Technology Innovation News Survey

Entries for June 1-15, 2023

Market/Commercialization Information

UR PRAC MATOC - USACE, KANSAS CITY DISTRICT (SNOTE)

U.S. Army Corps of Engineers, Kansas City District, Kansas City, MO
Contract Opportunities on SAM.gov, Solicitation W912DQ23R3018, 2023

After conducting market research, the U.S. Army Corps of Engineers (USACE) Kansas City District (NWK) has decided to consolidate its Hazardous, Toxic, and Radioactive Waste (HTRW) Remediation Projects into one Unrestricted (UR) Indefinite Delivery, Indefinite-Quantity (IDIQ) Preplaced Remedial Action Contract (PRAC) Multiple Award Task Order Contract (MATOC) under NAICS code 562910. This new UR IDIQ PRAC MATOC supports the performance of HTRW environmental remediation activities for Northwestern Division (NWD) and EPA Region 2. The MATOC will be solicited as an unrestricted procurement and competitively negotiated in accordance with FAR 15.304(c)(1)(ii)(A)(3), whereas price or cost will not be included as an evaluation factor as part of the source selection, and the Government intends to make an award to each and all qualifying offerors. The total ordering limitation of the MATOC is $245M and will be shared capacity among all awardees (i.e., MATOC holders). The MATOC will have a five-year base ordering period with no options to extend. The MATOC will be used to award negotiated firm-fixed-price (FFP) and cost-plus fixed fee (CPFF) task orders (TO)s for multi-disciplinary environmental remediation activities for a variety of projects throughout NWD and EPA Region 2. Individual TOs may have a period of performance that extends beyond the last day of the MATOC ordering period; however, a TO performance period will not exceed five years beyond the last day of the MATOC ordering period. Requirements will be funded at the TO level using appropriate funding sources, primarily EPA no-year funds, and will be administered by NWK. Funding is not currently available but will be made available for each TO. The Command Service Executive (CSE) approval for the proposed acquisition was received on 28 April 2022.
https://sam.gov/opp/0250c1f3e8724302a0d9242f9b67f138/view

CERCLA REMOVAL ACTION AT YOSEMITE NP, CA (SOL)

U.S. Department of the Interior, National Park Service, Port Angeles, WA
Contract Opportunities on SAM.gov, Solicitation 140P2123R0005, 2023

This is a total small business set-aside under NAICS code 562910. The U.S. National Park Service requires a contractor to conduct a response action under CERCLA to remove contaminated soil from a former waste dump site near El Capitan in Yosemite Valley within Yosemite National Park in Mariposa County, California, and restore it to natural conditions free of contaminants. Previous procurements have occurred to analyze the contaminants, characterize the hazards, and establish a framework for the removal action at this site in accordance with the CERCLA process. The contractor will implement a previously-developed Non-Time-Critical Removal Action work plan (NTCRAWP) to remove ~15,000 tons of contaminated soil and debris, transport it to appropriate disposal facilities, install five groundwater monitoring wells, perform the first year of monitoring, and prepare a Response Action Completion Report. The work includes field and lab analyses of soil samples in addition to the preparation of reports and other documentation required for this type of CERCLA action. A group site visit will occur at 1:00 PM PDT on Wednesday, July 12, 2023; pertinent details will be provided in Section L of the solicitation when it is posted. Attendance at the site visit is strongly encouraged (not mandatory). Requests for individual site visits will not be honored. Offers are due by 9:00 AM PDT on July 24, 2023. https://sam.gov/opp/b075a447e6154b9cae0088fad0aad807/view

ENVIRONMENTAL MONITORING AND REMEDIATION TECHNOLOGY ASSESSMENT INITIATIVE (EMRTAI)

