Technology Innovation News Survey

Entries for April 1-15, 2024

Market/Commercialization Information

F -- JOINT BASE MCGUIRE-DIX-LAKEHURST (JBMDL) OPTIMIZED REMEDIATION CONTRACT (ORC) (SNOTE)

U.S. Army Corps of Engineers, North Atlantic Division, Baltimore District, Baltimore, MD
Contract Opportunities on SAM.gov W912DR24R0008, 2024

This notice is to advise that a site visit will be conducted for this requirement at Joint Base McGuire-Dix-Lakehurst (JBMDL) on Tuesday, May 21, 2024, and Wednesday, May 22, 2024. Dates and the meeting place will be posted in an update to this notice. A draft solicitation was issued on May 5, 2024. Final solicitation issuance is anticipated by May 29, 2024 (https://sam.gov/opp/2a5c67e8c5694511942f70abcecc8b8d/view). Each contractor will be allowed a maximum of two (2) attendees to the site visit. To obtain access to the base, each contractor must fill out the JBMDL Short Term Entry Authority List (EAL) Form (Attachment A) and email it to the contacts in this notice by 11:00 AM EDT on Wednesday, May 15, 2024. This is a hard deadline. Each contractor may list both of their attendees on one (1) form. Please fill out each attendee's information on the chart. Please do not alter any other information on the form. The slide deck for the site visit presentation is Attachment B. This information will be presented while on the bus and at the sites. Contractors are responsible for printing their own copies of the slides. Hard copies of the slides will NOT be provided at the site visit. https://sam.gov/opp/f1245ced020f4694bdd6b70b0e87f06b/view

F -- THE PURPOSE OF THE SUPERFUND TECHNICAL ASSESSMENT (SOL)

U.S. Environmental Protection Agency, Region 3 Contracting Office, Philadelphia, PA
Contract Opportunities on SAM.gov 68HE0324R0001, 2024

This is a full and open competition under NAICS code 541620. EPA Region 3 requires a contractor to support the Superfund Technical Assessment and Response Team (START) contract, which provides nationally consistent advisory and assistance services to EPA On-Scene Coordinators (OSCs) and other federal officials implementing EPA's responsibilities under the national response system. The technical requirements include response, preparedness and prevention, assessment and inspection, technical support, data management, and training. The contractor shall fulfill these responsibilities within EPA Region 3, as well as outside the region on a backup regional response, cross-regional response, national response, and international response. The contractor shall be prepared to provide scientific/technical support for EPA activities in furtherance of the agency's primary mission: the protection of human health and the environment. Additionally, the contractor shall provide advisory and assistance services to other programs, such as the Superfund Pre-Remedial Program, Brownfields Program, and remedial support activities. The period of performance of this contract shall be from June 1, 2025, through November 30, 2029, exclusive of all required reports. Offers are due by 2:30 PM EDT on June 24, 2024.
https://sam.gov/opp/d129b7f37a6a44a6be0f2df7425a8dc4/view

F -- FUSRAP MAYWOOD SUPERFUND SITE - SATOC (SOL)

U.S. Army Corps of Engineers, Northwestern Division, Kansas City, MO
Contract Opportunities on SAM.gov W912DQ23R3040, 2024

This is a total small business set-aside under NAICS code 562910. The U.S. Army Corps of Engineers requires a contractor to perform soils and groundwater remedial action activities, provide operation and maintenance of onsite laboratory and database systems, perform waste management loadout and provide waste handling services, transport and dispose of waste, and perform environmental monitoring activities at the Formerly Utilized Sites Remedial Action Program (FUSRAP) Maywood Superfund Site (FMSS) in Maywood, New Jersey. The overall objective of this project is to complete all actions in accordance with the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and as amended by the Superfund Amendments and Reauthorization Act (SARA) and the National Oil and Hazardous Substances Contingency Plan (NCP). Work for both the soils and groundwater remedies shall be worked concurrently. Radioactive contamination at the FMSS resulted from rare earth and thorium processing operations conducted by MCW and associated material storage and waste disposal practices. Historical records indicate that processing of thorium from monazite sands may have begun as early as 1895. Processing operations created wastes containing thorium and lesser amounts of radium and uranium as well as rare earths. Offers are due by 12:00 PM EDT on June 24, 2024. https://sam.gov/opp/da83b6ede0d2403d890dfa0c58b26e0c/view

