

Technology Innovation News Survey

Entries for March 16-31, 2022

Market/Commercialization Information

RILEY KS & MINOT ND REGIONAL HW REMOVAL AND DISPOSAL

Defense Logistics Agency (DLA) Disposition Service - EBS, Battle Creek, MI
Contract Opportunities at SAM.gov, Solicitation SP4500-22-R-0013, 2022

This is a full and open competition under NAICS code 562211. The Defense Logistics Agency (DLA) Disposition Service requires the removal, transportation, and disposal of RCRA hazardous wastes, non-RCRA wastes, State-Regulated wastes, Non-State Regulated wastes, Universal Wastes, Compressed Gases, and PCBs located on or around military installations or within a 50-mile radius of any pickup point listed in the contract in the states of Iowa, Kansas, Missouri, Nebraska, North Dakota, and South Dakota. The contract is a firm fixed-price, indefinite-delivery, indefinite-quantity (IDIQ) contract with a 30-month base period followed by a 30-month option period. Offers are due by 3:00 PM EDT on May 20, 2022. <https://sam.gov/oap/6440164726464c3ba686e5366407077/view>

OFFICE OF LAND AND EMERGENCY MANAGEMENT (OLEM) LARGE MISSION SUPPORT

U.S. Environmental Protection Agency, Headquarters Acquisition Division, Washington, DC
Contract Opportunities at SAM.gov, Solicitation 68HRH22R0050, 2022

This is a full and open competition under NAICS code 541620. EPA requires mission support for its Office of Land and Emergency Management and its programs, regional, and/or field offices. OLEM's program offices include the Office of Resource Conservation and Recovery (ORCR), the Office of Superfund Remediation and Technology Innovation (OSRTI), the Office of Emergency Management (OEM), the Office of Brownfields and Land Revitalization (OBLR), the Office of Underground Storage Tanks (OUST), and the Federal Facilities Restoration and Reuse Office (FFRRO). This contract will primarily provide services in support of ORCR, OSRTI, and OEM. The contractor must provide ongoing support for technical, analytical and regulatory development and must furnish all resources to: perform all work described in the task areas of this PWS; perform all work issued through task orders under this contract; and perform contract management functions and meet all contract terms and conditions. Tasks that may be performed under this task area include, but are not limited to the following: support strategic planning, analysis and reporting; explore, develop and implement program initiatives; facilitate investment and program management; conduct management studies; develop projections; identify and evaluate new and creative approaches to partnerships; support and strengthen voluntary partnerships, industry relationships and non-regulatory programs; identify stakeholder needs; participate in meetings and briefings; provide background information for Freedom of Information Act (FOIA) requests; compile information to support response to Congressional requests; communicate program progress and accomplishments; prepare for management and implementation planning meetings; and perform other programmatic tasks in support of the mission. Offers are due by 5:00 PM EDT on June 6, 2022. <https://sam.gov/oap/7274e68a-3664-10b1-b197-7c85869a-c1/view>

FY22 USACE NASHVILLE DISTRICT ENVIRONMENTAL SERVICES

U.S. Army Corps of Engineers, Nashville District, Nashville, TN
Contract Opportunities at SAM.gov, Solicitation W912P22B0013, 2022

When the solicitation is released on or around May 6, it will be competed as an 8(A) set-aside under NAICS code 562910. U.S. Army Corps of Engineers, Nashville District, requires a contractor that can provide a full range of non-Architect-Engineer (A-E) environmental services to the Nashville District (LRN). The environmental services will fall generally under the categories of environmental compliance, environmental restoration, environmental conservation, and environmental regulatory services. Up to four contracts may be awarded under this anticipated Multiple Award Task Order Contract (MATOC). The total Indefinite Delivery Indefinite Quantity (IDIQ) MATOC pool capacity shall not exceed \$5,000,000. The place of performance includes various locations within the Nashville District U.S. Army Corps of Engineers Area of Responsibility. <https://sam.gov/oap/62f745336e1647c-24347c2a1826a1/view>

AE SERVICES FOR PEAT (PLANNING & ENVIR-NEPA/MASTER PLANNING \$249M)

