Technology Innovation News Survey

Entries for January 16-31, 2016

Market/Commercialization Information

SMALL BUSINESS VENDOR DAY

Federal Aviation Administration (FAA), Great Lakes Region, Chicago, IL.
Federal Business Opportunities, FBO-5106, Solicitation 23674, 2016

The FAA Central Service Area Small Business Development Program will host a Small Business Vendor Day in the FAA Central Regional Office at 2300 E. Devon Avenue, Des Plaines, Illinois 60018, on Wednesday, April 20, 2016, from 9:00 AM to noon. Attendance is limited to the first 25 small businesses that respond via email by 4:00 PM of March 18, 2016. Only small businesses registered in the System for Award Management in the NAICS codes specified in the FedBizOpps notice are invited to attend. The list of codes includes 541620 (Environmental Consulting Services) and 562910 (Environmental Remediation Services). There is no cost to attend this event, but preregistration is required. Once maximum attendance capacity is reached, registration will be closed.
https://www.fbo.gov/spg/DOT/FAA/GLR/23674/listing.html

ENVIRONMENTAL ENGINEERING PROFESSIONAL AND TECHNICAL SUPPORT SERVICES

Department of the Army, National Guard Bureau, Systems & IT Branch, Arlington, VA.
Federal Business Opportunities, FBO-5109, Solicitation EEPTSS-RFI, 2016

This notice is a request for information for market research and planning purposes only. The anticipated NAICS code is 562910, Remediation Services, with a size standard of 500 employees. The Government requires contractors to provide full environmental engineering services for National Guard installations across the CONUS and its surrounding territories in the following program areas: Environmental Restoration (cleanup); Environmental Quality (compliance); Environmental Planning (assessments and documentation); and Natural and Cultural Resources (preservation). The anticipated result of the future procurement is a multiple-award IDIQ contract for environmental engineering professional and technical support services, issued as a 5-year contract with a base period of one year and four option years. Capabilities statement responses to this RFI are due by 5:00 PM ET on March 23, 2016.
https://www.fbo.gov/spg/USA/NGB/DAHA92/EEPTSS-RFI/listing.html

PROFESSIONAL ENVIRONMENTAL REMEDIATION SERVICES

NASA, Office of Procurement, John F. Kennedy Space Center, FL.
Federal Business Opportunities, FBO-5109, Solicitation NNK16KMG001, 2016

The John F. Kennedy Space Center (KSC) is conducting market research to evaluate the availability of potential sources for professional remediation services in assessing, designing, and implementing soil and groundwater cleanups at various locations at KSC and Cape Canaveral Air Force Station (CCAFS), Florida. Vendors having capabilities that meet or exceed the stated requirements are invited to submit capability packages, appropriate documentation, and references. The NAICS code is 562910, Remediation Services, with a small business size standard of 500 employees. The estimated extent of service required would be a minimum number of three IDIQ contracts, each with an estimated value of $80M over a 5-year ordering period. Each firm must have extensive experience in the investigation, remedial design, and potential cleanup of large, complex sites affected by DNAPL and chlorinated solvents; use an analytical laboratory that has a state of Florida-approved Quality Assurance Project Plan; and employ drillers licensed in the state of Florida. Location of a firm's essential staff for this effort shall be within 150 miles of KSC and CCAFS (or a commitment to locate within 150 miles) and knowledge of the KSC and CCAFS locality. Although work will be performed predominantly at KSC and CCAFS, performance may also be required at other NASA Centers (not to exceed $5M per year). Capabilities statements must be received via email by 2:00 PM ET on March 24, 2016.
https://www.fbo.gov/spg/NASA/KSC/OPDC20220/NNK16KMG001/listing.html

MECHANICAL REMEDIATION DREDGING IN THE LOWER HARBOR

U.S. Army Corps of Engineers, USACE District New England, Concord, MA.
Federal Business Opportunities, FBO-5103, Solicitation W912WJ-16-R-0002, 2016

