Technology Innovation News Survey

Entries for March 16-31, 2021

Market/Commercialization Information

MEASUREMENT AND MONITORING METHODS FOR AIR TOXICS AND CONTAMINANTS OF EMERGING CONCERN IN THE ATMOSPHERE

Environmental Protection Agency, Funding Opportunity EPA-G2021-STAR-C1, 2021

As part of its Science to Achieve Results (STAR) program, U.S. EPA is seeking applications proposing research to advance air measurement and monitoring methods for air toxics and contaminants of emerging concern in the atmosphere. Specifically, this RFA seeks research that will provide advancements in (1) techniques for real-time, continuous measurements of concentrations with minimum detection limits below background concentrations or health risk-based thresholds and (2) stationary or mobile near-source measurement methods for quantifying emission rates of fugitive emissions. Two awards are anticipated out of an estimated $2.4M in total program funding. The closing date for applications is June 2, 2021. https://www.grants.gov/web/grants/view-opportunity.html?oppId=332405 Sister solicitation EPA-G2021-STAR-C2 presents the opportunity for early career awards. For details on early career eligibility criteria, see the notice at https://www.grants.gov/web/grants/view-opportunity.html?oppId=332406.

USACE TULSA DISTRICT RFP FOR $50M SERVICE-DISABLED VETERAN-OWNED SMALL BUSINESS SET-ASIDE IDC MATOC FOR ERS PROJECTS

U.S. Army Corps of Engineers (USACE), Tulsa District, Tulsa, OK.
Contract Opportunities at Beta.SAM, Solicitation W912BV21R0025, 2021

This acquisition is a service-disabled veteran-owned small business (SDVOSB) set-aside under NAICS code 562910. The USACE Tulsa District anticipates awarding up to 10 indefinite-delivery contracts (IDCs) with a maximum shared capacity of $50M under a firm-fixed-price MATOC (multiple-award task-order contract) for environmental remediation services projects assigned to the Regional Planning and Environmental Center, the Southwestern Division, and South Pacific Division. The IDCs awarded will be firm fixed price for control and remediation of environmental contamination from pollutants, toxic substances, radioactive materials, hazardous materials, munitions and explosives of concern, and munitions constituents. Proposals are due no later than 3:00 PM CT on May 26, 2021. https://beta.sam.gov/opp/08c0ad76bb2d4d68aa32d7fc71b3ef89/view

IDIQ MATOC FOR ENVIRONMENTAL REMEDIATION SERVICES IN SUPPORT OF THE FORMERLY USED DEFENSE SITE PROGRAM FOR THE ALBUQUERQUE DISTRICT

U.S. Army Corps of Engineers (USACE), Albuquerque District, Albuquerque, NM.
Contract Opportunities at Beta.SAM, Solicitation W912PP21R0008, 2021

From this solicitation the Government intends to award a MATOC (multiple-award task-order contract) with a target of up to five contracts to a possible combination of small business, 8(a) small business, and offerors on an unrestricted basis under NAICS code 562910. At least three IDIQs will be set aside for small business. The IDIQ MATOC shall have a shared capacity of $50M for environmental remediation services (ERS) in support of the FUDS Program for the Albuquerque District for ERS projects within the geographic boundaries of the USACE South Pacific Division (SPD), projects assigned to SPD, and their partners/customers. To be eligible to propose on the MATOC procurement or one of the seeding task orders under the planned IDIQs, Contractor must be accredited in accordance with the Digital Advanced Geophysical Classification Accreditation Program (DAGCAP). Offers are due by 2:00 PM MT on May 27, 2021.
https://beta.sam.gov/opp/e42c732e9bf14c14bebab593d44d4f65/view

USACE TULSA DISTRICT RFP FOR $150M 8(A) NATIONWIDE IDC MATOC FOR ENVIRONMENTAL REMEDIATION SERVICES PROJECTS ASSIGNED TO THE RPEC

U.S. Army Corps of Engineers (USACE), Tulsa District, Tulsa, OK.
Contract Opportunities at Beta.SAM, Solicitation W912BV21R0022, 2021