F -- JOINT BASE MCGUIRE-DIX-LAKEHURST (JBMDL) OPTIMIZED REMEDIATION CONTRACT (ORC) (PRESOL)

U.S. Army Corps of Engineers, North Atlantic Division, Baltimore District, Baltimore, MD
Contract Opportunities on SAM.gov W912DQ23R3040, W912DR24R0008, 2024

When this solicitation is released on or about May 29, 2024, it will be competed as a total small business set-aside under NAICS code 562910. The U.S. Army Corps of Engineers intends to issue a solicitation for a standalone "C" type contract to provide support to the Air Force at Joint Base McGuire-Dix-Lakehurst (JBMDL) in executing its Environmental Restoration Program (ERP) via a performance-based Optimized Remediation Contract (ORC). The work will consist of performing environmental remediation activities necessary for investigation, design, remedial action, remedial construction, and Long-Term Management (LTM) to achieve minimum Performance Objectives (POs) and stretch goals and support progress to Site Closeout (SC) at 67 Installation Restoration Program (IRP) and eight (8) Military Munitions Response Program (MMRP) sites in various phases of remediation. There is no solicitation at this time.
https://sam.gov/opp/1e3cdff211134ba9ab8d82020ff54ff9/view

Cleanup News

A TALE OF TWO PHASES LESSONS LEARNED FROM ISTR AT AN MGP SITE IN ALTON, IL

Hauber, E. I DCHWS West 2023 Fall Symposium, 25-27 October, Denver, CO, 22 slides, 2023

Free-phase NAPL was treated and removed, and persistent MGP-related compounds were reduced to levels below industrial/commercial standards by using thermal remediation at a former MGP site in Alton, Illinois. TCH was implemented to achieve a temperature of 100°C within the target treatment zone (TTZ) extending from ground surface to 30 to 45 ft bgs. The site was divided into two phases: Phase I was a pilot study at the former Gas Holder Area (10,800 cy), and Phase II represented the remaining source area (24,700 cy). https://mediacdn.guidebook.com/upload/205632/STKwYbmVzIwsUEsfKMs4xmpgBoIZRrW0wzoE.pdf

USING ELECTRICAL HYDROGEOLOGY FOR REMEDIAL DESIGN CHARACTERIZATION & MONITORING

Frandsen, S. I DCHWS West 2023 Fall Symposium, 25-27 October, Denver, CO, 28 slides, 2023

This talk explores two case studies where specialty electrical resistivity imaging (ERI) was used to build robust conceptual site models (CSM) to support better remedial design characterization and temporal electrical resistivity imaging (TERI) was used and to provide high-resolution monitoring and verification of remediation treatments. The first is an LNAPL release in a karst aquifer impacting a municipal supply well in Oklahoma. Specialty ERI identified zones of concern and structural features that could be swiftly remediated, resulting in site closure and water well restart in less than two years. TERI monitoring was used to assess the efficacy of the remedial techniques. The second case study is a Brownfields site contaminated with PCE and PAHs in Washington State, where the scan-first-then-drill approach located additional areas of concern and helped identify bioremediation as a potential remedial technology to complement electrical resistance heating. Stakeholders in both case studies incorporated this approach into their remedial design plans, providing discrete target zones for more cost-effective remediation and reducing the risk of trailing liabilities. https://mediacdn.guidebook.com/upload/205632/ZoBNdU3GBXwhei13cmP9XeqrFBN8cFsheRVf.pdf
Watch YouTube video of presentation on Scan First Approach: https://www.youtube.com/watch?v=41w1PFmG5jo

REMEDIAL ACTION IMPLEMENTATION APPROACHES AND LESSONS LEARNED FROM 15 YEARS OF CLEANUP AT A CHLORINATED SOLVENTS GROUNDWATER SITE

Smith, N. I DCHWS West 2023 Fall Symposium, 25-27 October, Denver, CO, 28 slides, 2023

Remedial action began in 2008 at the Bountiful/Woods Cross Operable Unit 1 Superfund Site to clean up a residual DNAPL source area and dilute plume that stretches over a mile downgradient. Since then, groundwater concentrations have improved significantly after installing hundreds of wells, multiple rounds of amendment injections, considerable conceptual site model refinement based on ongoing site characterization, and multiple remedial approaches. The presentation overviews the remedial action implementation, shares different approaches used throughout the process, and provides lessons learned that can be applied to similar sites.
https://mediacdn.guidebook.com/upload/205632/IT1uskeOCoWpmuD0XKC3Pi6QQlORQEfUz5w7.pdf
See 5-year review for more information: https://documents.deq.utah.gov/environmental-response-and-remediation/cercla/superfund/DERR-2023-016995.pdf