Environmental Protection Agency, Funding Opportunity EPA-OLEM-OMDP-23-01, 2023

The goal of the EMRATI, or Initiative, is to assess, demonstrate or test the performance of environmental monitoring and remediation technologies that can identify and recover critical minerals from legacy hard rock mining sites or metal processing (smelting, refining, etc.) sites. The EMRTAI will help stimulate the monitoring and remediation technology sector and support technology assessment and performance testing of technologies to advance EPA's mission to protect human health and the environment. The Initiative will also assist public entities such as non-profit organizations, industries, businesses, states, individuals, and communities in making better informed decisions when selecting new or existing environmental technologies for use at contaminated sites. The successful applicant (i.e., recipient of the proposed cooperative agreement) will conduct technology assessments, demonstration or performance testing of monitoring and remediation technologies related to legacy hard rock mining or metal processing sites for up to 3 years under a financial assistance agreement from EPA. The recipient will design and operate the Initiative by carrying out its work consistent with an EPA-reviewed and approved quality management plan (QMP) and conducting assessments, demonstrations or performance testing of environmental monitoring and remediation technologies for use at said sites. As a result, this Initiative will provide the public and stakeholders with objective, quality-assured technology assessment and performance testing data for developed technologies in the field of monitoring and site remediation. Examples of technology areas to be performance tested include but are not limited to: water monitoring and remediation; and solid media (soil and sediment) monitoring and remediation (metals recovery). Offers are due by 11:59 pm ET on July 31, 2023. https://www.grants.gov/web/grants/view-opportunity.html?oppId=348834

Cleanup News

APPLICATION OF AN IN-WELL REMEDIATION SYSTEM IN A SOUTHERN MISSOURI DRINKING WATER AQUIFER

Schaefer, C. and J. Zamora. I Missouri Waste Control Coalition 2022 Environmental Conference, 10-12 July, Osage Beach, MI, 37 slides, 2022

A gasoline release in rural southern Missouri resulted in petroleum hydrocarbons in onsite and offsite drinking water wells. An evaluation of remedial technologies led to installing an in-well system adjacent to the former onsite domestic well. The system combined in situ air stripping, air sparging, vapor extraction, and subsurface circulation in a single wellhead. After 16 months of operation, contaminant concentrations within the treatment well were reduced to below applicable risk-based concentration levels.
https://www.mowastecoalition.org/resources/Documents/2022%20Conference/The%20ART%20of%20Cedarcreek.pdf

HEATED WATER RECIRCULATION TO ENHANCE IN SITU ABIOTIC AND BIOTIC DEGRADATION

Krembs, F.J., M.I Olson, S. Quint, R. Hefner, M. Mercier, A. Sansom, Q. Le, N. Geibel, and M. Maxwell. I 2023 Bioremediation Symposium Proceedings, 8-11 May, Austin, TX, 30 slides, 2023

Several optimization approaches were designed and implemented to enhance natural attenuation of TCE at a Formerly Used Defense Site (FUDS) in Nebraska. The design included modeling using the USGS model VS2DH for heating, comparing a static electrode at the groundwater surface against the injection of heated water. Groundwater capture was evaluated using the EPA model WhAEM by modifying injection and extraction well locations and flow rates to focus heating and recirculation on TCE-impacted areas. The optimization approach consisted of three heated water injection wells, two extraction wells, and four nested in situ enhanced bioremediation (ISEB) injection wells. Heated groundwater recirculation coupled with ISEB amendment injection focused on the source area during the first phase of work and then transitioned to the downgradient plume. Target compounds, methane-ethene-ethane, total organic carbon, microbial communities with qPCR, and next-gen sequencing were monitored throughout the process. Subsurface temperatures were measured with transducers and depth-discrete measurements with a field meter. In situ microcosms were deployed, and parallel laboratory bench tests were also performed. Recirculation of heated groundwater was effective at increasing the subsurface temperature. During the first phase of treatment, water was injected at temperatures of up to 115°F. Subsurface temperatures in a monitoring well in the treatment zone increased from 56°F to 88°F while the temperature of extracted groundwater increased to 68°F. TCE concentrations were reduced by over 90% within the footprint of recirculation. Evidence suggests that abiotic and biotic degradation processes may have been involved, though physical flushing likely played a role. Bacterial populations increased in the area where heat and ISEB amendment were applied. In the parallel lab study, TCE degradation, sulfate reduction, methane production, and depletion of volatile fatty acids all occurred at more rapid rates at 115°F versus comparable reactors maintained at 56°F. ***Slides:*** https://www.battelle.org/docs/default-source/hidden/2023-bio-symp-presentations/track-a/a3_1300_57_krembs.pptx.pdf?sfvrsn=7a98468b_3 ***Longer abstract:*** https://www.battelle.org/docs/default-source/hidden/2023-bio-symp-abstracts/57_updabs.pdf?sfvrsn=9503489f_3

