCE ZONE

Rivett, M.O., R.A. Dearden, and G.P. Wealhall.

Journal of Contaminant Hydrology, Vol 170, 95-115, 2014

This paper presents the results of a detailed field-scale investigation of processes controlling the architecture, persistence, and dissolution of a 20 to 45 year old TCE DNAPL source zone located within a heterogeneous sand/gravel aquifer. The study was conducted at a UK industrial site where the source zone was partially enclosed by a 3-sided cell that allowed detailed longitudinal/fence transect monitoring along/across a controlled streamtube of flow induced by an extraction well positioned at the cell closed end. Researchers conducted an integrated analysis of high-resolution DNAPL saturation (from cores), dissolved-phase plume concentration (from multilevel samplers), tracer test results, and permeability datasets. DNAPL architecture was determined from soil concentration data using partitioning calculations. The authors advocate for further detailed field-scale studies on old DNAPL source zones that better resolve persistent pool/lens features and are of prolonged duration to assess the ageing of source zones. Such studies would underpin the application of more surgical remediation technologies. *This paper is **Open Access** at <http://www.sciencedirect.com/science/article/pii/S0169772214001594>.*

THE VAPOR-PHASE MULTI-STAGE CMD TEST FOR CHARACTERIZING CONTAMINANT MASS DISCHARGE ASSOCIATED WITH VOC SOURCES IN THE VADOSE ZONE: APPLICATION TO THREE SITES IN DIFFERENT LIFECYCLE STAGES OF SVE OPERATIONS

Brusseau, M.L., J. Mainhagu, C. Morrison, and K.C. Carroll.
Journal of Contaminant Hydrology, Vol 179, 55-64, 2015

Vapor-phase multi-stage contaminant mass discharge (CMD) tests were conducted at three field sites to measure mass discharge associated with contaminant sources located in the vadose zone. The three sites represent the three primary stages of the soil vapor extraction (SVE) operations lifecycle: pre/initial SVE, mid lifecycle, and near closure. The CMD values obtained from the tests were used in conjunction with a recently developed vapor-discharge tool to evaluate the impact of the measured CMDs on groundwater quality.

FIELD TRIAL ON REMOVAL OF PETROLEUM-HYDROCARBON POLLUTANTS USING A MICROBIAL CONSORTIUM FOR BIOREMEDIATION AND RHIZOREMEDIATION

Pizarro-Tobias, P., J.L. Niqui, A. Roca, J. Solano, M. Fernandez, F. Bastida, C. Garcia, and J.L. Ramos. Environmental Microbiology Reports, Vol 7 No 1, 85-94, 2015

An in situ bioremediation and rhizoremediation field-scale trial was performed in an area contaminated with oil refinery sludge in a semiarid climate (Murcia, Spain). Combinations of pasture seeds and/or a microbial consortium containing plant growth-promoting rhizobacteria and PAH-degrading bacteria were introduced to assess the survival and efficiency of the introduced microbes and to compare the effect of bioremediation without plants and that of the rhizoremediation process. Results revealed that the development of vegetation favored the evolution of indigenous microbiota with potential to remove petroleum wastes, which was inferred in the decline of total petroleum hydrocarbons seven months after the biological treatment. *This paper is **Open Access** at <http://onlinelibrary.wiley.com/doi/10.1111/1758-2229.12174/abstract>.*

ASSISTED BIOREMEDIATION TESTS ON THREE NATURAL SOILS CONTAMINATED WITH BENZENE

Carvalho, M.M., M.C. Vila, C. Delerue-Matos, M.T. Oliva-Teles, and A. Fiuza.
Eurasian Journal of Soil Science, Vol 4 No 3, 153-160, 2015

Remediation efficiencies obtained for bioremediation with and without ventilation (bioventing) for benzene contamination in three subsoils (limestone, granite, and schist) were very high ($\geq 99.3\%$). Project results suggested that the effect of the diversity and abundance of clay minerals outweighs the effect of the fraction of soil fines. Limestone and granite have clay minerals in their mineralogical composition, which required a longer timeframe for achieving the target remediation efficiency in both technologies, whereas schist, which has the highest fine fraction but without clay minerals, required the least time for remediation. Bioventing promoted higher remediation rates, confirming the importance of oxygen supply on assisted bioremediation. This effect was more pronounced in the granite subsoils, which presented the biggest difference for remediation times between unvented bioremediation and bioventing. http://fesss.org/download/son_savi/CO1C17SE.pdf

PASSIVE SAMPLING METHODS FOR CONTAMINATED SEDIMENTS: SCIENTIFIC RATIONALE SUPPORTING USE OF FREELY DISSOLVED CONCENTRATIONS