THERMAL REMEDIATION REQUIRES THERMAL MONITORING

Nienstedt, S. I DCHWS West 2023 Fall Symposium, 25-27 October, Denver, CO, 15 slides, 2023

Lessons learned from over 20 years of collecting and analyzing subsurface temperature profiles are presented, including examples of how temperature monitoring prompted operational changes by identifying zones of high groundwater flux, zones of low thermal conductivity (i.e., hot spots along the heater), smoldering of hydrocarbons, and instances where supplemental hydraulic or pneumatic was needed. It also presents examples of how temperature monitoring points installed near active utilities were used to initiate corrective actions and discusses the rationale for choosing between the two primary wellfield temperature monitoring systems, a thermocouple (i.e., Type K) or fiber optic system. Selection factors include target temperature, type of heating technology, potential for electromagnetic interference, resolution of data required, and cost.
https://mediacdn.guidebook.com/upload/205632/eUb4v4LWE7DbmGLfkXeuvLPVfmXzR7E45bro.pdf

CAN'T PUMP FOREVER– A PIVOT IN REMEDY

Reeve, J. I DCHWS West 2023 Fall Symposium, 25-27 October, Denver, CO, 14 slides, 2023

Efforts were ongoing for decades at a Superfund site in Washington State to remediate a large comingled TCE and chromium plume using a groundwater pump and treat system. The pump and treat strategy successfully removed most of the comingled contaminant mass. However, the extraction well network was poorly configured to remove TCE contamination to concentrations below the MCL from all locations within a reasonable timeframe. With an indeterminate remediation timeframe and the prospect of chasing diminishing returns at this mature site, activities were pivoted from pump and treat to in situ injections. That transition has successfully occurred, resulting in substantial residual TCE concentration reductions, a shortened timeframe to site closure, and cost savings for the client.
https://mediacdn.guidebook.com/upload/205632/RQKM4xOw5DsliHWcVRsIjrCBGfnE1kWnj6yR.pdf

Demonstrations / Feasibility Studies

STANDARDIZING SEDIMENT POREWATER PASSIVE SAMPLERS FOR INORGANIC CONSTITUENTS OF CONCERN

Conder, J., F. Risacher, M. Lawrence, J. Roberts, B. Pautler, A. Sweett, A. Jackson, and G. Rosen. ESTCP Project ER20-5261, 161 pp, 2023 (Published February 2024)

The overall objective of SERDP Project ER20-5261 is to enhance the standardization of and confidence in using peepers for passive sampling of inorganic constituents such as metals, metalloids, and anions in sediment porewater. This document details the results of a field demonstration in which peepers were deployed in surface sediment and surface water at Naval Base San Diego, San Diego, California. Over 2 days, commercially available peepers were deployed at 10 stations, left to equilibrate for approximately 10 days, and retrieved over 2 days. They were then processed and shipped to a commercial analytical laboratory. About 90% of peeper samples were successfully analyzed (peepers at 1 station could not be retrieved) for target metal analytes cadmium, chromium, copper, iron, lead, manganese, mercury, and zinc. Lithium and bromide tracers spiked into the peepers, indicating that >70% equilibration was reached for all target metals during the 10-day exposure. Both tracers performed similarly. In the future, using lithium tracer (rather than bromide) is recommended, as they are most efficient in terms of method simplicity and analytical cost savings. Method detection limits for peepers were sufficiently sensitive to detect concentrations lower than EPA's saltwater Criterion Continuous Concentration (CCC) for aquatic life. All metals except mercury (detection limit of approximately 0.1 to 0.4 µg/L) were detected in at least one peeper sample. Differences in sediment porewater and surface water concentrations were noted for some, but not all, metals. Detailed methods are presented, as well as logistical details and recommendations for planning and executing successful peeper investigations.
Final Report: https://serdp-estcp-storage.s3.us-gov-west-1.amazonaws.com/s3fs-public/2024-02/ER20-5261%20Final%20Report.pdf?VersionId=4bpH6T_x3DU3bX3oU5WHCjCU6npAe8WV
How-To on Peeper Deployment: https://vimeo.com/809180171/c276c1873a
How-To on Peeper Retrieval: https://vimeo.com/811073634/303edf2693
Fact Sheet: https://serdp-estcp-storage.s3.us-gov-west-1.amazonaws.com/s3fs-public/2023-05/ER20-5261%20Fact%20Sheet.pdf?VersionId=LQvo1_Zoiy3TJJ67sL_YZdFM7Xa5MWd