IN SITU TREATMENT FOR HEXAVALENT CHROMIUM USING ISCR ENHANCED BIOREMEDIATION IN SATURATED CLAY SOILS RESULTS IN NO FURTHER ACTION

Miller, O. and Ryan Moore. I 2023 Bioremediation Symposium Proceedings, 8-11 May, Austin, TX, 16 slides, 2023

A pilot program was conducted to evaluate two options to treat hexavalent chromium (>300 mg/L) in an unconfined aquifer at a former plating facility. The first pilot test utilized in situ chemical reduction (ISCR) via zero-valent iron (ZVI) slurry. The second pilot test employed an engineered staged released electron donor to facilitate anaerobic bioremediation in combination with a soluble divalent iron (DVI). The reagents were injected using direct push technology (DPT) methods. Results demonstrated that both approaches were adequate, but the combination of the electron donor and DVI yielded better results throughout the study. The full-scale application used the same proven, staged electron donor but switched the ISCR reagent to a colloidal suspension of a sulfidated ZVI to increase the ISCR longevity and reactivity. Through 126 DPT injection points, ~18,000 gals of the ISCR/donor solution was applied over a ~9,000 ft^2 treatment area, generally between 7 ft and 22 ft bgs, into the saturated clay aquifer. Results from the pre-remediation testing showed performance was significantly better using a bio-enhanced ISCR approach with a self-distributing electron donor and a sulfidated ZVI. Post-application results demonstrated >99% reduction of hexavalent chromium to below lab detection limits in groundwater for over two years resulting in No Further Action. Results confirmed that high concentrations of hexavalent chromium (>300 mg/L) can be treated using reductive technologies and that the low permeability aquifer can accept sufficient fluids for in situ remediation. ***Slides:*** https://www.battelle.org/docs/default-source/hidden/2023-bio-symp-presentations/track-a/a5_0915_237_miller.pptx.pdf?sfvrsn=a3843962_3 ***Longer abstract:*** https://www.battelle.org/docs/default-source/hidden/2023-bio-symp-abstracts/237.pdf?sfvrsn=77e98ec6_3

Demonstrations / Feasibility Studies

FIELD VALIDATION OF A NOVEL PASSIVE SAMPLER FOR DISSOLVED PFAS IN SURFACE WATERS

Gardiner, C., A. Robuck, J. Becanova, M. Cantwell, S. Kaserzon, D. Katz, J. Mueller, and R. Lohmann. | Environmental Toxicology and Chemistry 41(10):2375-2385(2022)

A novel integrative passive sampler was field-tested to derive sampling rates (R_S) for nine PFAS in surface waters. Three sampling campaigns were conducted, deploying polyethylene tube passive samplers in the effluent of two wastewater treatment plant (WWTP) effluents across Narragansett Bay for 1 month each. Passive samplers exhibited linear uptake of PFAS in the WWTP effluents over 16-29 days, with in situ Rs for nine PFAS ranging from 10 ml/day (perfluoropentanoic acid) to 29 ml/day (PFOS). Similar sampling rates (19 ± 4.8 ml/day) were observed in estuarine field deployments. Applying these R_S values in a different WWTP effluent predicted dissolved PFAS concentrations mostly within 50% of their observations in daily composite water samples, except for perfluorobutanoic acid (where predictions from passive samplers were 3 times greater than measured values), perfluorononanoic acid (1.9 times), perfluorodecanoic acid (1.7 times), and perfluoropentanesulfonic acid (0.1 times). Results highlight the potential use of passive samplers as measurement and assessment tools of PFAS in dynamic aquatic environments.