This acquisition is an 8(a) small business set-aside under NAICS code 562910. The U.S. Army Corps of Engineers (USACE) intends to award a $150M firm-fixed-price 8(a) nationwide MATOC (multiple-award task-order contract) with a target of five indefinite-delivery contracts (IDCs) to provide a full range of environmental remediation services (ERS) to support projects assigned to the USACE Southwestern Division Regional Planning and Environmental Center, the Southwestern Division, and the South Pacific Division. The ERS IDCs may include control and remediation of environmental contamination from pollutants, toxic substances, radioactive materials, hazardous materials, munitions and explosives of concern, and munitions constituents. Remedial actions may address regulated, non-regulated toxic substances, and emerging contaminants. Proposals are due by 3:00 PM CT on June 29, 2021. All questions must be asked in Bidders Inquiry as described in the solicitation. https://beta.sam.gov/opp/49a4b4a982ef4197a4d7764ce2644dad/view

MULTIPLE ENVIRONMENTAL GOVERNMENT ACQUISITION FORMERLY USED DEFENSE SITES (FUDS), AND MILITARY MUNITIONS RESPONSE PROGRAM (MMRP)

U.S. Army Corps of Engineers (USACE), Los Angeles District, Los Angeles, CA.
Contract Opportunities at Beta.SAM, Solicitation W912PL21R0009, 2021

This solicitation is full and open. The Government intends to award one Regional South Pacific Division (SPD) IDIQ MATOC (multiple-award task-order contract) with a target of up to five indefinite-delivery contracts as a result of this solicitation for a total value of $49.5M. The IDIQ MATOC will be for environmental remediation services at FUDS and MMRP sites under NAICS code 562910, in support of the U.S. Army Corps of Engineers, primarily within the Los Angeles District (California, Nevada, and Arizona), SPD, and existing SPD customers. Task orders will be issued firm fixed price based on the requirements of the performance work statement at known or suspected MMRP or HTRW sites. The MATOC period of performance shall have a 3-year base and a 2-year option. Offers are due by 2:00 PM MT on June 30, 2021. Offerors are advised that funds are not currently available for this acquisition.
https://beta.sam.gov/opp/38bfd1baf76745a2855856e5ca6c90b4/view

Cleanup News

QUANTIFYING HYDRAULIC CONDUCTIVITY SPATIAL VARIABILITY FOR CEMENT-BASED SOLIDIFICATION/STABILIZATION (S/S) REMEDIATION PROJECT: CASE STUDY

Fenton, G.A., C.B. Lake, and R. Liza. | Canadian Geotechnical Journal 58:155-64 (2021)

The goal of this analysis was to characterize the spatial variability of hydraulic conductivity in an existing cement-based solidification/stabilization system. The sampling recommendations for the quality control (QC) program of the system to achieve target decision error probabilities were examined regarding the acceptance or rejection of the system with respect to hydraulic conductivity. More than 2000 QC samples were collected over an area of 300,000 m². Considering the "worst-case" correlation length and the hydraulic conductivity mean and variance, hypothesis test error probabilities are used to provide recommendations for conservative sampling requirements. the analysis of this large construction project represents a unique opportunity to review the current practice of S/S field sampling requirements. https://cdnsciencepub.com/doi/pdf/10.1139/cgj-2020-0067
For more information on the Sydney Tar Ponds project, see presentations from https://www.atlanticclra.ca/wp-content/uploads/2014/12/ARA-PPT.pdf and https://www.atlanticclra.ca/wp-content/uploads/2014/12/2014-10-29-ARC-Wolfville-Tar-ponds-and-climate-change.pdf

CASE STUDY: NEW DELIVERY METHOD TO INJECT REMEDIAL AMENDMENTS INTO A DIFFICULT AQUIFER

Feeney, G. | Smart Remediation, 23 January, Toronto, Ontario, Canada, 45 slides, 2020

A case study of a former fueling station site in Canada where two different in situ remediation techniques to treat PHCs failed is presented. Potential reasons for the failed remedial efforts are proposed, and insights are offered on avoiding failure and maximizing success for in situ remediation. The presentation highlights the collection of additional site data for selection and application of a different in situ remediation approach. Risk management measures were used so remediation of the source area was not required. However, an injected permeable reactive barrier was installed to prevent the continued offsite migration of the PHC plume at a busy downgradient barrier.
https://2ziaphmm3zh1x23mj335vjxt-wpengine.netdna-ssl.com/wp-content/uploads/2019/10/SMART-Remediation-Toronto-2020-Gerren-Feeney-Kevin-French.pdf