U.S. Army Corps of Engineers, Mobile District, Mobile, AL
Contract Opportunities at SAM.gov, Solicitation W912782R0051, 2022

This is a sources sought announcement for market research purposes only. The U.S. Army Corps of Engineers (USACE), Mobile District, seeks to gain knowledge of potential qualified Small Business, HUBZone, 8(a), Service Disabled Veteran Owned, and Women-Owned Small Business firms capable of supporting its Planning and Environmental Division under NAICS code 541330. The USACE Mobile District is specifically looking for contractors capable of supporting development of products and studies associated with environmental compliance; planning, conservation, National Environmental Policy Act (NEPA), environmental supporting studies, master planning, restoration/remediation design, pollution prevention, miscellaneous sustenance for military, civil, and federal agencies, and all phases of USACE Mobile District civil works projects including but not limited to preliminary studies through complete feasibility reports for ecosystem restoration, flood risk management, shallow and deep draft navigation, water supply, hurricane and storm damage reduction, recreation, plan formulation, socio-economic analysis, dredged material testing, water quality studies, and wetland delineation. Capability statements are due by 2:00 PM CDT on May 15, 2022. <https://sam.gov/oap/15777556a614874-277a0934855815/view>

Cleanup News

LESSONS LEARNED FROM 6-YEARS OF FULL-SCALE PFAS PLUME MANAGEMENT AND LIQUID GAC GROUNDWATER TREATMENT

Pöhlmann, D. and R. Morrish. 1 Global Enviro Summit 4-6 April, Charlotte, NC, abstract only, 2022

A groundwater pump and treat system was activated to capture a PFOA/PFOS plume at a former DoD fire training area. Historical remedial actions included SVE and in situ anaerobic biodegradation. The extracted groundwater was treated using two 20,000-lb liquid granular activated carbon (LGAC) vessels operated in series to below PFOA and PFOS discharge objectives of 0.04 and 0.02 µg/L, respectively. To date, the system has treated ~700 million gallons of groundwater, removed 37.7 lbs of PFOA, and 20 LGAC exchanges have been conducted. When the pump and treat system was designed and installed, much was unknown about the plume behavior of PFOA and PFOS and the use of LGAC to treat these compounds. Additional delineation showed that the PFOA/PFOS plume is concentrated near the water table surface. Passive Flux meters were deployed to evaluate their applicability to PFOA/PFOS measurement and their correlation to groundwater concentrations and mass removed by the pump and treat system. Samples analyzed by the total oxidizable precursor assay indicated that individual PFOA/PFOS compounds account for ~30% of total PFAS impact on the LGAC system. *More information:* https://www.michigan.gov/newsresponse/0,9038,7-365-86511_82718_83952---,00.html

HOW TO ADDRESS LOW PH DURING IN SITU BIOREMEDIATION

Elkins, B. 1 Global Enviro Summit 4-6 April, Charlotte, NC, abstract only, 2022

SERDP/ESTCP published a base-addition design tool to help practitioners develop a comprehensive pH management plan utilizing commonly used bases. A method was developed to alter the surface charge of Mg(OH)₂ to improve subsurface transport and injectability. Lab studies validated that a colloidal suspension of Mg(OH)₂ could be transported through sand-packed columns without significant permeability loss. The proprietary formula of colloidal Mg(OH)₂ was commercialized into the product CoBupH™. The base-addition design tool and lab titration data were used to successfully remediate a chlorinated-impacted site in NC. CoBupH and potassium bicarbonate were selected as the buffers, with EOB® Pro co-injected as the electron donor. The site had two distinct water-bearing zones; the shallower zone contained groundwater with an average pH of ~4 standard units due to an acid release from an off-site source. Post-injection monitoring since 2016 shows nearly complete conversion of chlorinated solvents to ethene while maintaining a neutral aquifer pH. *Base addition design tool:* https://www.serdp-estcp.org/content/download/48437/460804/file/Base%20Add%20Design%20Tool%20-%202018_v1x

METHODOLOGIES UTILIZED FOR CONTAMINATED SEDIMENT DREDGING, THIN LAYER CAPPING, ISOLATION CAPPING, AND WATER TREATMENT. RANDLE REEF SEDIMENT REMEDIATION PROJECT STAGE 2