Mayer, P., T.F. Parkerton, R.G. Adams, J.G. Cargill, J. Gan, T. Gouin, P.M. Gschwend, S.B. Hawthorne, P. Helm, G. Witt, J. You, and B.I. Escher.
Integrated Environmental Assessment and Management, Vol 10 No 2, 197-209, 2014

Based on previous research on hydrophobic organic contaminants, the authors conclude that quantification of the freely dissolved concentration (C_{free}) of an organic contaminant using passive sampling methods (PSMs) allows a direct assessment of 1) contaminant exchange and equilibrium status between sediment and overlying water, 2) benthic bioaccumulation, and 3) potential toxicity to benthic organisms. The use of PSMs to measure C_{free} thus provides an improved basis for the mechanistic understanding of fate and transport processes in sediments and has the potential to significantly improve risk assessment and management of contaminated sediments. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4235458/>

ENHANCED-ELECTROKINETIC EXTRACTION OF HEAVY METALS FROM DREDGED HARBOR SEDIMENT

Yoo, J.C., J.S. Yang, E.K. Jeon, and K. Baek.
Environmental Science and Pollution Research, Vol 22 No 13, 9912-9921, 2015

In this study, the feasibility of an ex situ electrokinetic (EK) process combined with pre-oxidation using hydrogen peroxide (H_2O_2) and pre-washing using EDTA was investigated for enhancing the extraction of Cu, Pb, and Zn from actual dredged harbor sediment. H_2O_2 pre-oxidation led to a change in the fractionation of Cu bound to organic matter and the sulfide fraction in the Fe-Mn oxides to the exchangeable fraction, but was not effective at removing metals. In contrast, EDTA pre-washing changed the Fe-Mn oxide-bound fractions of Cu and Pb into easily extractable fractions, removing 20.1, 27.5, and 32.8% of Cu, Pb, and Zn, respectively. During EK treatment, metals were transported toward the anode by electromigration of negatively charged complexes such as metal-EDTA and metal-citrate; however, EK treatment did not enhance the removal of metals significantly because metals accumulated near the anodic region with an increase in the exchangeable fraction due to the short EK operating duration and low voltage gradient. Thus, it is necessary to extend the EK operating duration or increase the voltage gradient for effective transportation and removal of metals from sediment.

IMMOBILIZATION OF METALS USING BIOCHAR AND GREEN WASTE COMPOST TO AID BIOMASS PRODUCTION ON A CONTAMINATED SITE

Jones, S., P. Bardos, P. Kidd, P. Menger, M. Mench, W. Friesl-Hanl, G. Soja, T. Hutchings, and F. de Leij. CABERNET 2014: Tailored & Sustainable Redevelopment toward Zero Brownfields, 4th International Conference on Managing Urban Land, 14-16 October 2014, Frankfurt am Main, Germany. 29 slides, 2014

Researchers evaluated the effect of different biochars and green waste compost on immobilization of metals in soil from a copper-contaminated former wood treatment plant in France to establish if there is an improvement in yield when green amendments are applied (thereby indicating the potential for production of biomass usable for energy on marginal land) and to gain insight into the optimal mode of use of green amendments as gentle remediation options. Three biochars were investigated: unamended biochar, Fe-amended biochar, and C-Cure-Metal, a specialized remediation product. As the biomass used for biochar production was grown on the site to be remediated, the project also investigated the possibility of recycling biomass produced on contaminated sites for further site improvement. Pre- and post-incubation leach tests indicated that all treatments significantly reduced available copper compared to the

control, with the higher biochar application rate reducing Cu most greatly and C-Cure-Metal the most effective biochar. The greatest improvement in plant yields was obtained with a higher application rate of biochar combined with compost.
http://www.zerobrownfields.eu/HombreTrainingGallery/12_Jones.pdf

A TECHNOLOGY FOR REAL-TIME MONITORING OF VOCs EMANATING FROM THE HANFORD TANK FARMS

Conca, J., J. Sears, and L. Lockrem.
WM2014 Conference, 2-6 March 2014, Phoenix, Arizona. Paper 14360, 12 pp, 2014

Proton transfer reaction mass spectrometry (PTR-MS) is well suited to real-time measurements of VOCs emitted from waste tanks at the Hanford site, groundwater releases into the vadose zone, vapor intrusion from soil into buildings, and aboveground vapor releases. In PTR-MS, a proton transfers from H₃O⁺ to gas-phase organic compounds with a proton affinity greater than water (e.g., acetone or BTEX). The PTR-MS study on 58 volatiles and mixtures described in this paper demonstrated excellent performance with respect to dozens of volatiles, including amines and nitrosamines, furans, nitriles, aromatics, alcohols and ketones, and carbonyls as sampled through PFC tubing up to 100 ft, reflecting the field conditions of a mobile unit and optimized for site worker safety. The tests determined the performance efficiencies, detection limits, analytical speed, memory effects and logistical necessities of PTR-MS in field applications using a mobile laboratory. Results showed response times were excellent (seconds) except for dimethylamine, which had clearing times up to 45 min. <http://www.wmsym.org/archives/2014/papers/14360.pdf>