The U.S. Army Corps of Engineers plans to issue an RFP for a new firm-fixed-price construction dredging contract under NAICS code 237990. The solicitation will be issued on an unrestricted basis on or about March 25, 2016. The project involves mechanical remediation dredging of ~120,000 yd^3 of PCB-contaminated sediments and their disposal into the Lower Harbor Confined Aquatic Disposal Cell. The work requires the contractor to achieve precise dredge cuts in depths from 3 to 30 feet of water and to perform disposal with minimal spillage or turbidity. A silt curtain and oil boom is to be placed around the perimeter of the disposal cell. All work to be performed under this contract (including all dredge areas and the disposal cell) is located between the Route 195 and Route 6 bridges. The dredged sediments will be placed into split-hull scows for transport to the disposal cell. Free-standing water collected in the scows/hoppers is to be decanted and filtered using activated carbon to ensure compliance with the 50-ntu turbidity criterion.
https://www.fbo.gov/spg/USA/COE/DACA33/W912WJ-16-R-0002/listing.html

ENVIRONMENTAL SERVICES AND OPERATIONS (ESO)

Environmental Protection Agency, Office of Acquisition Management, Region I, Boston, MA.
Federal Business Opportunities, FBO-5110, Solicitation SOL-R1-14-00003, 2016

EPA has issued the official solicitation for its Environmental Services and Operations (ESO) acquisition as a total small business set-aside under NAICS code 562910, with a size standard of 500 employees. Questions regarding the solicitation are due by 3:00 PM ET on March 11, 2016. Services under the ESO contracts may be ordered by any EPA Region or Headquarters Office. The ESO performance work statement (attached to the notice at FedConnect) describes general tasks that will be accomplished under this contract. ESO-type activities may include but are not limited to groundwater sites with challenging geology, manufactured gas plant sites, residential/high access sites, vapor intrusion sites, large geographic sites contaminated with mining chat, and large watershed surface water and sediment sites.

The details of this solicitation (including a 26-page Q&A file) are available only through FedConnect at https://www.fedconnect.net/FedConnect/?doc=SOL-R1-14-00003&agency=EPA[Note: It might be necessary to copy and paste the URL into your browser for direct access.] Proposals are due by 3:00 PM ET on April 11, 2016. https://www.fbo.gov/spg/EPA/OAM/RegI/SOL-R1-14-00003/listing.html

Cleanup News

SYNERGISTIC REMEDIATION USING EZVI, CARBON SOURCES AND KB-1 TO PROMOTE RISK-BASED CLEANUP OF CHLORINATED ETHENES AT A HISTORICAL TRAIN DERAILMENT SITE

Droy, B. Abstracts of the 21st Annual Florida Remediation Conference, Orlando, 8-9 October 2015

A soil and groundwater combined remedy was developed and implemented to address PCE, TCE, cis-1,2-DCE, and VC contamination at a historical train derailment site in the southeastern U.S. Site investigations revealed groundwater contamination was primarily located in the shallow aquifer and underlying clays. The remediation approach combined an existing pump-and-treat system with multiple innovative technologies to achieve a timely, risk-based site closure. Emulsified zero-valent iron (EZVI), vegetable oil, lactate, and KB-1® culture were injected as remediation amendments to enhance the biogeochemistry of the subsurface and accelerate reductive dechlorination reactions: EZVI to treat the residual DNAPL source in the subsurface, KB-1 to bioaugment the existing dechlorinating bacteria, and vegetable oil and lactate to nourish and stimulate the microbial populations. Soil and groundwater monitoring results indicate that the contaminant concentrations have declined to levels below the cleanup objectives. In situ chemical reduction, bioremediation, and the existing remediation system were synergistically combined to expedite site cleanup in a manner that eliminated years of pump and treat. Regulatory approval has been given to develop a site closure plan*Additional news*: http://files.ctctcdn.com/8f66ed33401/68eb3fd2-1dcb-41bc-8038-f59e6f1890be.pdf

LARGE DIAMETER AUGER REMEDIATION AT WILSON CORNERS ON KENNEDY SPACE CENTER

Kline, R. and A. Chrest.
Abstracts of the 21st Annual Florida Remediation Conference, Orlando, October 8-9, 2015.

The Wilson Corners site at Kennedy Space Center was used as a rocket engine component cleaning facility and lab in support of the Apollo program in the 1960s and '70s. TCE used at the facility was discharged to a septic system and sometimes spilled on the ground. Since the first site assessment activities in the 1980s, ~20,000 lb of chlorinated VOCs have been removed; however, several areas of high-concentration CVOCs remain. Between September 2014 and February 2015, NASA implemented an interim measure (IM) in the Hot Spot 1 high-concentration area. The effort employed soil mixing using a large-diameter auger, hot air/steam generation and delivery, vapor extraction and conditioning, off-gas treatment, recovered-liquid treatment and discharge, and zero-valent iron mixing and delivery. Real-time data monitoring was an integral part of the treatment process to enhance treatment efficiency and maximize results. Due to the elevated subsurface temperatures anticipated following the IM, initial samples will be collected using direct-push technology, with monitoring wells to follow as subsurface temperatures subside.