Harris, W. and M. Laliberte. 1 SMART Remediation 31 March, Toronto, ON, 33 slides, 2022

The Randle Reef site contains ~695,000 m³ of sediment contaminated with PAHs and other toxic chemicals and is the largest PAH-contaminated sediment site on the Canadian Great Lakes. Multiple sources of contamination include operation of a coal gasification plant, petroleum refining, steel making, municipal waste, sewage, and overland drainage; the average total PAH concentration was ~5,000 ppm, with peaks exceeding 70,000 ppm. The remediation plan included constructing a 6.2-hectare engineered containment facility (ECF) over the contaminated sediment, removing ~445,000 m³ of sediment using a combination of hydraulic and mechanical dredging, and placing the sediment within the ECF. The ECF is made of double steel sheet pile walls, with the outer walls driven to depths of up to 24 m into the underlying sediment and sealed inner walls, creating an impermeable barrier. Dredged contaminated sediments were treated and dewatered in a water treatment plant before placement in the ECF to balance the water input. Dredging was followed by thin-layer capping of undredged-contaminated sediment and isolation capping of the Stelco Intake/Outfall channel sediments. Once dredging is completed, the ECF will be covered by a multi-layered environmental cap followed by consolidation and dewatering of the sediments. <https://22a9pnm3n1x23m1335vvt-woronline.netdna-csl.com/wp-content/uploads/2022/04/SMART-Remediation-Toronto-March-31-2022-Wayne-Harris-Marc-Laliberte%20-%2033-slides.pdf>

LESSONS LEARNED FROM ONE OF THE LARGEST "TRADITIONAL" ZVI PRBS INSTALLED IN NORTH AMERICA

Sweet, B. 1 SMART Remediation 31 March, Toronto, ON, 17 slides, 2022

This presentation shares lessons learned from the installation of one of the largest "traditional" zero-valent iron (ZVI) permeable reactive barriers (PRBs) in North America. The site is a former industrial facility with legacy chlorinated solvent issues, mainly TCE and daughter products. Managing off-site migration was critical to facilitating site redevelopment. Risk mitigation measures included installing a 400 m, ZVI-based PRB system to control plume migration. The site conditions necessitated the creative use of multiple installation procedures; the wall was installed via a blended approach utilizing direct push injection and trenching techniques to address the complex plume structure. Over 400,000 kg of ZVI were installed across 335 m of linear injection points and 65 m of trenching to complete the PRB installation to depths of up to 9 m. The focus of this case study asks: How does a contractor install a PRB? What techniques are being used in the field and why? How can creative problem-solving be used to address technical and logistical challenges? <https://22a9pnm3n1x23m1335vvt-woronline.netdna-csl.com/wp-content/uploads/2022/04/SMART-Remediation-Toronto-March-31-2022-Ben-Sweet.pdf>

Demonstrations / Feasibility Studies

REMEDIATION OF PERSISTENT ARSENIC GROUNDWATER CONTAMINATION IN A FRACTURED ROCK AQUIFER IN A COASTAL AREA BY USING IEG-GCW® GROUNDWATER CIRCULATION

Papini, M.P., G. Rehner, P. Ciampi, E.J. Alesi, E. Bartsch, M. Pellegrini, S. Olivieri, F. Bonfanti, and G. Liati. 1 AquaConSol 2021, 15-17 June, virtual, abstract only, 2021

Groundwater contaminated with arsenic (As) from a major incident at a fertilizer manufacturing site represented a significant environmental problem ~45 years after the event. After a major explosion, a portion of As was transported vertically into the fractured rock formation of the aquifer, where the deposits continue to act as an active secondary source contaminating the groundwater. Traditional pump and treat technology managed and reduced the impact of contamination outside site boundaries. However, a significant mass of As was trapped in the fractured aquifer contaminating groundwater up to 40 m bgs. Groundwater Circulation Well (GCW) technology was chosen to enhance As mobilization in the source area. A pilot plant consisting of a 40 g deep IEG-GCW®, equipped with 4 screens at different depths and a treatment system to remove dissolved As by oxidation and filtration on Macrolite, was started in 2020. The hydraulic effectiveness of the IEG-GCW® in a fractured rock aquifer (pumping rate ~2.5 m³ / h and ROI ~15 m) and the capability to increase pollutant mobilization significantly compared to the traditional pumping wells were demonstrated within the first few months of operation. Results showed that upconing of the coastal saltwater present at 45 m bgl could be controlled and reverted using a properly designed GCW. The pilot test is ongoing and will generate general design parameters for the remediation plan for industrial sites in coastal areas with fractured rock aquifers.