LEACHING OF PERFLUOROALKYL ACIDS DURING UNSATURATED ZONE FLUSHING AT A FIELD SITE IMPACTED WITH AQUEOUS FILM FORMING FOAM

Schaefer, C.E., G.M. Lavorgna, D.R. Lippincott, D. Nguyen, A. Schaum, C.P. Higgins, and J. Field. | Environmental Science & Technology 57(5):1940-1948(2023)

In situ water flushing was performed at an AFFF-impacted site to accelerate PFAA leaching from unsaturated soils in a highly characterized field test cell. Porous cup suction lysimeters were used to assess the changes in PFAA porewater concentrations as a function of PFAA mass removal from the unsaturated soils, where flushing was intermittently paused to determine ambient PFAA porewater concentrations. The fractional decreases in PFAA porewater concentrations during flushing exceeded the fractional decrease in PFAA mass removal from the soil. PFOS porewater concentrations decreased by 76% (with negligible rebound) compared to a 7.4% decrease in overall PFOS mass removed from the unsaturated zone. Overall, results suggest that less stringent soil cleanup criteria may be more appropriate when considering soil impacts to groundwater than those that consider an equivalent relationship between mass removal and mass discharge. In addition, remedial approaches that remove only a modest fraction of the PFAA soil mass may protect underlying groundwater, particularly for perfluorinated sulfonates with at least six carbons.

TREATMENT OF PAHS CONTAMINATED SOIL IN ABANDONED INDUSTRIAL SITE USING COMBINED METHOD OF IMPROVED IN SITU CAPPING AND ELECTROKINETIC ENHANCED-BIOREMEDIATION

Li, J., F. Li, M. Tong, and S. Guo. | Journal of Hazardous Materials 455:131606(2023)

This study proposed an improved in situ cap combined with electrokinetic-enhanced bioremediation and investigated its feasibility in treating PAH-contaminated soil at an abandoned industrial site. Changes in soil properties, concentration of PAHs, and microbial community in experiments with 0, 0.8, 1.2, and 1.6 V/cm voltages were analyzed. Results showed that improved in situ capping could effectively sequester migration of PAHs by adsorption and biodegradation, and an electric field could enhance removal of PAHs from contaminated soil and the bio-barrier. In electric field experiments, the soil environment under the voltage of 1.2 V/cm was more favorable for the growth and metabolism of microorganisms. The residual concentrations of PAHs (19.47 ± 0.76 mg/kg and 619.38 ± 20.05 mg/kg) in the bio-barrier and contaminated soil of the experiment with 1.2 V/cm were the lowest, indicating that optimization of the electric field conditions may lead to better results.

INCREASING IN SITU BIOREMEDIATION EFFECTIVENESS THROUGH FIELD-SCALE APPLICATION OF MOLECULAR BIOLOGICAL TOOLS

Madison, A.S., S.J. Sorsby, Y. Wang, and T.A. Key.
Frontiers in Microbiology 13:1005871(2023)