LANDFARMING OFFERS VIABLE ENVIRONMENTAL CLEANUP SOLUTION IN ARCTIC

Budnik, J. The Corps Environment, Vol 17 No 1, p 8, 2016

Four miles north of downtown Nome, Alaska, a Formerly Used Defense Sites (FUDS) World War II-era fuel storage tank (~1 million gal capacity of diesel fuel) deteriorated over time and tainted the surrounding soil. The Corps found about 30,000 tons of petroleum-contaminated material to remediate at a site that is accessible only by sea or air. The site contractor proposed solutions that included burning the pollution out of the soil on site, excavating and barging the dirt off site, and finally landfarming, which offered a cost savings of about $3 million over the other options. The contaminated soil was removed from the source location, spread 1 to 2 ft thick across a 12-acre area, and tilled. Conditions will be ideal for biodegradation of petroleum-based contaminants if a balance of warm soil temperature, moisture, and aerobic microbial activity is achieved during the spring and summer months. The Nome site is expected to meet the state's cleanup requirements by 2019.
http://www.usace.army.mil/Portals/2/docs/Environmental/Corps_Environment/The_Corps_Environment_January_2016.pdf

INTEGRATED BIOREMEDIATION SYSTEM OF A TPHS-POLLUTED SOIL BY USING AUTOCHTHONOUS BACTERIA AND PHYTOREMEDIATION: IN SITU APPLICATION AT A FORMER OIL REFINERY

Guarino, C., P. Iavazzo, V. Spada, B. Conte, R. Sciarrillo, L. Serbolisca, E. Franchi, & A. Cardaci.
Phytotechnologies for Sustainable Development: 12th International Conference Abstracts, 2015

The effectiveness of combined biological treatments was evaluated for the reclamation of petroleum-contaminated soil at a former oil refinery in northern Italy. A landfarm-based biological remediation process—the integrated bioremediation system with autochthonous bacteria and rhizo-microbiota (IBS-ABR)—was applied to the site. This strategy stimulated aerobic biodegradation by autochthonous bacteria bioaugmented by a previously isolated and characterized indigenous bacterial consortium. A phytoremediation step assisted with promoting growth of bacteria and fungi and the ultimate achievement of successful results. TPH showed a reduction of 50% after landfarming and biostimulation, and a further drop of 40% after phytoremediation and bioaugmentation. Combining different bioremediation technologies selected with attention to specific site characteristics provided an effective, innovative, and sustainable approach for remediation of TPHs at large field scale.

PHYTOREMEDIATION OF PAHS: DESIGNING FOR SUCCESS

Jordan, M. and L. Yang.
IPEC 2015: 22nd Annual International Petroleum Environmental Conference, 35 PowerPoint slides, 2015

Two case studies are presented to illustrate design considerations for successful plant-based remediation. One site is a former foundry in Illinois with impacts in the upper three ft of soil. The design incorporated native prairie grasses and trees. A second site in the coastal plain of North Carolina used a mixture of black and white willow trees to address PAHs in the upper six ft of soil. The approach for each site highlights factors to consider in plant selection, spacing, installation, and maintenance, such as species performance in lab or field demonstrations, degree of hydrocarbon weathering, constituents and potentially limiting compounds, depth, monoculture versus multiple species, phytotoxicity, climate, soil type, remedial time frame, irrigation, aeration of the vadose zone, fertilization, and maintenance requirements.http://ipec.utulsa.edu/Conf2015/Manuscripts/Jordan_PAHRemediation.pptx

Demonstrations / Feasibility Studies

SMOLDERING REMEDIATION OF COAL-TAR-CONTAMINATED SOIL: PILOT FIELD TESTS OF STAR

Scholes, G.C., J.I. Gerhard, G.P. Grant, D.W. Major, J.E. Vidumsky, C. Switzer, and J.L. Torero.
Environmental Science & Technology, Vol 49 No 24, 14334-14342, 2015