LONG TERM DYNAMICS OF PLANT COMMUNITIES AFTER BIOLOGICAL REMEDIATION OF OIL CONTAMINATED SOILS IN FAR NORTH

Novakovsky, A.B., V.A. Karnev, and M.Y. Markarova. 1 Scientific Reports 11:4888(2021)

The long-term dynamics of plant communities were studied following bio- and phytoremediation of oil-contaminated soils. Nine plots in Northern Europe were treated using various bioremediation methods and monitored for 12 years. Geobotanical descriptions of each plot were performed, and Grime's theoretical competition-stress-tolerance (CSR) framework was used to assess the vegetation state and dynamics. A clear shift of communities was observed from pioneer (where ruderal species were prevalent) to stable (where competitor species were dominant) states, though the remediation type did not significantly impact the vegetation recovery rate. All methods led to a 55-90% decrease in the oil content of the soil and recovery of the vegetation cover. The plant communities contained mainly cereals and sedges, which significantly differed from the original tundra communities before the oil spill. The control plot, treated only by mechanical cleaning, had minimum oil degradation (50%) and vegetation recovery rates, although, in CSR terms, its vegetation assemblage resembled the background community. Cereals (*Agrostis gigantea*, *Deschampsia cespitosa*, *Phalaris arundinacea*, and *Poa pratensis*), sedges (*Carex canescens*, *Carex limosa*, and *Eriophorum vaginatum*), and shrubs (*Salix*) were the most effective species for phytoremediation, exhibiting high community productivity under harsh conditions. <https://www.nature.com/articles/s41598-021-034276-5.pdf?origin=publication>

A BOREHOLE TEST FOR CHLORINATED SOLVENT DIFFUSION AND DEGRADATION RATES IN SEDIMENTARY ROCK

Allen-King, R.M., R.L. Kiekhaefer, D.J. Goode, P.A. Hsieh, M.M. Lohar, and T.E. Imbriggotta. Groundwater Monitoring & Remediation [Published online 13 January 2022 before print]

This article presents new field measurement and numerical interpretation methods to parameterize the diffusion of TCE and its biodegradation products (DPs) from a sedimentary rock matrix. A dual-packer system was used to interrogate a low-permeability section of the rock matrix adjacent to a previously contaminated borehole. The borehole monitoring history established pre-test conditions. TCE and its biodegradation products (DPs) were removed from groundwater between the packers at the onset of the testing. The parameters were estimated by fitting a radial diffusion model to the concentration history and borehole concentration data, or back-diffusion, are the tortuosity factor and sorption coefficients of TCE and DPs in the rock matrix and the TCE and DP biodegradation rate coefficients in the borehole. The equipment design and the interpretive method were demonstrated using a borehole accessing the grey mudstone at a TCE-contaminated site in the Newark Basin. In the test, both nonreactive (bromide) and reactive (trichlorofluoroethene) tracers were used to constrain the estimated parameters. The parameters estimated from the field test were consistent with values measured independently in lab experiments using field samples of similar lithology. TCE and DP concentration distributions in the rock matrix before the test illustrated how the results could be used to enhance the understanding of contaminant distribution.

GEOELECTRICAL MONITORING OF DENSE NON-AQUEOUS PHASE LIQUID (DNAPL) REMEDIATION: NUMERICAL, EXPERIMENTAL, AND FIELD STUDIES

Power, C., J. Gerhard, and P. Tsourlos. First International Meeting for Applied Geoscience & Energy Expanded Abstracts, ISSN (print):1052-3812, ISSN (online):1949-4645, page 3561, abstract only, 2021

This presentation summarizes recent numerical, lab, and fieldwork to assess the application of various geoelectrical methods to improve DNAPL remediation monitoring. Novel couplings between a DNAPL model and geoelectrical models (e.g., GPR, ERT, TDIPI) were developed to provide valuable and cost-effective exploratory tools to assess the performance of the models to monitor DNAPL remediation in complex, field-scale environments. Lab tank experiments were conducted to introduce a new surface-to-horizontal borehole configuration for improved ERT mapping of DNAPL remediation. ERT was used at an industrial field site to monitor a DNAPL source zone undergoing thermal remediation successfully.