UTILIZING A LOW-INTENSITY ELECTROCHEMICAL-BASED TECHNOLOGIES FOR TREATING PERSISTENT CHLORINATED VOLATILE ORGANIC COMPOUNDS IN TIGHT SUBSURFACE MATRIX

Jin, S. | DCHWS 2021 Design and Construction at Hazardous Waste Sites Virtual Symposium, 29-30 March and 1 April, Virtual, 21 slides, 2021

This presentation describes low-intensity electrochemical reduction and oxidation technologies and provides a case study of a full-scale application at the Former Adhesives Plant in South Carolina to address chlorinated ethenes contamination in saturated soil and groundwater.
https://clu-in.org/conf/tio/DCHWS16/slides/2Slide_Presentation_for_Song_Jin,_Ph.D.,_CHMM;_AETECS.pdf

APPLICATION OF MULTIPLE REMEDIAL TECHNIQUES AND APPROACHES AT A FORMER PHARMACEUTICAL MANUFACTURING FACILITY

Russell, D.J. | DCHWS 2021 Design and Construction at Hazardous Waste Sites Virtual Symposium, 29-30 March and 1 April, Virtual, 22 slides, 2021

Multiple technologies were used to address environmental risk receptors at a former pharmaceutical manufacturing facility in New Jersey, resulting in redevelopment of the property for mixed-use as a Brownfields site. The sitewide strategy included evaluating the existing groundwater extraction and treatment system that was preventing migration of impacts to the adjacent river, recommending additional source remediation at residual contamination areas (RCAs), and conducting a cost-benefit analysis of potential remedial alternatives applied to the RCAs.
https://clu-in.org/conf/tio/DCHWS16/slides/13Slide_Presentation_for_David_Russell,_P.E.,_BCEE,_LSRP;_AECOM.pdf

REMEDIATION OF THE MARWELL TAR PIT, WHITEHORSE, YUKON

Horobin, R. and P. Inglis. | Smart Remediation, 4 February, virtual, 16 slides, 2021

A risk-based restoration strategy was designed for the Marwell Tar Pit site, which contained approximately 30,000 m3 of hydrocarbon-contaminated soil, largely consisting of tar that remained from an old oil refinery. Several soil remediation methods were assessed, but onsite thermal desorption was selected based on several factors, including technical feasibility, reliability, public and regulator acceptance, ongoing liability, and cost. The presentation summarizes the technical challenges that had to be overcome through the application of the technology and its use in northern Canada, including significant concerns from the local population about the impact on air quality both before and during the restoration works. Air quality monitoring during the project and how the findings were used to address the concerns of the local population are covered.
https://2ziaphmm3zh1x23mj335vjxt-wpengine.netdna-ssl.com/wp-content/uploads/2021/01/SMART-Remediation-Virtual-Session-4-Feb-25-2021-Ric-Horobin-and-Paul-Inglis.pdf

Demonstrations / Feasibility Studies

ADVANCES IN ANAEROBIC BENZENE BIOREMEDIATION: MICROBES, MECHANISMS, AND BIOTECHNOLOGIES

Dworatzek, S., J. Webb, E. Edwards, N. Bawa, S. Guo C. Toth, K. Bradshaw R. Peters, et al.
REMTECH 2020: The Remediation Technologies Symposium, 14-15 October, Virtual Meeting, abstract, 2020

A field pilot test examining benzene biodegradation using DGG-B® bioaugmentation was conducted in November 2019 at a site in Saskatchewan contaminated with BTEX. The pilot test included three injection points, two of which received up to 10 L of the DGG-B culture. A third injection point received killed culture, which served as a control to rule out if dead cells or media components could promote benzene degradation. These first-to-field projects will establish clear guidelines and approaches for using bioaugmentation cultures, including a better understanding of dosing requirements, timeframes for obtaining results, and ranges of conditions over which the cultures are effective.

CHANGE IN THE BINDING FORM OF COPPER AND ZINC IN SEWAGE FIELD SOIL BY ADDITION OF BIOCHAR AFTER EIGHT YEARS OF FIELD EXPOSURE

Wagner, A., A. Muller, and M. Kaupenjohann.