CHARACTERIZATION AND STABILIZATION OF INCINERATION FLY ASH FROM A NEW MULTI-SOURCE HAZARDOUS WASTE CO-DISPOSAL SYSTEM: FIELD-SCALE STUDY ON SOLIDIFICATION AND STABILIZATION

Huang, x., L. Wang, G. Fan, X. Bi, D. Yan, J.W.C. Wong, and Y. Zhu.
Environmental Science and Pollution Research 31: 7712-7727(2024)

A field-scale study examined the physicochemical properties, heavy metal content, heavy metal leaching concentration, and dioxin content of the incinerator fly ash (HFA) generated by the multi-source hazardous waste co-disposal system and compared them with those of conventional municipal waste incineration fly ash (FA). The study investigated the solidification and stabilization of HFA disposal using sodium diethyl dithiocarbamate combined with cement. Findings revealed significant differences in the structure, composition, and dioxin content of HFA and FA; HFA contained substantially lower dioxin levels. HFA exhibited an unusually high concentration of zinc, surpassing the permitted emission limits, making zinc content a critical consideration in HFA disposal. After stabilization and disposal, the heavy metal leaching and dioxin content of HFA can meet landfill disposal emission standards when a 1% concentration of 10% sodium diethyldithiocarbamate (DDTC) and 150% silicate cement are employed.

INNOVATIVE ZVI APPLICATION FOR SUSTAINABLE REMEDIATION OF CHLORINATED SOLVENT PLUMES

Rugge, K., M. Dreyer, D. Fan, J. Wang, N. Durant, R. Thalund-Hansen, P.L. Bjerg, A.V. Christiansen, L. Levy, M.T. Hag, and N. Tuxen.
AquaConSoil 2023, Prague, Czech Republic, 12-14 September, 14 slides, 2023

This study field-tested a new method for chlorinated solvents (cVOCs) in groundwater. Microcosm and column test reactors with five different ZVI products were prepared as a pre-design step using groundwater and aquifer materials from a cVOC-contaminated site to identify an optimal ZVI product for remediation. Provect-IR® with KB-1® culture achieved the most complete treatment and was selected for a pilot test at the site. A pilot scale permeable reactive barrier (PRB) was installed at the site. The Provect-IR design dose of 1% by weight of soil and 4 L KB-1 dechlorinating culture was added per injection point. PRB installation was followed by soil core sampling and analyses (magnetic susceptibility, visible iron, and laboratory iron analysis) and comprehensive depth-specific water sampling to measure ZVI distribution. Direct Current Induced Polarization (DCIP) monitored distribution, allowing for detailed spatial information. IP properties were used to infer spatial information on hydraulic conductivity, which assessed contaminant mass discharge before and during remediation. Three transects of monitoring wells were installed to monitor PRB performance. Baseline monitoring confirmed expected iron-reducing conditions with incomplete reductive dechlorination, significant TCE and cDCE concentrations, low VC concentrations, and only trace levels of ethene and ethane. The performance monitoring program included chemical and microbial analysis and CSIA to document and quantify biotic and abiotic degradation. Quarterly groundwater sampling established cVOC degradation trends and calculated cVOC mass/flux removal in the plume. Complete cVOC degradation to ethene/ethane was observed in areas with sufficient Provect-IR and KB-1 culture distribution. Dual isotope plots indicated that degradation pathways changed from solely biotic to a combination of biotic and abiotic degradation after PRB creation. Minor methane production was observed in the groundwater, and the methane inhibitors in the product sufficiently avoided critical methane from spreading in the area. https://aquaconsoil.com/assets/3b10_Kirsten_Rugge-ver2.pdf

Research

TRACKING MERCURY CONVERSION AND DISTRIBUTION IN AQUATIC ENVIRONMENTS.