Research

IDENTIFYING BIOAUGMENTATION CANDIDATES FOR BIOREMEDIATION OF POLYCYCLIC AROMATIC HYDROCARBONS IN CONTAMINATED ESTUARINE SEDIMENT OF THE ELIZABETH RIVER, VA, USA

Volkoff, S.J., D.L. Rodriguez, D.R. Singleton, A.W. McCumber, M.D. Aiken, J.R. Stewart, and C.K. Gunsch. 1 Applied Microbiology and Biotechnology 106:1715-1727(2022)

The bacterial community of the Elizabeth River was measured using culture-based and culture-independent methods to identify potential candidates for bioremediation of PAH-contaminated estuarine sediments. DNA-based stable isotope probing (SIP) experiments with phenanthrene and fluoranthene using sediment from the former Republic Creosoting site identified PAH-degrading bacteria within the Azoarcus, Hydrogenophaga, and Crococcoccus genera. Targeted cultivation recovered six PAH-degrading strains, including a strain similar to Hydrogenophaga sequences detected in SIP experiments. Other isolates were more than 90% identical to organisms within the Novosphingobium, Sphingobium, Sphingotrichomonas, and Alcaligenes genera. 16S rRNA gene amplicon microbiome analyses performed on sediment samples from four sites showed a divergence between the microbial community at the Republic Creosoting site and less contaminated sites, such as enrichment of several bacterial clades. Sequences within the microbiome libraries similar to SIP-derived sequences were generally found at high relative abundance. The Crococcoccus sequence was present at low to moderate relative abundance. Results suggest that Azoarcus and Hydrogenophaga strains may be good target candidates for biostimulation, while Crococcoccus spp. may be good targets for bioaugmentation in these sediments. The study demonstrates the value of using culture-based and culture-independent methods to identify promising bacterial candidates for use in a precision bioremediation scheme.

ANALYSIS OF PER- AND POLYFLUOROALKYL SUBSTANCES IN HOUSTON SHIP CHANNEL AND GALVESTON BAY FOLLOWING A LARGE-SCALE INDUSTRIAL FIRE USING ION-MOBILITY-SPECTROMETRY-MASS SPECTROMETRY

Valdiviezo A, Aly NA, Luo YS, Cordova A, Casillas G, Foster M, Baker ES and Rusyn I.

Large quantities of PFAS-containing firefighting foams were deployed following the chemical fire at the Intercontinental Terminals Company in Deer Park, TX, in 2019. The release of PFAS into the Houston Ship Channel/Galveston Bay (HSC/GB) prompted concerns over the extent and level of PFAS contamination. A targeted liquid chromatography-tandem mass spectrometry (LC-MS/MS)-based study of temporal and spatial patterns of PFAS associated with this incident revealed the presence of seven species whose levels gradually decreased over six months. Targeted LC-MS/MS analysis focused on ~30 PFAS molecules and may have missed other PFAS compounds present in firefighting foams. A non-targeted LC-ion mobility spectrometry-mass spectrometry (LC-IMS-MS)-based analytical method was applied to 31 samples from nine HSC/GB sites collected over 5 months to conduct a more comprehensive characterization. Data showed that an additional 19 PFAS were detected in HSC/GB surface water; most decreased gradually after the incident. PFAS features detected by LC-MS/MS correlated well in abundance with LC-IMS-MS data, though LC-IMS-MS identified several additional PFAS, many of which may be components of firefighting foams. Findings illustrate that non-targeted LC-IMS-MS can improve the understanding of PFAS presence in complex environmental samples.