European Geosciences Union General Assembly, 4-8 May, Virtual, poster, 2020

Changes in the binding form of copper and zinc after eight years of field exposure to 0 and 5% biochar were examined in a field trial. Plots with 5% biochar tended to have lower concentrations of copper as a percentage of the total contents in fractions I-III (I mobile, II easy to supply, III bound to Mn oxides) compared to the plots without biochar addition. In fractions IV and V (IV organically bound, V bound to poorly crystalline Fe oxides), no clear differences could be found. In fractions VI and VII (VI bound to crystalline Fe oxides and VII residual), the plots with 5% biochar showed significantly higher percentages of copper. Changes in the copper-binding form were not clearly ascertainable in plots with recent biochar addition. For zinc, only fractions I and II decreased significantly after eight years of field exposure to biochar. No clear changes could be seen in all other fractions. These effects were also present directly after biochar addition. Therefore, biochar appears to be a suitable additive to immobilize zinc and especially copper. https://presentations.copernicus.org/EGU2020/EGU2020-21764_presentation.pdf

IN SITU BIOREMEDIATION OF THE SOURCE ZONE FOR CHLORINATED SOLVENTS IN GROUNDWATER - SUCCESSES AND CHALLENGES

LaPat-Polasko, L. and M. Hayes. | 16th Annual Gatekeeper Regulatory Roundup 4-5 March, virtual, 37 slides, 2020

In situ bioremediation was conducted to remediate two plumes containing cVOCs and 1,4-dioxane in the groundwater at an aluminum pipe manufacturing company. A treatment zone was established using a temporary recirculation system upgradient of source area. Quick-release carbon substrate was injected to biostimulate microbes, followed by injection of a slow-release carbon substrate to support extended bioremediation of cVOCs. https://www.epaz.org/assets/docs/Conference/2020/2020Proceedings/2020EPAZ_D1_BO3.2_LaPat-Polasko.pdf

TIME-LAPSE ELECTRICAL RESISTIVITY TOMOGRAPHY MAPPING OF DNAPL REMEDIATION AT A STAR FIELD SITE

Trento, L.M., P. Tsourlos, and J.I. Gerhard. | Journal of Applied Geophysics 184:104244(2021)

Time-lapse electrical resistivity tomography (ERT) was used to map remediation of coal tar at a site undergoing full-scale application of self-sustaining treatment for active remediation (STAR) — an in situ thermal treatment based on smoldering combustion. Spatially and temporally resolved data from ERT complemented the conventional discrete and overview data normally collected during STAR operations. A STAR treatment cell targeting coal tar at 2.4 m bgs and below the water table was monitored with 2D surface resistivity surveys conducted before, during, and after treatment. ERT was demonstrated to map likely treated coal-tar zones by identifying a characteristic, local, temporal resistivity signal pattern corresponding to STAR-induced subsurface temperature and liquid saturation changes. In addition, ERT identified the subsurface areas (i) effectively captured by the vapor extraction system, (ii) possibly missed by the vapor capture system, and (iii) where and when re-infiltration of groundwater occurred post-treatment. In addition, the overall average subsurface resistivity provided a useful metric to correlate with traditional site measures of treatment, such as the cumulative amount of DNAPL mass treated. Overall, the resistivity surveys provided valuable continuous mapping of the subsurface, including the locations of DNAPL mass destruction, and showed that ERT is promising for supporting evaluations of in situ remediation programs

NON-INVASIVE SURVEY TECHNOLOGY FOR ESTIMATING THE DISTRIBUTION OF OXIDANT SOLUTION: A PILOT INJECTION STUDY

Tsai, Y.-J., T.-N. Wu, C.-H. Lee, S.-L. Lin, and W.-H. Tsai.
Journal of Contaminant Hydrology 239:103779(2021)

Magnetometric resistivity was applied to survey the distribution of an injected oxidant during an in situ chemical oxidation (ISCO) application. Sodium persulfate was applied via four pulse injections from one injection well at a 10 m x 10 m test site. A magnetic field survey coupled with conventional monitoring was performed before the initial injection and after each pulse injection. While groundwater samples from six observation wells and seven direct-push electrical conductivity, loggings did not provide sufficient data to quantify the distribution and flow behavior of the injected oxidant, the magnetic field survey visually showed the dynamic distribution of the injected oxidant. Flow pathways and flow behavior were assessed accordingly. Overall, the magnetic field survey combined with the monitoring of the well samples helped explain abnormal changes in the electrical conductivity of the observation wells and supported the use of the magnetic field survey technology to monitor ISCO injections.