A standardized framework pairing Molecular Biological Tools (MBTs) with traditional contaminant and geochemical analyses was successfully applied at two contaminated sites. At a TCE-impacted groundwater site, framework application informed the design of an enhanced bioremediation approach. Baseline abundances of 16S rRNA genes for a genus of obligate organohalide-respiring bacteria were measured at low abundances (101-102 cells/mL) within the TCE source and plume areas. Data combined with geochemical analyses suggested that intrinsic biodegradation (i.e., reductive dechlorination) was occurring, but activities were limited by electron donor availability. The framework was utilized to support the development of a full-scale enhanced bioremediation design and to monitor remedial performance. The framework was applied at a second site with residual petroleum hydrocarbon-impacted soil and groundwater. MBTs, specifically qPCR and 16S gene amplicon rRNA sequencing, were used to characterize intrinsic bioremediation mechanisms. Functional genes associated with anaerobic biodegradation of diesel components were 2-3 orders of magnitude greater than unimpacted background samples. Intrinsic bioremediation mechanisms were found to be sufficient to achieve groundwater remediation objectives. The framework was further utilized to assess that enhanced bioremediation could be a successful remedial alternative or complement to source area treatment. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9950576/pdf/fmicb-13-1005871.pdf

Research

A SENSITIVE METHOD FOR THE DETECTION OF LEGACY AND EMERGING PER- AND POLYFLUORINATED ALKYL SUBSTANCES (PFAS) IN DAIRY MILK

Hill, N.I., J. Becanova, and R. Lohmann.
Analytical and Bioanalytical Chemistry 414:1235-1243(2022)

A sensitive method to determine 27 PFAS in milk was modified and applied to raw and processed milk samples from 13 farms across the U.S. as several documented cases of PFAS-contaminated dairy milk have raised concerns over this exposure pathway. Combining acid and basic extraction methods and ENVI-Carb cleanup achieved recoveries of targeted PFAS between 70 and 141%. The method detection limits ranged from 0.8 to 22 ng/L (for 26 PFAS) and 144 ng/L for perfluorobutanoic acid (PFBA). The uniqueness of this method is considered in the targeted screening of a broad range of legacy PFAS, as well as perfluorinated sulfonamide species and fluorotelomer sulfonates. No legacy PFAS were detected in 13 milk samples from regions of concern, despite local use of biosolids or proximity to fire training areas.

LIMITED EFFECTIVENESS OF CARBONACEOUS SORBENTS IN SEQUESTERING AGED ORGANIC CONTAMINANTS IN SEDIMENTS

Taylor, A.R., J. Wang, P. Kaur, D. Schlenk, and J. Gan
Environmental Science & Technology 57(25):9385-9393(2023)

Three different carbonaceous sorbents (biochars, powdered activated carbon, and granular activated carbon) were amended to a Superfund site marine sediment contaminated with DDT residues. The amended sediments were incubated in seawater for up to 1 year, then the freely dissolved concentration (C_{free}) and biota-sediment accumulation factors (BSAFs) for a native polychaete were measured. Even though the bulk sediment concentrations were very high (6.4-154.9 µg/g OC), both C_{free} and BSAFs were low, ranging from non-detect to 1.34 ng/L and from non-detect to 0.024, respectively. Adding carbonaceous sorbents, even at 2% (w/w), did not consistently lead to reduced DDT bioaccumulation. The limited effectiveness of carbonaceous sorbents was attributed to the low DDT availability due to prolonged aging, highlighting the need for considering contaminant aging when using sorbents for remediation.

EFFECT OF ARSENIC ON EPS SYNTHESIS, BIOFILM FORMATION, AND PLANT GROWTH-PROMOTING ABILITIES OF THE ENDOPHYTES PSEUDOMONAS PD9R AND RAHNELLA LATICIS PD12R. I

Tournay, R.J., A. Firrincieli, S.S. Parikh, D.M. Sivitilli, and S.L. Doty.
Environmental Science & Technology 57(23):8728-8738(2023)