HIGH PERFORMANCE 3D GEOPHYSICAL IMAGING AND 4D TIME-LAPSE MONITORING OF SUBSURFACE CONTAMINATION AND ASSOCIATED PROCESSES AT THE HANFORD SITE

Johnson, T., M. Truex, J. Thomle, C. Strickland, D. Wellman, J. Zachara, D. Rucker, R.D. Hildebrand, and R. Versteeg.
WM2014 Conference, 2-6 March 2014, Phoenix, Arizona. Paper 14362, 11 pp, 2014

Over the past 10 to 15 years, electrical resistivity tomography (ERT) survey instrumentation has advanced rapidly, enabling large amounts of data to be collected quickly and autonomously, and providing the opportunity to characterize the subsurface and monitor subsurface properties at high resolution in space and time. High-performance parallel computing resources and advanced ERT imaging techniques are applied at the Hanford Site to 1) characterize the 3D distribution of vadose zone contamination beneath former waste infiltration galleries at the Hanford B-Complex, 2) monitor engineered vadose zone desiccation for contaminant immobilization in 4D at the Hanford BC Cribs and Trenches Area, and 3) monitor infiltration of Columbia River water into the contaminated aquifer underlying former waste infiltration galleries at the Hanford 300 Area. <http://www.wmsym.org/archives/2014/papers/14362.pdf>

TREATMENT OF A PHC SOURCE ZONE USING LAND APPLICATION OF SULFATE

Wei, Yunxiao, Master's thesis, University of Waterloo, 2015

This pilot-scale experiment was performed in the sand pit area at the University of Waterloo Groundwater Research Facility at CFB Borden in Ontario. A multicomponent petroleum hydrocarbon (PHC) source zone (3 m x 3 m) was emplaced in 2012 between 1 and 3 m bgs inside a sheet-pile-walled experimental gate. Three episodes of sulfate release (5 m³ of 5-20 g/L sodium sulfate, and 0.3 g/L ammonium sulfate) at ground surface were conducted over an 8-month period. Multilevel monitoring wells in conjunction with a real-time resistivity data collection system were employed in continuous tracking of sulfate patterns and migration. Results demonstrated that 5 g/L sodium sulfate did not provide sufficient infiltration, whereas 15-20 g/L sodium sulfate created strong density-dependent flow. Sulfate monitoring showed the real-time resistivity system allowed collection of high-resolution data. PHC mass discharge results indicated significant attenuation of benzene, toluene, and xylene after sulfate application. The sulfate isotope data support the occurrence of sulfate reduction. Microbiological data showed the occurrence of biodegradation under both aerobic and anaerobic conditions in the PHC plume. <http://hdl.handle.net/10012/9193>

ANTIMONY RETENTION AND RELEASE FROM DRAINED AND WATERLOGGED SHOOTING RANGE SOIL UNDER FIELD CONDITIONS

Hockmann, K., S. Tandy, M. Lenz, R. Reiser, H.M. Conesa, M. Keller, B. Studer, and R. Schulin. Chemosphere, Vol 134, 536-543, 2015

Investigators compared antimony (Sb) leaching from a calcareous shooting range soil under drained and waterlogged conditions in four large outdoor lysimeters. After monitoring the leachate samples taken at biweekly intervals for >1.5 years under drained conditions, two of the lysimeters were subjected to waterlogging, with a water table fluctuating according to natural rainfall water infiltration. Sb leachate concentrations under drained conditions showed a strong seasonal fluctuation between 110 µg/L in summer and for details of this research, see K. Hockmann's Ph.D. thesis at <http://e-collection.library.ethz.ch/eserv/eth:8135/eth-8135-02.pdf>.