A FIELD METHOD TO QUANTIFY CHLORINATED SOLVENT DIFFUSION, SORPTION, ABIOTIC AND BIOTIC DEGRADATION IN LOW PERMEABILITY ZONES

Allen-King, R.M., M. Lora, D. Goode, T. Imbriggotta, C. Tedeman, and A. Shapiro. SERDP Project ER-2533, 108pp, 2021

A method, including tools and protocols, was developed to determine site-specific transport properties of VOCs in the low permeability matrix of fractured sedimentary rock aquifers. The project developed and tested: (1) a pusher tool, (2) a specialized sampling apparatus, (3) a solubility test protocol, and (4) a numerical model capable of simulating the field data. A field test was initiated by replicating the contaminated groundwater in the test interval with literature data on the contaminants removed, and tracers added. CVOC concentrations, including degradation products and tracers, were monitored. Results showed two tracer tests in adjacent vertical intervals of the same borehole were successful. The similarity of the parameters estimated indicates good reproducibility for the field conditions of the tests. The parameters estimated from the field tests were reasonably consistent with supporting lab measurements and literature data, verifying the test protocol. A single test can provide information equivalent to at least three sets of research-quality independent lab tests of the rock properties. <https://www.serdp-estcp.org/content/download/55771/544996/file/ER-2533%20Final%20Report.pdf>

DEVELOPING PIGE INTO A RAPID FIELD-SCREENING TEST FOR PFAS

Peaslee, G. SERDP Project ER19-1142, 41 pp, 2020

This project was designed to determine the operating parameters to turn a lab technique known as Particle Induced Gamma-ray Emission Spectroscopy (PIGE) into a field-deployable approach to rapidly screen for the presence of PFAS in groundwaters at AFFF-impacted sites. The precise beam energy of protons required to measure the presence of organic fluorine as a surrogate for PFAS in groundwater that could be produced by modifying a field-deployable accelerator system was determined. Modifications were made to a commercial system's design plans. The method detection limits were estimated based on a series of lab measurements on existing and new solid-phase extraction media. The project showed that the modified system would be theoretically capable of making rapid PIGE measurements (minutes per sample) at a field site. The discovery of an inline filter material that allows PIGE measurement detection limits in the 10-50 ppt range for all anionic PFAS simultaneously indicates the system may be used in various situations to facilitate site characterization, remediation, and long-term monitoring. <https://www.serdp-estcp.org/content/download/55736/544707/file/ER19-1142%20Final%20Report.pdf>

BIOREMEDIATION OF TOLUENE BY BIOAUGMENTATION, BIOSTIMULATION AND NATURAL ATTENUATION

Yaman, C., I. Anil, O. Aga, A.B. Yaman, A. Qureshi, E.S. Web of Conferences 260:11014 (2021)

Biological processes treated toluene-contaminated groundwater in reactor columns to assess the impact of bioaugmentation (BA) and biostimulation (BS) on toluene degradation efficiency. After 44 days of the natural attenuation treatment, toluene concentrations decreased from 5 mg/l to 4.304 mg/l in Reactor 2, with a 13.9% removal efficiency. Toluene decreased to 0.0239 mg/l in the Reactor 1 BA and BS treatment, with a 99.5% removal efficiency. https://www.e3s-conferences.org/articles/e3sconf/ndf/2021/5/e3sconf_icSD2021_11014.pdf

ESTABLISHMENT OF REGIONAL PHYTOREMEDIATION BUFFER SYSTEMS FOR ECOLOGICAL RESTORATION IN THE GREAT LAKES BASIN, USA. I. GENOTYPE x ENVIRONMENT INTERACTIONS

Zalesny, Jr., R.S., A. Pilipovic, E.R. Rogers, J.G. Burken, R.A. Hallett, C.-H. Lin, B.G. McLanahan, N.D. Nelson, A.H. Wiese, E.O. Bauer, L. Buechel, B.S. DeBauche, M. Peterson, R. Seegers, and R.A. Vinhal. I Forests 12:430(2021)