Self-sustaining treatment for active remediation (STAR) is an emerging, smoldering-based technology for NAPL remediation. In the first in situ field evaluation of STAR, pilot tests were performed at 3.0 m (shallow test) and 7.9 m (deep test) bgs within distinct lithological units contaminated with coal tar at a former industrial facility. This project mapped the outward propagation of a NAPL smoldering front, quantified the NAPL destruction rate in real time, and demonstrated self-sustained smoldering (i.e., after termination of ignition) below the water table. The shallow test destroyed a total of 3,700 kg of coal tar over 12 days, while the deep test destroyed 860 kg over 11 days. During this treatment, This paper is **Open Access** at http://pubs.acs.org/doi/full/10.1021/acs.est.5b03177.

DEMONSTRATION AND VALIDATION OF A FRACTURED ROCK PASSIVE FLUX METER: ESTCP COST AND PERFORMANCE REPORT

ESTCP Project ER-200831, 72 pp, 2015

The overall project objective was to demonstrate and validate the Fractured Rock Passive Fluxmeter (FRPFM) as a new closed-hole passive sensing technology for fractured media. The FRPFM provides simultaneous measurement of the (1) presence of flowing fractures, (2) location of active or flowing fractures; (3) active fracture orientation (i.e., dip and azimuth); (4) direction of groundwater flow in each fracture; (5) cumulative magnitude of groundwater flux in each fracture; and (6) cumulative magnitude of contaminant flux in each fracture. Various technologies exist to measure (1), (2) and (3) above; however, the FRPFM is the only technology that also measures (4), (5) and (6).
https://www.estcp.com/content/download/35027/337003/file/ER-200831-CP.pdf

CAN ACTIVATED CARBON BE USED TO TREAT DREDGED SEDIMENTS?

Kornacki, A.
The Corps Environment, Vol 17 No 1, p 9, 2016

The U.S. Army Engineer Research and Development Center and the Buffalo District have undertaken a large-scale demonstration of activated carbon (AC) treatment for sediments dredged from Ashtabula Harbor, Ohio. Although levels of contamination at this site are low, the goal is to determine if bioaccumulation can be reduced in the bioactive zone of the 50-ft-deep placement site. The long-term objective is to evaluate the performance of AC under field conditions to determine if the technology can be utilized in situations or harbors where sediment contamination is a concern. The most biologically active zone in lake sediment is at the surface of the lake bottom, and the project will also place a 2- to 5-cm layer of AC-treated sediment to provide a protective bioactive zone cap. During the 2015 dredging season a total of 7,200 yd^3 was placed in the open-lake area as part of the study, of which 1,200 yd^3 of sediment was treated with both powdered and granular AC to see how well each mixed with sediment, how each type acted when it was dropped from the scow to the placement site, and how quickly the two AC types adsorbed contaminants. Both types were mixed into dredged sediment contained in the placement scow using a clam shell bucket. After the sediment settled, sampling showed well-blended GAC and smears of PAC in the bioactive zone. During the 2016 season, the team will return to the open-lake placement site and test for the reduction of contaminant bioavailability.
http://www.usace.army.mil/Portals/2/docs/Environmental/Corps_Environment/The_Corps_Environment_January_2016.pdf

FIELD APPLICATION OF BIOGEOCHEMICAL REDUCTIVE DECHLORINATION BY PERMEABLE REACTIVE BARRIER

Kennedy, L.G. and J.W. Everett.
International Journal of Environment and Waste Management, Vol 14 No 4, 2014

Biogeochemical reductive dechlorination (BiRD) uses biotically generated iron sulfide minerals to abiotically reduce chlorinated aliphatic hydrocarbons (CAHs). BiRD was applied in a permeable reactive barrier (PRB) configuration at Dover Air Force Base, the first time this approach was tested in the field. Iron sulfide minerals were generated in trenches filled with iron-rich sand, mulch, mineral gypsum (sulfate), and limestone (pH control). For comparison purposes, trenches were also filled with sand, mulch, and limestone to create conditions favorable to biostimulation. Compared to biostimulation, BiRD showed little evidence of methanogenesis, indicating that the reductive capacity of the applied organic was converted to mineral iron sulfide rather than methane. CAH treatment in the biostimulation PRB was incomplete after 150 days, apparently stalling at DCE, whereas in the BiRD treatment area, CAH treatment appeared to be rapid and reduced PCE, TCE, and DCE levels within the 150-day time period. *See the final report of the field test at* http://www.eosremediation.com/download/Abiotic/Final%20BiRD%20Report.pdf.