In vitro and *in silico* methods were used to compare the arsenic resistance mechanisms, synthesis of extracellular polymeric substances (EPS), biofilm formation, and plant growth-promoting abilities of the endophytes Pseudomonas sp. PD9R and *Rahnella laticis* PD12R. PD12R tolerates arsenate (As(V)) and arsenite (As(III)) to concentrations 5x greater than PD9R, synthesizes high volumes of EPS in response to arsenic, and sequesters arsenic in the capsular EPS and cells. While arsenic exposure induced EPS synthesis in both strains, only PD12R continued to form biofilms at high As(III) and As(V) concentrations. The effects of endophyte inoculation on *Arabidopsis* growth varied by strain and As(V) concentration; PD9R positively affected plants exposed to low levels of arsenic. Comparative genomic analyses exploring the EPS synthesis and arsenic resistance mechanisms against other *Pseudomonas* and *Rahnella* strains suggest that both strains possess atypical arsenic resistance mechanisms from other plant-associated strains. In contrast, the configuration of the EPS synthesis systems appeared to be more broadly distributed among plant- and non-plant-associated strains.

BENCH-SCALE ASSESSMENT OF NMR AND COMPLEX RESISTIVITY (CR) SCREENING TECHNOLOGIES FOR RAPID ASSESSMENT OF PFAS IN SOILS AND SEDIMENTS

Slater, L., K. Keating, and C. Schaefer. SERDP Project ER19-1128, 60 pp, 2022

This exploratory project investigated the hypothesis that "sorption of PFAS compounds onto soil-fluid interfaces will result in a detectable complex resistivity (CR) and/or nuclear magnetic resonance (NMR) response." Specific objectives focused on evaluating the potential for using these technologies as rapid screening tools to evaluate PFAS in soil and sediments. CR and NMR measurements were acquired on artificial and natural soils collected from the source zone at Joint Base McGuire Dix Lakehurst (JBMDL). The artificial soil experiments involved measurements on contaminated sand/organic material, sand/clay material, and pure sand mixtures to evaluate the sensitivity of CR and NMR measurements to sorption of PFAS constituents in a commercial AFFF solution. Initial measurements on natural soils focused on samples acquired from impacted, suspected impacted, and assumed uncontaminated locations around the source zone. These soils were saturated with a synthetic groundwater based on the composition of JBMDL groundwater. Three natural soil samples from JBMDL were monitored for one month during continuous flushing of the samples with the synthetic groundwater to promote the desorption of PFAS compounds from the contaminated soil. The CR response of PFAS-contaminated soils from JBMDL before and after methanol treatment to remove strongly sorbed PFAS constituents

was investigated in a related effort. The second phase also exploited a unique opportunity to perform a series of preliminary field-scale CR measurements on a transect crossing the source zone at JBMDL. Results showed that the low-field NMR geophysical method has inadequate sensitivity to detect PFAS in soil. No detectable signals were observed in the lab, so the technology was not pursued in the subsequent preliminary field-scale investigations. In contrast, lab measurements provided evidence that sorption of PFAS contaminants onto artificial and natural soil may result in a detectable CR signature. CR signals on artificial soils saturated with synthetic PFAS-contaminated groundwater captured the temporal evolution of a polarization attributed to PFAS sorption. However, lab measurements on natural soils acquired from JBMDL did not conclusively establish a link between soil PFAS concentrations and CR signal. Although no detectable CR response was recorded from flushing a natural PFAS-contaminated soil to promote desorption over one month, a significant decrease in imaginary conductivity was recorded following a methanol wash procedure to promote PFAS desorption. Field-scale CR measurements at JBMDL revealed an intriguing complex conductivity pattern, with imaginary conductivity increasing towards the expected source of the contamination.
https://serdp-estcp-storage.s3.us-gov-west-1.amazonaws.com/s3fs-public/2023-03/ER19-1128%20Final%20Report.pdf

STUDY TO ASSESS TREATMENT ALTERNATIVES FOR REDUCING PFAS IN LEACHATE FROM STATE-OWNED LANDFILLS
State of Maine Department of Administrative and Financial Services, Bureau OF General Services, 258 pp, 2023