National Institute of Environmental Health Sciences, Superfund Research Program (SRP), April 2024

SRP-funded researchers provided insight into how and at what timescale mercury changes within a wetland ecosystem. They found mercury from different sources is converted into other mercury forms that eventually have similar properties. This finding can inform environmental management or pollution control strategies.
https://tools.niehs.nih.gov/srp/researchbriefs/view.cfm?Brief_ID=352

PAH BIOREMEDIATION WITH RHODOCOCCUS RHODOCHROUS ATCC 21198: IMPACT OF CELL IMMOBILIZATION AND SURFACTANT USE ON PAH TREATMENT AND POST-REMEDIATION TOXICITY

Huizenga, J.M., J. Schindler, M.T. Simonich, L. Truong, M. Garcia-Jaramillo, R.L. Tanguay and L. Semprini. l Journal of Hazardous Materials 470:134109(2024)

Research was conducted to demonstrate the cometabolic treatment of a mixture of PAHs by *Rhodococcus rhodochrous* ATCC 21198 and investigate PAH metabolites and toxicity. The Tween ® 80 surfactant and cell immobilization techniques enhanced bioremediation. Total PAH removal ranged from 70-95% for fluorene, 44-89% for phenanthrene, 86-97% for anthracene, and 6.5-78% for pyrene, with maximum removal achieved with immobilized cells in the presence of Tween 80. The evaluation of PAH metabolites produced by 21198 identified a complex mixture of hydroxylated compounds, quinones, and ring-fission products. Toxicity increased after bioremediation, manifesting as mortality and developmental effects in embryonic zebrafish. 21198's ability to rapidly transform PAHs of various molecular structures and sizes suggests that 21198 can be a valuable microorganism to catalyze PAH remediation. Additional research should pursue implementing further treatment processes to address toxic PAH metabolites to help lower post-remediation toxicity in future studies.

PREDICTING PER- AND POLYFLUOROALKYL SUBSTANCES REMOVAL IN PILOT-SCALE GRANULAR ACTIVATED CARBON ADSORBERS FROM RAPID SMALL-SCALE COLUMN TESTS

Hopkins, Z. and D. Knappe
AWWA Water Science 6(2):e1369(2024)

A study was conducted to predict PFAS breakthrough curves obtained at pilot-scale from rapid small-scale column test (RSSCT) data. The scale-up protocol was developed for pilot data obtained with coagulated/settled surface water (TOC = 2.3 mg/L), three granular activated carbons (GACs), and two empty bed contact times (EBCT). Between 7 and 11 PFAS breakthrough curves were available for each pilot column. RSSCT design investigations assumed that intraparticle diffusivity is independent of GAC particle size (constant diffusivity [CD]) or linearly dependent on GAC particle size (proportional diffusivity [PD]). CD-RSSCTs predicted the bed volumes of water that could be treated at pilot-scale to reach 50% breakthrough (BV50%) of individual PFAS. In contrast, PD-RSSCTs overpredicted BV50% by a factor of 2 to 3. PFAS breakthrough curve shapes from CD-RSSCTs deviated from those obtained at pilot-scale, indicating that intraparticle diffusivity depended on GAC particle diameter (d_p). Use of the pore surface diffusion model (PSDM) determined that intraparticle diffusivity was proportional to $(d_p)^{0.25}$ when considering data up to about 70% PFAS breakthrough. The PSDM and this proportionality factor can be used to design RSSCTs or scale up existing CD-RSSCT data. The developed RSSCT scale-up approach was validated for PFAS breakthrough percentages up to 70% using pilot-scale data obtained with groundwater and wastewater-impacted groundwater and with additional GACs. https://awwa.onlinelibrary.wiley.com/doi/epdf/10.1002/aws2.1369

PREDICTING FUTURE WELL PERFORMANCE FOR ENVIRONMENTAL REMEDIATION DESIGN USING DEEP LEARNING

Song, X., H. Ren, Z. Hou, X. Lin, M. Karanovic, M. Tonkin, V.L. Freedman, I. Demirkanli, and R. Mackley. Journal of Hydrology 617(Part C):129110(2023)

A deep learning (DL) framework with a multi-channel three-dimensional convolutional neural network (MC3D-CNN) was developed to predict well performance and assist future environmental remediation design. The framework was developed with operational and monitoring data routinely collected during pump-and-treat (P&T) remedy operations, including well extraction and injection rates and in situ contaminant concentrations. The framework was used to integrate transient 3-D contaminant plumes and multiple aquifer properties (e.g., hydraulic conductivity and hydrostratigraphic maps) to identify characteristic patterns controlling and representing extraction well mass recovery and to provide future mass recovery estimates for existing wells and candidate wells at any location. The framework was evaluated using a realistic synthetic dataset generated from a well-calibrated flow and transport model used in the 200 West Area of DOE's Hanford Site. The multi-channel feature in the framework integrates various types and temporal densities of training datasets for DL model development. The trained DL model achieved an accuracy of > 90% in ranking extraction well performance in validation datasets and >80% in predicting high-performance-ranking well locations. The approach provides a flexible tool to support adaptive site management, streamline decision-making, and may reduce remediation time and costs. It can be used as a filtering tool to improve the current P&T network optimization design by reducing the number of candidate well locations.