REMOBILIZATION OF TRIVALENT CHROMIUM AND THE REGENERATION OF IN SITU PERMEABLE REACTIVE BARRIERS DURING OPERATION

Kaimbi, Lapaka Albertina, University of Pretoria, 121 pp, 2014

A study was conducted to evaluate the reduction of Cr(VI) to Cr(III) in a biological permeable reactive barrier and regeneration of the biological PRB to achieve continuous long-term operation. Precipitation of chromium hydroxide affected the porosity and hydraulic conductivity of the barrier system. The regeneration process involved remobilization of precipitated chromium hydroxide using a dilute acid (0.1% HCl) and recovery of Cr(III) by electrokinetics (EK). The microbial barrier system achieved ~75% Cr(VI) removal within 63 days of operation. Formation of chromium hydroxide was observed in the second week. After 4 weeks of soil washing with 0.1% HCl and EK remediation with a DC voltage of 50-150 V, an increase in total chromium (73%) was observed, suggesting that the trapped chromium species were remobilized. The combination of EK and soil washing transformed >95% Cr(VI) to lower toxicity Cr(III). One of the limitations of EK, however, is a near-anode focusing effect whereby a layer of precipitate forms around the anode, leading to a reduction in performance efficiency. <http://repository.up.ac.za/handle/2263/43365>

REDUCING THE MOBILITY OF ARSENIC IN BROWNFIELD SOIL USING STABILISED ZERO-VALENT IRON NANOPARTICLES

Gil-Diaz, M., J. Alonso, E. Rodriguez-Valdes, P. Pinilla, and M.C. Lobo.
Journal of Environmental Science and Health A, Vol 49 No 12, 1361-1369, 2014

Researchers investigated the effectiveness of using a commercial stabilized suspension of nanoscale zero-valent iron (NZVI) to immobilize As in brownfield soil and NZVI impact on Fe availability in the treated soil. The phytotoxicities of the soil samples were also evaluated using a germination test with barley (*Hordeum vulgare* L) and common vetch (*Vicia sativa* L). Two doses of the commercial NZVI suspension were studied (1% and 10%), and two soil-nanoparticle interaction times (72 h and 3 mo) were used to compare the stabilities of the treated soils. Arsenic availability was evaluated using a sequential extraction procedure and the TCLP test. NZVI application significantly decreased As availability in the soil, and As immobilization was more effective and more stable over time with the 10% dose than with the 1% dose. Fe leachability remained

General News

AN INTEGRATED FRAMEWORK OF METHODS, TECHNOLOGIES, TOOLS AND POLICIES FOR IMPROVEMENT OF BROWNFIELD REGENERATION IN EUROPE: PROJECT FINAL REPORT

TIMBRE Project, 84 pp, 2014

The Timbre project aimed to support end users in overcoming existing barriers to brownfield re-use by developing and providing customized problem- and target-oriented packages of technologies, approaches, and management tools for brownfield prioritization, re-use planning, and remediation. Europe has over 20,000 megasites—large and complex contaminated sites with significant remediation costs—and these were the particular focus of the project. The effective and sustainable regeneration of megasites requires innovative investigation and remediation technologies and integrated evaluation approaches for optimized reuse options. This report details the results of the multifaceted Timbre effort.

<http://cordis.europa.eu/docs/results/265/265364/final1-timbre-265364-final-report-publishable-summary.pdf>

CONTEMPORARY MANAGEMENT OF SITES WITH PETROLEUM LNAPL PRESENCE

Suthersan, S., B. Koons, and M. Schnobrich.
Groundwater Monitoring & Remediation, Vol 35 No 1, 23-29, 2015

A broader understanding of the science of LNAPL in the subsurface has resulted in a wholesale change in the conceptualization and management of LNAPL sites. New and improved tools support a greater investment in site characterization and development of LNAPL conceptual site models while generating increased returns by better matching a remedy to the concern that the LNAPL poses. This process also allows demonstration as to whether remediation will provide no net benefit compared to natural zone source depletion. *This paper is **Open Access** at <http://onlinelibrary.wiley.com/doi/10.1111/qwmr.12099/pdf>.*

ABSTRACTS OF THE 4TH INTERNATIONAL SYMPOSIUM ON SEDIMENT MANAGEMENT: I2SM 2014

Ferrara Fiere Congressi, 128 pp, 2014

I2SM 2014 was held in Ferrara, Italy, on September 17-19, during the RemTech Expo. The symposium was organized by Ferrara Fiere Congressi, Politecnico di Milano (Department of Civil and Environmental Engineering), and the Ecole des Mines de Douai to attract academics, environmental professionals, and public agencies involved in sediment issues to discuss the state of the art. A special issue of the international peer-reviewed journal *Environmental Technology* will be edited with selected papers from the symposium.

http://i2sm.remtechexpo.com/images/documenti/I2SM_ABSTRACTS_WEB_VERSION.pdf

The Technology Innovation News Survey welcomes your comments and suggestions, as well as information about errors for correction. Please contact Michael Adam of the U.S. EPA Office of Superfund Remediation and Technology Innovation at adam.michael@epa.gov or (703) 603-9915 with any comments, suggestions, or corrections.

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