COMPARISON OF IN SITU CHEMICAL REDUCTION TO ENHANCED REDUCTIVE DECHLORINATION TO TREAT CHLORINATED ETHENES

Leigh, D. SMART Remediation Conference, January 27, Vancouver, BC. 16 slides, 2015

In pilot tests conducted to address TCE in the aerobic groundwater at Concord Naval Weapons Station (CNWS) Site 29, the Navy evaluated two treatments: biologically mediated enhanced reductive dechlorination (ERD) and combined biotic and abiotic in situ chemical reduction (ISCR). The ERD pilot was conducted by distributing emulsified vegetable oil and a dechlorinating microbial culture (SDC-9™). The ISCR test enhanced biotic reductive dechlorination by distributing Emulsified Lecithin Substrate®, SDC-9™, and zero-valent iron. TCE and DCE fell below the MCL in both pilot tests, but VC fell below the MCL only with ISCR, which achieved the remedial goals in about one-third the time required by ERD. The Navy selected ISCR for full-scale treatment.
Slides:
http://www.smartremediation.com/wp-content/uploads/2014/10/SMART_Vancouver-2015_Dan-Leigh_Peroxychem.pdf
Paper: http://www.peroxychem.com/media/105083/Concord-Naval-Base-Case-Study-22-01-ESD-14.pdf

Research

LIFE CYCLE OF METHYL TERT-BUTYL ETHER IN CALIFORNIA PUBLIC WATER SUPPLY WELLS

McHugh, T.E., S.R. Rauch, S.M. Paquette, J.A. Connor, and A.D. Daus.
Environmental Science & Technology Letters, Vol 2 No 1, 7-11, 2015

The California Department of Public Health Water Quality Analyses database provided data used to evaluate the extent of MTBE in public water supply wells in California and how these impacts have changed over time. The data show that MTBE has never been detected in >98% of 13,183 public water supply wells tested for MTBE. The number of wells with first-time detections of MTBE peaked in 2000 and has decreased by 80% since that time. For the 188 wells in which MTBE has been detected at least once, MTBE was not detected in the most recent analysis of 142 of these wells. These results indicate that the impact of MTBE on public water supply wells in California has peaked and is declining.*This paper is* ***Open Access*** *at* http://pubs.acs.org/doi/full/10.1021/ez500377t.

SELF-SUSTAINING SMOULDERING COMBUSTION OF COAL TAR FOR THE REMEDIATION OF CONTAMINATED SAND: TWO-DIMENSIONAL EXPERIMENTS AND COMPUTATIONAL SIMULATIONS

Hasan, T., J.I. Gerhard, R.M. Hadden, and G. Rein.
Fuel, Vol 150, 288-297, 2015

This study presents the development and validation of a computational model that simulates the propagation of a smoldering front through a porous medium against unique experiments in coal tar and sand. The model couples a multiphase flow solver in porous media with a perimeter expansion module based on Huygens principle to predict the spread. A suite of 2-D experiments using coal tar-contaminated sand were conducted to explore the time-dependent vertical and lateral smoldering front propagation rates and final extent of remediation as a function of air injection rate. A thermal severity analysis revealed, for the first time, the temperature-time relationship indicative of coal tar combustion. When calibrated to the base-case experiment, the model correctly predicts the remaining experiments. This work provides further confidence in a model for predicting smoldering, which eventually is expected to be useful for designing soil remediation schemes for a novel technology based upon smoldering destruction of organic contaminants in soil.*Preprint manuscript at* https://spiral.imperial.ac.uk/handle/10044/1/27000.

THE FLUTE™ ACTIVATED CARBON TECHNOLOGY (FACT™)

FACT™ is a flexible borehole liner equipped with a reactive covering for NAPL detection and a continuous strip of activated carbon felt 0.125 in thick x 1.5 in wide. The carbon felt is located on the inside of a hydrophobic cover. A diffusion barrier lies between the carbon felt and the liner to isolate the carbon from the liner. The liner is everted into the borehole using a pressure differential between water added to the inside of the liner and the hydraulic head in the borehole. The liner presses the carbon felt firmly against the borehole wall while sealing the entire borehole. The carbon felt strip sorbs organic solutes from the formation, both from the secondary porosity (fractures) and from the primary porosity. After sufficient equilibration time, the liner is recovered by inversion, preventing the carbon felt from contacting any other portion of the borehole wall during removal. Once removed from the hole, the carbon felt is sectioned at closely spaced intervals, placed in sample bottles with a solvent (e.g., methanol or pentane), and analyzed in a lab. Lab analysis measures mass of contaminant per unit mass of carbon felt. Modeling tools are being developed and evaluated by Danish Technological University researchers in collaboration with SERDP-sponsored researchers to understand how the mass on the carbon felt relates to contaminant concentrations in matrix pore water.*Additional information*:

- The FACT-FLUTe Technology: A Modeling Tool for Interpreting Field Data (21 pp, 2014) http://orbit.dtu.dk/files/105671549/FACTFLUTe_report_final.pdf
- Innovative Field Investigations in Limestone using a FACT-FLUTe (Abstract, 2015) http://orbit.dtu.dk/files/111775757/Abstract_AquaConSoil2015_accepted.pdf
- Hydrogeologic Spatial Resolution Using Flexible Liners (4 pp, 2012) http://users.ipfw.edu/isiorho/HydroFlexliners.pdf

HIGH-RESOLUTION CHARACTERIZATION OF DNAPL SOURCE ZONE ARCHITECTURE IN CLAY TILL

Broholm, M.M., A.S. Fjordboge, G.S. Janniche, T. Jorgensen, J. Damgaard, et al.
Third International Symposium on Bioremediation and Sustainable Remediation Technologies: Platform, Panel, and Poster Abstracts. Miami, Florida, 2015

Activities at a Naverland chemical distribution facility (1965-83) near Copenhagen, Denmark, left PCE and TCE DNAPL at the site. Innovative investigation methods were employed to characterize the source zone hydrogeology and contamination and thus obtain an improved conceptual understanding of DNAPL source zone architecture in fractured clay till and bryozoans limestone bedrock in a multiple-lines-of-evidence approach, initialized with surface geophysics to determine the surfaces of the clayey till and the underlying limestone aquifer. Based on the geophysical investigations and site history, membrane interphase probing (MIP) and soil gas surveys were used for delineation of the most contaminated area. In the DNAPL source area, intact coring with subsampling for quantitative soil analysis, photo-ionization detector (PID) and hydrophobic dye tests (Indigo Blue and SudanIV) was carried out and followed by installation of NAPL FACT FLUTe liners. Though no single technique was sufficient for characterization of the DNAPL source zone architecture, the combined use of MIP; coring with quantitative subsample analysis, SudanIV test and PID; and NAPL FACT FLUTe gave good insight into the source zone architecture in the clayey till. Surface geophysics with ground penetrating radar and seismic reflection and refraction combined with geologic information supplemented the conceptual understanding of transport and distribution of DNAPL in the fill, clayey till, and the interface to the limestone. The DNAPL source zone architecture in the clay till was consistent with conceptual expectations.

DNAPL ACCUMULATION IN WELLS AND DNAPL RECOVERY FROM WELLS: MODEL DEVELOPMENT AND APPLICATION TO A PILOT SCALE STUDY

Sleep, B.E., S. Beranger, S. Reinecke, and Y. Filion.
Advances in Water Resources, Vol 85, 109-119, 2015

DNAPL accumulation and recovery from wells cannot be accurately modeled through typical pressure or flux boundary conditions due to gravity segregation of water and DNAPL in the wellbore, the effects of wellbore storage, and variations of wellbore inflow and outflow rates with depth, particularly in heterogeneous formations. This paper

presents a discrete wellbore formulation for numerical modeling of DNAPL accumulation in observation wells and DNAPL removal from recovery wells. The formulation includes fluid segregation, changing water and DNAPL levels in the well, and the corresponding changes in fluid storage in the wellbore. The method was added to a 3-D finite difference model (CompSim) for three-phase (water, gas, DNAPL) flow. In comparisons of model predictions to 3-D pilot-scale experiments of DNAPL (benzyl alcohol) infiltration, redistribution, recovery, and water flushing, the model predictions agree well with experimental results. Characterization of mixing in the extraction well is important for predicting removal of highly soluble organic compounds, such as benzyl alcohol. A sensitivity analysis shows that the incorporation of hysteresis is critical for accurate prediction. Among the multiphase flow and transport parameters required for modeling, results are most sensitive to soil intrinsic permeability.