AIR SPARGING REMEDIATION OF VOCS CONTAMINATED LOW-PERMEABILITY SOIL BASED ON PRESSURE GRADIENT CONTROL

Xu, L., H. Zhu, F. Zha, H. Kang, L. Fang, J. Liu, X. Tan, and C. Chu.
Chemosphere 339:139650(2023)

In this study the pressure gradient-enhanced air sparging (PGEAS) approach's efficiency was compared to that of the conventional air sparge approach by evaluating the remedial efficiency, mass transfer characteristics and remedial mechanism of PGEAS. PGEAS uses sparging pressure and flow distance to create and control the pressure gradient in soil to improve airflow and contaminant removal in the air sparging process. A critical value must be exceeded to enhance VOC removal and mass transfer characteristics. The study's measured pore pressure and liquid saturation results confirmed a notable pressure gradient and drainage behavior in soil, indicating the massive air subchannel formation during air sparging. At a 2D scale, discrete distributions of contaminant concentrations in exhaust air and soil were observed and the removal extent and area were enhanced using the PGEAS approach with a pressure gradient higher than the critical value. The PGEAS approach accelerated gaseous contaminant exhaust, reduced residual contamination in soil, and promoted total contaminant removal, resulting in an improved remediation efficiency compared to the conventional approach.

CHINESE SAPINDACEOUS TREE SPECIES (*SAPINDUS MUKOROSII*) EXHIBITS LEAD TOLERANCE AND LONG-TERM PHYTOREMEDIATION POTENTIAL FOR MODERATELY CONTAMINATED SOILS

Sahito, Z.A., A. Zehra, S. Yu, S. Chen, Z. He, and X. Yang. Chemosphere 338:139376(2023)

A study assessed the lead tolerance and phytoremediation potential of the fast-growing soapberry tree *Sapindus mukorossi* in moderately contaminated soil. Two independent experiments were conducted to assess its tolerance at the germination level and prolonged growth stage. In the germination experiments, seeds were exposed to Pb $(NO_3)_2$ at various concentrations (0, 5, 10, 20, 50, 100, 200, 300, 400, and 500 µM) for 120 days. Results showed significant differences in germination time, germination index, seedling vigor index, germination energy, final germination, germination inhibition, seedling height, and root/shoot weight compared to the control experiments. In the prolonged growth experiments, seedlings were grown for 6 months in soils amended/spiked with different Pb concentrations (T0 = 0, T1 = 20, T2 = 50, T3 = 100, T4 = 150 and T5 = 200 mg/kg soil) and their biomass was determined. The highest biomass achieved in 6 months was T0 (12.62 g/plant), followed by T1 (12.33 g/plant), T2 (12.42 g/plant), T3: (11.86 g/plant), T4 (10.86 g/plant) and T5 (10.06 g/plant). *S. mukorossi* showed no visible signs of Pb toxicity. The total Pb content in *S. mucrossi* tissues was classified as roots > leaves > stems during exposure. The highest cumulative absorption of Pb occurred between the fourth and fifth months of exposure. Maximum transfer factor (TF) was detected during the fourth month, ranging from 0.888 to 1.012 for the different Pb concentrations. Growth behavior, lead accumulation, bioconcentration factors (BCF), and tolerance index (TI) indicated that*S. mucrossi* may tolerate moderate Pb concentrations for longer periods. Findings suggest that *S. mukorossi* may be deployed for long-term phytoremediation coupled with urban forest applications.