Phytoremediation selection was used to establish 16 phytoremediation buffer systems (phyto buffers) throughout the Lake Superior and Lake Michigan watersheds, comprised of 12 PRS-selected clones each year. Differences in genotypes, environments and their interactions for height, diameter, and volume were tested for ages one to four years. All trees showed optimal health. Mean volume ranged from 71 ± 26 to 132 ± 39 cm³ (first year), 1440 ± 575 to 5765 ± 1132 cm³ (second year), and 8826 ± 2648 to 10,530 ± 2110 cm³ (third year). The fourth-year mean annual increment of buffer group trees ranged from 1.1 ± 0.7 to 7.8 ± 0.5 m³/ha/yr. Generalist varieties were identified with superior establishment across a broad range of buffers and specialist clones adapted to local soil and climate conditions. Using generalists and specialists enhances the potential for phytoremediation best management practices that are geographically robust, regionally designed, and globally relevant. <https://chdl.sagepub.com/doi/10.3390/forests12040430>

RHIZOREMEDIATION OF HYDROCARBON CONTAMINATED SOIL USING LUFFA AEGYPTIACA (MILL) AND ASSOCIATED FUNGI

Ani, E., A.A. Adekunle, K. Kadiri, and K.L. Njoku. International Journal of Phytoremediation 23(14):1444-1456(2021)

The potential of *Luffa aegyptiaca* and its rhizosphere, non-mycorrhizal fungi to biodegrade and bioremediate hydrocarbon-contaminated soil were investigated in vitro and in situ. The study was conducted in two stages: 1) a preliminary study using hydrocarbon-treated filter paper and 2) an in vitro study with Mineral Salt Media read on a spectrophotometer at two photosynthetically active wavelengths (530 nm and 620 nm). The rhizoremediation study was conducted in situ at a contaminated site. The study showed different rates of hydrocarbon utilization by isolated fungi. The in vitro biodegradation study showed that *Aspergillus niger*, *Fusarium solani*, *Curvularia lunata*, and *Trichoderma harzianum* degraded kerosene (78%), diesel (70%), spent engine oil (83%), and crude oil (77%), respectively. The rhizoremediation study using *L. aegyptiaca* and *C. lunata* enhanced remediation 72.15% compared to 32.32% and 14% using only the plant or fungus. *aegyptiaca* also decreased in the presence of the fungus. Results showed that *Curvularia lunata* enhanced the germination, survival, growth, and bioremediation efficiency of *L. aegyptiaca* in a polluted environment.

General News

PER- AND POLYFLUOROALKYL SUBSTANCES IN THE ENVIRONMENT

Evich, M.G., M.J.B. Davis, J.P. McCord, B. Acrey, J.A. Awkerman, D.R.U. Knappe, A.B. Lindstrom, T.F. Speth, C. Tebes-Stevens, M.J. Strynar, Z. Wang, E.J. Weber, W.M. Henderson, and J.W. Washington. Science 375:eabg9065(2022)

PFAS have become symbolic of environmental contamination, garnering public, scientific, and regulatory concern over the past several years. PFAS are synthesized by direct fluorination (e.g., electrochemical fluorination) and oligomerization (e.g., fluorotelomerization). More than a megatonne of PFAS is produced yearly, and many wind up in end-use products. Atmospheric and aqueous fugitive releases during manufacturing, use, and disposal have resulted in the global distribution of these compounds. Volatile PFAS facilitate long-range transport and are commonly transformed into recalcitrant terminal PFAS, which do not degrade under environmental conditions and instead migrate through the environment and accumulate in biota through multiple pathways. Efforts to remediate PFAS-contaminated matrices are in their infancy, with current research targeting drinking water.

ION EXCHANGE MEMBRANES AND FIBERS AS PASSIVE SAMPLERS FOR CHEMICALLY-DIVERSE PFAS

Blaney, L. and K. He. ESTCP Project ER20-1073, 87 pp, 2021

This project developed ion-exchange membrane and fiber strategies for passive sampling of chemically-diverse PFAS and addressed the need to measure and remediate PFAS. The specific objectives were: (1) develop ion-exchange membrane and fiber passive samplers capable of concentrating short- and long-chain PFAS with varying log D values; (2) establish selectivity coefficients for 19 PFAS of concern in the ion exchange-based samplers to quantitatively describe PFAS uptake and partitioning; (3) confirm that the ion-exchange materials are capable of effective deployment and performance in synthetic and real groundwater and surface water matrices; (4) investigate ion exchange-based passive samplers for cationic, zwitterionic, and anionic PFAS; (5) ensure consistent performance of the samplers in single- and multi-sorbate scenarios; (6) characterize effects of solution pH, ionic strength, background ions, temperature, and dissolved organic matter on the passive samplers; and (7) deploy the passive samplers in lab-based mesocosms to confirm their ability to resolve spatiotemporal variations in PFAS concentration. <https://www.serdp-estcp.org/content/download/55740/544727/file/ER20-1073%20Final%20Report.pdf>