IRON-BASED METALLIC SYSTEMS: AN EXCELLENT CHOICE FOR SUSTAINABLE WATER TREATMENT

Ghauch, A.
Freiberg Online Geology, Vol 38, 1-80, 2015

This paper presents the scientific basis of iron corrosion and filtration for iron filters and also addresses questions regarding the removal mechanism of organic contaminants in zero-valent iron/water (ZVI/H_2O) systems. Topics covered include (1) the removal mechanism of organic contaminants in ZVI systems (micrometric and nanometric scale) with application to antibiotics and emphasis on permeability loss; (2) using ZVI-amended systems (e.g., bimetallics and trimetallics) in addition to technical issues relative to experimental design with application to emerging contaminants (pharmaceuticals and personal care products, or PPCPs); (3) the role that nanometric and micrometric ZVI can play in improving the Fenton process in terms of sustainability in sonicated and silent systems; (4) the potential of ZVI and ZVI-based systems (bimetallics and trimetallics) as reliable catalysts for persulfate activation that yields complete degradation of PPCPs; (5) thermal activation of persulfate for application to hot-spot effluents; (6) the use of natural Fe-based minerals (lemonite, ferrihydrite) as durable catalysts or recycled Fe-based material (e.g., brake rotors) and sunlight energy as a sustainable water treatment process; and (7) a common basis for future scientific research on ZVI remediation as a whole. Sixteen peer-reviewed original papers have been published based upon this research.http://tu-freiberg.de/sites/default/files/media/institut-fuer-geologie-718/pdf/fog_volume_38.pdf

REMEDIATION OF PAH-CONTAMINATED SOIL BY THE COMBINATION OF TALL FESCUE, ARBUSCULAR MYCORRHIZAL FUNGUS AND EPIGEIC EARTHWORMS

Lu, Y.F. and M. Lu.
Journal of Hazardous Materials, Vol 285, 535-541, 2015

A 120-day experiment was performed to investigate the effect of a multi-component bioremediation system consisting of tall fescue, arbuscular mycorrhizal fungus (AMF), and epigeic earthworms for cleaning up PAHs-contaminated soil. Inoculation with AMF and/or earthworms increased plant yield and PAH accumulation in plants; however, PAH uptake by tall fescue accounted for a negligible portion of soil PAH removal. Mycorrhizal tall fescue significantly enhanced PAH dissipation, PAH degrader density, and polyphenol oxidase activity in soil. The combination of AMF+earthworms+tall fescue achieved the highest PAH dissipation (93.4%), wherein the soil PAH concentration declined from an initial value of 620 to 41 mg/kg in 120 days. This concentration is below the threshold level required for Chinese soil PAH quality (45 mg/kg dry weight) for residential use.

THE COMPARATIVE PHOTODEGRADATION ACTIVITIES OF PENTACHLOROPHENOL (PCP) AND POLYCHLORINATED BIPHENYLS (PCBS) USING UV ALONE AND TiO_2-DERIVED PHOTOCATALYSTS IN METHANOL SOIL WASHING SOLUTION

Zhou, Z., Y. Zhang, H. Wang, T. Chen, and W. Lu.
PLoS ONE, Vol 9 No 9, 2014

The efficiency of the use of UV irradiation without catalyst or with TiO_2/graphene-TiO_2 photodegradation methods was determined in a comparison of the photodegradation of two types of hydrophobic chlorinated aromatic compound: PCP and PCBs. Results show that photodegradation in methanol solution under pure UV irradiation was more efficient than degradation with either of the catalysts tested, contrary to previous results in which photodegradation rates were enhanced using TiO_2-derived catalysts. Researchers examined the effects of factors such as UV light illumination, addition of methanol to the solution, catalyst dosage, and pH of the reaction mixture, and then deduced the degradation pathway. Photochemical treatment in methanol soil washing solution did not benefit from use of the catalysts. Pure UV irradiation was sufficient for the dechlorination and degradation of the PCP and PCBs.
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0108765

MEASUREMENT OF NATURAL LOSSES OF LNAPL USING CO_2 TRAPS

McCoy, K., J. Zimbron, T. Sale, and M. Lyverse.
Groundwater, Vol 53 No 4, 658-667, 2015