Research

PORTABLE MERCURY DETECTOR TESTING AND EVALUATION REPORT

Office of Research and Development, EPA 600/R-20/019, 39 pp, 2020

This project provided credible information to select and implement technologies to protect human health and the environment during a response and remediation effort following a spill or other release to the environment. The performance of five commercially available portable Hg detectors (Ametek Arizona Instrument's Jerome® J405 and Jerome® J505 and Lumex's RA-915+, RA915M, and Light 915) was evaluated to determine whether the instruments could accurately detect Hg concentrations in the air below ATSDR's recommended action level of 1 µg/m³ for normal residential occupancy. The Jerome J505 and both the Lumex-RA 915 M and Lumex-RA 915+ instruments were compliant with EPA Performance Specification (PS) 12A and met the detection and sensitivity requirements for a clearance determination based on a 1 µg/m³ residential action level. The Jerome J405 was less sensitive, with no detector responses observed for target Hg concentrations below 1.10 µg/m3 and therefore was not in compliance with EPA PS 12A. Additionally, the Lumex detectors had response times of 2 to 7 seconds, whereas the Jerome J505 had a response time of 2 to 6 minutes. However, for Hg clearance purposes, the response time is likely not a concern.
https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=539902&Lab=CESER

HYDROTHERMAL ALKALINE TREATMENT FOR DESTRUCTION OF PER- AND POLYFLUOROALKYL SUBSTANCES IN AQUEOUS FILM-FORMING FOAM

Hao, S., Y.-J. Choi, B. Wu, C.P. Higgins, R. Deeb, and T.J. Strathmann.
Environmental Science & Technology 55(5):3283-3295(2021)

This study evaluated the hydrothermal alkaline treatment of diverse PFASs present in aqueous film-forming foam (AFFF). Quantitative and semiquantitative high-resolution mass spectrometry analyses of PFASs demonstrated a rapid degradation of all 109 PFASs identified in two AFFFs (sulfonate- and fluorotelomer-based formulations) in water amended with an alkali at near-critical temperature and pressure. This included per- and polyfluoroalkyl acids and a range of acid precursors. Most PFASs were degraded to nondetectable levels within 15 min, while the most recalcitrant perfluoroalkyl sulfonates were degraded within 30 min when treated with 5 M NaOH. ^{19}F NMR spectroscopic analysis and fluoride ion analysis confirmed the near-complete defluorination of PFASs in both dilute and concentrated AFFF mixtures. No stable volatile organofluorine species were detected in reactor headspace gases by the gas chromatography-mass spectrometry analysis. These findings indicated a significant potential for application of hydrothermal treatment technologies to manage PFAS waste streams.

BENEFICIAL TRAITS OF ROOT ENDOPHYTES AND RHIZOBACTERIA ASSOCIATED WITH PLANTS GROWING IN PHYTOMANAGED SOILS WITH MIXED TRACE METAL-POLYCYCLIC AROMATIC HYDROCARBON CONTAMINATION

Kidd, P.S., A. Alvarez, V. Alvarez-Lopez, A. Cerdeira-Perez, B. Rodriguez-Garrido, A. Prieto-Fernandez, and M. Chalot. | Chemosphere 277:130272(2021)

The objective of the study was to obtain bacterial inoculants from phytomanaged soils at a site in France contaminated with trace metals (TMs) and PAHs. After determining root endophytic and rhizosphere soil bacterial counts, isolates were pooled by amplified rDNA restriction analysis and identified by 16S rDNA sequencing. Isolates were further characterized for the production of plant growth-promoting (PGP) substances and resistance to TM. The selected strains were evaluated for their ability to degrade PAHs. Proteobacteria and Actinobacteria dominated the collection of isolates; differences in taxonomic diversity between plant species (*Populus or Zea mays*) depended on the remediation treatment. The majority of isolates exhibited at least one of the tested PGP traits, as well as resistance to more than one TM. Several rhizosphere and endophyte and one bulk soil isolate showed high rates of fluoranthene and pyrene reduction.