GREEN REMEDIATION BEST MANAGEMENT PRACTICES: SOIL VAPOR EXTRACTION & OTHER AIR-DRIVEN SYSTEMS

Office of Land and Emergency Management, EPA 542-F-22-002, 4 pp, 2022

In line with the renewed Agency emphasis on sustainability and climate change resilience and mitigation, the Superfund Program is updating the green remediation best management practice (BMP) fact sheets for the most common remedies in the Superfund program. These fact sheets aim to share technical information on best practices that build sustainability into contaminated site cleanup operations across the portfolio of remediation approaches. The updated GR fact sheet on soil vapor extraction (SVE) and other air-driven systems outline BMPs that can help minimize the environmental footprint of constructing, operating, maintaining, and monitoring cleanup remedies involving SVE, air sparging, or vapor intrusion mitigation technologies. The update also highlights synergies between green remediation and climate adaptation practices, where one action provides both greenhouse gas mitigation and climate resilience. https://clu-in.org/greenremediation/dccs/gb_fact_sheet_SVE_air-driven_systems.pdf

ENVIRONMENTAL SEQUENCE STRATIGRAPHY (ESS) AS A REMEDY OPTIMIZATION TOOL

Cramer, R., J.D. Spalding, and D. Collins. NAVFAC Open Environmental Restoration Resources Webinar #23, 62 minutes, 2021

Environmental sequence stratigraphy (ESS) focuses on using geology to better define the heterogeneous subsurface that confounds many complex contaminated site remediation projects. The presentation provides an overview of the ESS approach and how it has evolved into a way to optimize the pathway to response completion. The challenge is not only to define the subsurface geologic framework but also to implement the geologic model to optimize remediation. Navy remedial project managers share case study examples of applying ESS to emergency response sites. <https://www.youtube.com/watch?v=cF5E-ncdM4k>

PHYTOREMEDIATION TECHNOLOGY FOR THE REMOVAL OF HEAVY METALS AND OTHER CONTAMINANTS FROM SOIL AND WATER

Kumar, V., M.P. Shah, and Sushil Kumar Shahi (eds), Elsevier, ISBN 978-0-323-85763-5, 620 pp, 2022

The exploitation of plants and their associated microbes to degrade, detoxify, stabilize toxic and hazardous contaminants, and restore the contaminated site are discussed in this book. The book primarily focuses on the remediation of toxic and hazardous environmental contaminants, their phytoremediation mechanisms and strategies, advances, and challenges in the current scenario.

OVERVIEW OF THE DREDGED MATERIALS MANAGEMENT TOOL (DMDT)

Williams, K., S. Paczuski, R. Clarke, K. Auken, and J. Hoffman. Great Lakes Sediment Regulation Workshop, Duluth, MN, 3 March, 11 slides, 2022.

EPA Region 5 developed a multi-criteria decision-support tool to help communities characterize and quantify the economic and social dimensions of beneficially using dredge material so these dimensions can be more easily weighed alongside economic considerations. Region 5 and ORD collaboratively refined the tool to enhance usability through conducting a series of workshops with groups of stakeholders involved in dredging decisions. A user-friendly interface was created for the tool and an instruction manual that describes how to use it was developed based on the results of the workshops and related research efforts. This tool will facilitate collective decisions that demonstrate how dredge materials can be beneficially used to restore habitats, provide economic benefits, and increase ecosystem services. https://cfpub.epa.gov/cfsl/public_file_download.cfm?download_id=544430&sh=CFE

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 michael.adam@epa.gov or (703) 603-9915 with any comments, suggestions, or corrections.

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