A study of methods to treat PFAS in leachate collected from the Juniper Ridge Landfill in Old Town and the Dolby Landfill in East Millinocket was conducted. Specifically, the study identified four readily available methods to reduce the concentration of six regulated PFAS to no more than 20 ng/l, the Maine Interim Drinking Water Standard for PFAS in drinking water: 1) adsorption media (e.g., granular activated carbon and ion exhange resins); 2) reverse osmosis; 3) foam fractionation; and 4) electrochemical advanced oxidation process.
https://www.maine.gov/dafs/bgs/sites/maine.gov.dafs.bgs/files/inline-files/Resolves%202021%2C%20ch.%20172%20Study.pdf

INTERLABORATORY STUDY OF POLYETHYLENE AND POLYDIMETHYLSILOXANE POLYMERIC SAMPLERS FOR EX SITU MEASUREMENT OF FREELY DISSOLVED HYDROPHOBIC ORGANIC COMPOUNDS IN SEDIMENT POREWATER
Lotufo, G.R., M.M. Michalsen, D.D. Reible, P.M. Gschwend, U. Ghosh, A.J. Kennedy, K.M. Kerns, M.I. Rakowska, A. Odetayo, J.K. MacFarlane, S. Yan, and M. Bokare.
Environmental Toxicology and Chemistry 41(8):1885-1902(2022)

A study evaluated the precision and accuracy of multi-lab measurements to determine freely dissolved concentrations (C_{free}) of PAHs and PCBs in sediment porewater using polydimethylsiloxane (PDMS) and low-density polyethylene (LDPE) polymeric samplers. Four labs exposed performance reference compound (PRC) preloaded polymers to actively mixed and static ex situ sediment for ~1 month; two labs had longer exposures (2 and 3 months). For C_{free} results, intra-lab precision was high for single compounds (coefficient of variation 50% or less), and for most PAHs and PCBs, inter-lab variability was low across polymers and exposure methods. Variability was higher for the most hydrophobic PAHs and PCBs, present at low concentrations and requiring larger PRC-based corrections, and naphthalene, likely due to differential volatilization losses between labs. Overall, there was low intra- and interlab variability between methods (PDMS vs. LDPE, actively mixed vs. static exposures). C_{free} polymer equilibrium was achieved in ~1 month during active exposures, suggesting that using PRCs may be avoided for ex situ analysis using comparable active exposure; however, such ex situ testing may not reflect field conditions. Polymer-derived C_{free} concentrations for most PCBs and PAHs were on average, within a factor of 2 compared with concentrations in isolated porewater, which were directly measured by one lab; difference factors of up to 6 were observed for naphthalene and the most hydrophobic PAHs and PCBs. The C_{free} results were similar for academic and private sector labs. https://setac.onlinelibrary.wiley.com/doi/epdf/10.1002/etc.5356

General News

PFAS PODCAST SERIES: SERDP AND ESTCP RESEARCH AND DEMONSTRATIONS
Guillette, T., SERDP & ESTCP Project ER23-7692, 2023

This podcast series focuses on SERDP and ESTCP research and demonstrations that address PFAS in the environment. The podcasts highlight three primary topics: remediation, fate and transport, and ecotoxicity. In the first season, a broad panel of experts who have each contributed to the growing knowledge base around remediating this emerging chemical of concern will be interviewed. As the podcasts are published, they will be available for users. *For a list of upcoming podcasts and to listen to previous podcasts, see* https://serdp-estcp.org/projects/details/d8fdde05-10b6-43d4-a4d3-2a1a60329392

FY 2022 SUPERFUND ACCOMPLISHMENTS REPORT
EPA Website, Updated June 21, 2023

Throughout fiscal year 2022, the Superfund program protected human health and the environment nationwide by accelerating cleanups, developing innovative remedies, responding rapidly to emergencies, advancing environmental justice, and supporting sites' return to beneficial use.
https://www.epa.gov/superfund/superfund-accomplishments-report-fiscal-year-2022