General News

GUIDE TO PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) SAMPLING WITHIN NATURAL RESOURCE DAMAGE ASSESSMENT AND RESTORATION

Pulster, E.L., S.R. Bowman, L. Keele, and J. Steevens. USGS Open-File Report 2024-1001, 68 pp, 2024

The widespread contamination and the potential toxicity of PFAS to human and environmental health have resulted in the proposed designation of PFOA and PFOS as hazardous substances, which may prompt new requirements for reporting, regulatory action and site cleanup. For researchers involved in natural resource damage assessment efforts, understanding the multifaceted dynamics of the environmental fate and transport of PFAS will be essential for appropriate sample collections, analyses and data interpretation. This guide aims to provide fundamental concepts and considerations involved with environmental sampling for PFAS during site assessments. https://pubs.usgs.gov/of/2024/1001/ofr20241001.pdf

PFAS REMEDIATION IN SOIL: AN EVALUATION OF CARBON-BASED MATERIALS FOR CONTAMINANT SEQUESTRATION

Bui, T.H., N. Zuverza-Mena, C.O. Dimkpa, S.L. Nason, S. Thomas and J.C. White.
Environmental Pollution 344:123335(2024)

This paper comprehensively evaluates current insights on PFAS sequestration in soil using carbon-based sorbents. The two driving forces governing PFAS sorption are hydrophobic effects

originating from fluorinated carbon (C-F) backbone "tail" and electrostatic interactions deriving from functional groups on the molecules' "head." Consequently, varying C-F chain lengths and polar functional groups significantly alter PFAS availability and leachability. Matrix parameters such as soil organic matter, inorganic minerals, and pH significantly impact PFAS sequestration by sorbent amendments. Carbon-based materials such as activated carbon, biochar, carbon nanotubes, and their composites are used for PFAS adsorption. Modifying the carbon structural and surface chemistry is essential to increase the active sorption sites and strengthen interactions with PFAS. The review evaluates current literature, identifies knowledge gaps in current remediation technologies, and addresses future strategies for PFAS sequestration in contaminated soil using sustainable novel carbon-based sorbents.

ADVANCES IN PFAS DESTRUCTIVE TECHNOLOGIES

Wong, M. and D. Major. ERDP & ESTCP Webinar Series, May 2024

This SERDP and ESTCP webinar features DoD-funded research efforts to develop technologies for PFAS destruction. First, Dr. Mike Wong discusses his research on using novel boron nitride semiconductor photocatalysts for PFAS decomposition. Second, Dr. David Major presents his research developing and demonstrating in situ and ex situ smoldering combustion approaches for PFAS destruction. https://serdp-estcp.mil/toolsandtraining/details/e633cc36-2973-40a8-8530-10ffb75b6b91/advances-in-pfas-destructive-technologies

RESEARCH PROGRESS OF BIO-SLURRY REMEDIATION TECHNOLOGY FOR ORGANIC CONTAMINATED SOIL

Sun, J., F. Wang, X. Jia, X. Wang, X. Xiao, and H. Dong. I RSC Advances 13:9903(2023)

This paper summarizes the importance and advantages of bio-slurry remediation technology compared with traditional soil remediation technologies, introduces the technical infrastructure and technological processes, and discusses various factors that may affect its remediation performance. By analyzing the applications of this technology to remediate typical organic pollutant-(PAHs, PCBs, total petroleum hydrocarbons, and pesticide) contaminated sites, the paper summarizes the following key features of bio-slurry remediation:

1. the technology has a wide range of applications and can be used in the remediation projects of various types of organic-contaminated soil sites such as in clay, sand, and high organic matter content soil;
2. the technology can be controlled by adjusting environmental parameters and operational conditions, such as nutrients, organic carbon sources (bio-stimulation), inoculants (bio-augmentation), water-to-soil ratio, etc., thus improving the restoration performance.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10076817/pdf/RA-013-D2RA06106F.pdf

EFFECTIVE MANAGEMENT OF PFAS IN GROUNDWATER: EXPLORING FATE & TRANSPORT AND REMEDIATION ALTERNATIVES

Newell, C.J. I AEHS Foundation 33rd Annual International Conference on Soil, Water, Energy, and Air, 18-21 March, San Diego, CA, 18 slides, 2024

A novel retention-based framework was developed to categorize PFAS groundwater plumes for appropriate management strategies. This framework introduces PFAS Monitored Retention (PMR) and PFAS Enhanced Retention (PER) approaches, incorporating established and innovative techniques. These strategies emphasize site-specific characterization, groundwater modeling, and other critical implementation factors. This shift towards retention-based management may be useful to the groundwater community as it addresses PFAS groundwater contamination, highlighting the need for customized solutions for each unique plume.
https://www.xcdsystem.com/AEHS/abstract/File23293/PDFforhandouttoattendeesopt_275_0401012208.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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