REGENERATION OF PER- AND POLYFLUOROALKYL SUBSTANCE-LADEN GRANULAR ACTIVATED CARBON USING A SOLVENT BASED TECHNOLOGY

Siriwardena, D.P., R. James, K. Dasu, J. Thorn, R.D. Iery, F. Pala, D. Schumitz, S. Eastwood, ad N. Burkitt. | Journal of Environmental Management 289:112439(2021)

Ethanol and isopropyl alcohol with 0.5% and 1.0% ammonium hydroxide (NH4OH) as a base additive were tested to determine the most effective regenerant solution to remove PFAS from contaminated granular activated carbon (GAC). Based on column tests using laboratory-contaminated GAC with PFOA and PFOS, the solvent-based mix (SBM) of ethanol with 0.5% NH4OH was found to be the optimum performing regenerant solution. The GAC life span assessment indicated that solvent-regenerated GAC performed similarly to virgin GAC without losing its optimal performance of PFAS sorption. Optimal performance was maintained even after four cycles of solvent regenerations tested using the optimum SBM. Average percent removal in laboratory-contaminated GAC using the optimum SBM was 65% and 93% for PFOS and PFOA, respectively. Four field-spent GAC samples were also regenerated using the optimum SBM. Percent removal from these samples was found to be in range of 55%-68%.

DEALING WITH COMPLEX CONTAMINATION: A NOVEL APPROACH WITH A COMBINED BIO-PHYTOREMEDIATION STRATEGY AND EFFECTIVE ANALYTICAL TECHNIQUES

Conte, A., S. Chiaberge, F. Pedron, M. Barbafieri, G. Petruzzelli, M. Vocciante, E. Franchi, and I. Pietrini. | Journal of Environmental Management 288:112381(2021)

A train of technologies using advanced phytoremediation in combination with other biological approaches was evaluated for effectiveness in remediating soil contaminated with N-containing compounds, alkyl aromatic hydrocarbons, copper, and nickel. Pre-treatment (landfarming and bioaugmentation) was found to significantly impact soil fertility, increase germinability up to 85%, and allow the plants to extract the metals adequately. Furthermore, with EDTA as a mobilizing agent, nickel absorption increased up to 36% in *Helianthus annuus* and up to 88% in *Zea mays*. For copper, absorption increase of up to 262% in Helianthus annuus and up to 202% in *Zea mays* was observed. Analysis through Fourier-Transform Ion Cyclotron Resonance Mass Spectrometry highlighted the biodegradation of some of the N-containing compounds by almost 90% after phytoremediation. Metagenomic analysis of the soil showed a typical microbial population of oxidizing hydrocarbon strains with a prevalence of the *Nocardiaceae* family (43%).

COMPATIBILITY OF CHELATORS WITH PERMANGANATE FOR CHELATOR-ENHANCED PERMANGANATE-BASED ISCO REMEDIATION OF CHLORINATED ETHENES DNAPLS

Peng, L., L. Li, Z.-L. Chen, and D. Deng. | Chemical Engineering Journal 394:124893(2020)

Permanganate-based ISCO to remediate chlorinated ethenes DNAPLs is seriously hindered by the formation of MnO_2 rinds. Chelation and stabilization of Mn(III) species formed in situ, the precursors of MnO_2, were examined. To identify suitable chelators, the chemical compatibility of 16 representative commercial chelators with permanganate was first investigated. Organic chelators generally induced rapid consumption of permanganate and concurrent severe MnO_2 precipitation when mixed with permanganate. In contrast, polyphosphate-based inorganic chelators showed high compatibility due to the redox-inert nature of the chelators. Among all chelators tested, only pyrophosphoric acid (PPA) effectively stabilized the Mn(III) species and mitigated the generation and precipitation of MnO_2 when permanganate was exposed to TCE liquid (a representative of chlorinated ethenes). Further studies showed that mitigation of MnO_2 precipitation by PPA significantly improved permanganate oxidation of TCE DNAPL in the water/DNAPL biphasic system and in the sand column.