Efflux of CO_2 above releases of petroleum LNAPLs has emerged as a critical parameter for resolving natural losses of LNAPLs and managing LNAPL sites. This paper introduces a new method for measuring CO_2 efflux above LNAPL bodies: CO_2 traps. The traps involve upper and lower solid-phase sorbent elements that convert CO_2 gas into solid-phase carbonates. The sorbent is placed in an open vertical section of 10-cm PVC pipe located at grade. The lower sorbent element captures CO_2 released from the subsurface via diffusion and advection. The upper sorbent element prevents atmospheric CO_2 from reaching the lower sorbent element. The traps provide integral measurement of CO_2 efflux based over the period of deployment, typically 2 to 4 weeks. Favorable attributes of the devices include simplicity, generation of integral (time-averaged) measurement, and a simple means of capturing CO_2 for carbon isotope analysis. Results from the deployment of 23 CO_2 traps at a former refinery indicate natural loss rates of LNAPL (measured in the fall, likely concurrent with high soil temperatures and consequently high degradation rates) ranging from 13,400 to 130,000 L/Ha/yr. *For more information, see a slide presentation at* http://www.coems.org/files/CEMS%20January%202015%20luncheon%20presentation.pdf *and K.M. McCoy's thesis at* http://dspace.library.colostate.edu/webclient/DeliveryManager/?pid=206723.

General News

ASSESSING THE POTENTIAL FOR METALS MOBILIZATION DURING THE APPLICATION OF IN SITU CHEMICAL OXIDATION

TECHNOLOGIES
Gardner, K.H., E. Hadnagy, B.A. Smith, K. O'Shaughnessy, R. Fimmen, D.K. Nair, and H.V. Rectanus.
SERDP Project ER-2132, 83 pp, 2015

This guide provides for an assessment of the potential for metals mobilization during the application of in situ chemical oxidation (ISCO) technologies. It begins with a review of historical evidence of metals mobilization resulting from ISCO in both lab and field, the environmental issues associated with metals release, and the U.S. regulatory framework governing metals contamination, followed by a review of the fundamental science for subsurficial fate and transport of metals (As, Cr, Cu, Ni, Pb, Zn) in groundwater and the major ISCO technologies (persulfate, permanganate, and H_2O_2 oxidation). This document is designed to help the reader evaluate site-specific metal mobilization potential, with design suggestions for minimizing and monitoring metals mobilization in an ISCO field event.
https://www.estcp.com/content/download/38034/361084/file/ER-2132%20Guidance%20Document.pdf
See also the final project report upon which the guide is based:
https://www.estcp.com/content/download/38033/361074/file/ER-2132%20Final%20Report.pdf

NANO-ENABLED ENVIRONMENTAL PRODUCTS AND TECHNOLOGIES: OPPORTUNITIES AND DRAWBACKS
Christensen, F.M., A. Brinch, J. Kjolholt, P.D. Mines, N. Schumacher, T.H. Jorgensen, and R.M. Hummelshoj.
The Danish Environmental Protection Agency, Copenhagen. Miljoprojekt 1803, 90 pp, 2015

The authors investigated the benefits for health and environment presented by the use of nanomaterials in environmental products and technologies used more or less directly in addressing health and environmental problems—solutions often referred to as nano-enabled environmental technologies and products applied in (1) water and wastewater purification, (2) soil and groundwater remediation, (3) air purification, (4) energy consumption reduction, and (5) antibacterial uses. The report is not comprehensive but rather gives an overview of the most well-known and widely applied technologies based on literature review and dialogue with stakeholders.
http://www2.mst.dk/Udgiv/publications/2015/12/978-87-93352-96-4.pdf

THE NIEHS SUPERFUND RESEARCH PROGRAM: 25 YEARS OF TRANSLATIONAL RESEARCH FOR PUBLIC HEALTH
Landrigan, P.J., R.O. Wright, J.F. Cordero, D.L. Eaton, B.D. Goldstein, B. Hennig, R.M. Maier, et al.
Environmental Health Perspectives, Vol 123 No 10, 2015

The Superfund Research Program (SRP) is an academically based, multidisciplinary, translational research program that for over 25 years has pursued scientific solutions to health and environmental problems associated with hazardous waste sites. Coordinated by the National Institute of Environmental Health Sciences, SRP supports multi-project grants, undergraduate and postdoctoral training programs, individual research grants, and SBIR and STTR grants. This paper provides an overview of the program's many successes.http://ehp.niehs.nih.gov/1409247/

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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