EVALUATING SOURCE CONTROL SUFFICIENCY WITH TIGSED, A SMALL-SCALE SEDIMENT CONTAMINATION MODEL
Rose, N.D., P. Spadaro, and J. Dittman | Northwest Remediation Conference, 2 May, Tacoma, WA, 19 slides, 2023

The Sediment Contamination Assessment Model (SEDCAM) is a modeling approach developed to estimate the contribution of source loadings to sediment in Commencement Bay, a Superfund site in Puget Sound. The TIGSED modeling approach combines the SEDCAM equation with stormwater and sediment modeling data to provide sediment contamination concentrations on a much smaller scale than possible with the original SEDCAM equation. TIGSED provides the ability to calculate millions of SEDCAM equation results in a matter of minutes, allowing for parameters to be adjusted year-by-year and the application of SEDCAM equations on a very small spatial scale. This can be combined with information on upland and water sources to understand whether these sources will result in recontamination, identify the specific areas likely to be re-contaminated and assess the most efficient ways to control multiple sources. The presentation includes case studies that show how TIGSED can be applied to determine whether current sources are sufficiently controlled. The presentation also describes how the methodology can be used to evaluate the potential for controlling multiple sources when the results determine that source is likely to result in recontamination. https://nwremediation.com/wp-content/uploads/3B_DeMars.pdf

MICROBIAL AND THERMAL TREATMENT TECHNIQUES FOR DEGRADATION OF PFAS IN BIOSOLIDS: A FOCUS ON DEGRADATION MECHANISMS AND PATHWAYS
Kumar, R., T.K. Dada, A. Whelan, P. Cannon, M. Sheehan, L. Reeves, and E. Antunes.
Journal of Hazardous Materials 452:131212(2023)

In this article, PFAS degradation mechanisms utilized in thermal treatment like pyrolysis, incineration, gasification, smoldering combustion, hydrothermal liquefaction (HTL), and biodegradation are reviewed and compared. For example, in PFOS biodegradation, C-S bond cleavage occurs first, followed by hydroxylation, decarboxylation, and defluorination reactions to form perfluoroheptanoic acid. In HTL, PFOS degradation is carried through OH^-, catalyzed through a series of nucleophilic substitution and decarboxylation reactions. In contrast, thermal PFOS degradation involves a three-step random-chain scission pathway. The first step includes C-S bond cleavage, followed by defluorination of perfluoroalkyl radical, and radical chain propagation reactions. Lastly, the termination of chain propagation reactions produces very short-fluorinated units. Important policies and strategies employed worldwide to curb PFAS contamination in biosolids are also highlighted in the article.

RECENT ADVANCES IN 1,4-DIOXANE REMOVAL TECHNOLOGIES FOR WATER AND WASTEWATER TREATMENT
Tang, Y. and X. Mao. | Water 15(8):1535(2023)

This review summarizes the current available physicochemical and biological treatment technologies for removing 1,4-dioxane from water and wastewater and discusses the strategies that may fulfill the stringent 1,4-dioxane standard. Advanced oxidation processes, such as ultraviolet radiation coupled with H_2O_2 (8-10 mg/L), have shown efficient 1,4-dioxane destruction and have been applied for water and wastewater treatment processes. On the other hand, more than 30 pure microbial strains and microbial communities that can metabolically or metabolically degrade 1,4-dioxane were reported. Biodegradation has been proven to be a feasible and cost-effective approach for 1,4-dioxane remediation. Suspended growth bioreactor, immobilized cell bioreactor, and biofiltration systems were the most used biological approaches to remove 1,4-dioxane from contaminated water. Though 1,4-dioxane easily desorbs after the adsorption by materials such as granular activated carbon and zeolite, temporary 1,4-dioxane removal by adsorption followed by 1,4-dioxane biodegradation in the bioaugmented adsorption media, may be a feasible strategy to treat 1,4-dioxane-contaminated water.
https://www.mdpi.com/2073-4441/15/8/1535/pdf?version=1681463438

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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