General News

NONAQUEOUS PHASE LIQUID REMOVAL BY POSTCONVENTIONAL TECHNIQUES

Boufadel, M.C., W. Ji M.P. Jayalakshmamma, C.A. Khalil, S. Abrams, L. Zhao, and A. Wang.
Journal of Environmental Engineering 147(3)(2021)

This review covers conventional NAPL remediation technologies that rely on pumping water, hot water, and air sparging with vapor extraction and addresses polymer and foam delivery to directly add solutions to low-permeability zones where NAPL resides. For lower permeability soils, electrokinetics (EK) appears appropriate and could be used to deliver anionic surfactants through electromigration or nonionic surfactants through electroosmosis. An emerging hydraulic technique is chaotic advection, which maximizes the contact between the delivered solution and the soil region of interest. The main challenge of applying EK in field studies is the familiarity of operators and scalability, as the electrodes cannot be more than 15-20 m apart.

INNOVATIVE APPROACHES TO MONITOR AND SURVEY AT-RISK SPECIES ON DOD LANDS

Wolff, P., J.D. Willson, and B.A. DeGregorio. | SERDP & ESTCP Webinar Series, Webinar #132, April 2021

On April 22, SERDP and ESTCP sponsored webinars focusing on DoD-funded research efforts to improve the management and recovery of threatened, endangered, or at-risk species on DoD installations. Specifically, investigators talked about a subsurface passive acoustic monitoring tool to document the occurrence and abundance of at-risk underwater-calling frogs and a simulation-based method for estimating the density and abundance of secretive snakes. https://www.serdp-estcp.org/Tools-and-Training/Webinar-Series/04-22-2021

PERFORMANCE ASSESSMENT OF PAST BIOREMEDIATION APPROACHES FOR CHLORINATED SOLVENT SOURCE ZONES

Hatzinger, P., M. Tucker, J. Myers, M. Annable, A. Haluska, and F. Loffleler. ESTCP Project ER-201427, 636 pp, 2020

Two approaches were used to evaluate the success or failure of different bioremediation applications and to evaluate factors that may have contributed to those outcomes. Fifteen sites with chlorinated ethenes as the primary contaminant were selected that were treated using common bioremediation techniques and had data that allowed statistical evaluation of remedial performance over time. Sites with extensive pre-and post-treatment data were prioritized, and overburden aquifers were selected over bedrock aquifers. Statistical analyses of the large database were performed to identify factors that may promote or prevent successful application of bioremediation strategies. Assessment tools were applied, and additional well sampling was conducted at 5 of the 15 sites to quantify contaminant mass flux, the presence of key dehalogenating organisms and genes, and determine whether biodegradation was still occurring. Pre-treatment data and post-treatment data were compared with information on site conditions and treatment methods. The data were used to draw conclusions about the long-term effectiveness of VOC bioremediation. https://www.serdp-estcp.org/content/download/53165/523129/file/ER-201427%20Final%20Report.pdf

ON PER- AND POLYFLUOROALKYL SUBSTANCES: SUGGESTED RESOURCES AND CONSIDERATIONS FOR GROUNDWATER PROFESSIONALS

Frankel, A.J. Groundwater [Published online 3 April 2021 prior to print]

This article summarizes suggested resources and key considerations for groundwater professionals wishing to become familiars with PFAS. It includes background information, current groundwater-related regulations, risk considerations, comparison to other groundwater contaminants, mitigation options, and a broad selection of references.

APPLICATION OF BIOCHAR-BASED MATERIALS IN ENVIRONMENTAL REMEDIATION: FROM MULTI-LEVEL STRUCTURES TO SPECIFIC DEVICES

Lu, L., W. Yu, Y. Wang, K. Zhang, X. Zhu, Y. Zhang, Y. Wu, H. Ullah, X. Xiaom, and B. Chen.
Biochar 2:1-31(2020)

This review summarizes recent progress on the theoretical investigation and engineering applications of biochar materials in environmental remediation. The summary includes structure-application relationships and structural properties of biochar from macroscopic and microscopic aspects. The review also highlights important progress on the functionalization and device of biochar-based materials, including magnetic biochars, 2D and 3D biochar-based macrostructures, immobilized microorganisms on biochar, and biochar-amended biofilters, and evaluates the environmental friendliness and sustainability of biochar-based materials from synthesis to application. *This paper is* ***Open Access*** *at*https://link.springer.com/article/10.1007/s42773-020-00041-7

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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