Technology Innovation News Survey

Entries for March 1-15, 2021

Market/Commercialization Information

U.S. Army Corps of Engineers (USACE), Mobile District, Mobile, AL. Contract Opportunities at Beta.SAM, Solicitation W9127820R0060, 2021

The purpose of this announcement is to replace solicitation W9127820R0060, originally issued October 8, 2020, in its entirety. This competitive small business (SB) and 8(a) small business set-aside solicitation for a MATOC (multiple-award task-order contract) will provide Environmental Remediation Services (ERS) under NAICS code 562910 in support of the Army and Air Force installation restoration programs. The MATOC will be used primarily at Cape Canaveral Air Force Station, Patrick AFB, Homestead Air Reserve Base, Avon Park Air Force Range, MacDill AFB, Maxwell/Gunter AFB, and Arnold AFB, but may be used anywhere in the Mobile District AOR, which includes the states of Alabama, Tennessee, Mississippi, and Florida and other assigned locations. The term of this MATOC is 10 years from date of contract award with a total capacity of $249M. The Government anticipates awarding a target of seven SB contracts to share $219M in capacity and a target of five 8(a) SB contracts to share $30M in capacity. Firms may compete for both pools; however, separate proposals are required for each pool. The ERS consist of hazardous, toxic and radioactive waste (HTRW) assessments, investigations, studies, remedial designs, remedial actions and operations, monitoring, and other related services, including construction of restoration support facilities. Questions must be received via the ProjNet bidder inquiry key by 2:00 PM CT on April 20, 2021. Offers are due by 2:00 PM CT on May 5, 2021. https://beta.sam.gov/opp/b2c8b373b2324c1c9d4a01d01b90bc4b/view

A-E INDEFINITE DELIVERY CONTRACT FOR HAZARDOUS, TOXIC AND RADIOACTIVE WASTE SUPPORT FOR THE GREAT LAKES / OHIO RIVER DIVISION
U.S. Army Corps of Engineers (USACE), Huntington District, Huntington, WV.
Contract Opportunities at Beta.SAM, Solicitation W91237-21-R-0004, 2021

This acquisition is a total small business set-aside under NAICS code 541620 for a single award not to exceed $3M over the life of the 5-year contract. The majority of work under this contract will be to support the Huntington District's Section 202 Nonstructural Flood Damage Reduction Program (i.e., residential and commercial floodproofing/acquisitions under the 202 program) in West Virginia, Virginia, Ohio, North Carolina, and Kentucky, as well as to support the District's intergovernmental and interagency support program, and other civil works projects. Offers are due by 4:00 PM ET on May 6, 2021. https://beta.sam.gov/opp/9ded7cfffd9748be832c94f2e2e1669f/view

SANTA MONICA MOUNTAINS NATIONAL RECREATION AREA & WOOLSEY FIRE
National Park Service, PWR GOGA (86000) San Francisco, CA.
Contract Opportunities at Beta.SAM, Solicitation 140P8421R0003, 2021

This acquisition is a service-disabled veteran-owned small business set-aside (SDVOSB) under NAICS code 562910. The National Park Service, Santa Monica Mountains National Recreation Area has a requirement for site remediation throughout nine areas of the park where ash and surface soil were affected by release to the environment of contaminants of potential concern (COPCs) as a result of buildings burned in the Woolsey Fire in November of 2018. The COPCs include metals, dioxins and furans, PCBs, and asbestos. The work of this contract consists of supervision, labor, tools, and equipment necessary to load, haul, accept, process, record, reduce, and provide final disposal of remaining soils that exceed preliminary remedial goals for nine areas throughout the recreation area, followed by debris removal and disposal, and site restoration. Contractor shall obtain all necessary permits required to complete the work. Site visits will be by appointment only. Project range is estimated to be between $500,000 and $1M. Offers are due by 4:00 PM PT on May 10, 2021.https://beta.sam.gov/opp/c86f2822094a480db272e07120bfd18c/view

DEPARTMENT OF ENERGY, OFFICE OF ENVIRONMENTAL MANAGEMENT SPECIAL NOTICE - PROCUREMENT SCHEDULE UPDATE
Dept of Energy, Environmental Management Consolidated Business Center, Cincinnati, OH.
Contract Opportunities at Beta.SAM, Solicitation EM_PROCUREMENT_UPDATE, 2021

The Department of Energy is providing updated procurement schedule information regarding two near-term RFPs. Final RFP release dates are anticipated no sooner than May 2021 for the Waste Isolation Pilot Plant Operations contract and May 2021 for the Waste Isolation Pilot Plant Transportation contract. This information is subject to further change based on continued COVID-19 impacts. Submit any questions or comments about the stated timeframes or any related matters of concern to Aaron Deckard, EMCBC Acquisition Integration Lead, atEMProcurementNews@emcbc.doe.gov. https://beta.sam.gov/opp/d5dd0163414b45a8951655d1e2330ae3/view

SPECIAL NOTICE FOR UCMR 5
U.S. Environmental Protection Agency, Acquisition Division, Cincinnati, OH
Contract Opportunities at Beta.SAM, Solicitation 68HERC21R0109, 2021

EPA's Office of Ground Water and Drinking Water is announcing a potential future opportunity for analytical laboratory services supporting the Fifth Unregulated Contaminant Monitoring Rule (UCMR 5) under NAICS code 541380. UCMR 5 requires systems to collect occurrence data for contaminants that might be present in drinking water but are not yet subject to EPA's drinking water standards. The UCMR 5 proposal outlines monitoring between 2023 and 2025 for 30 new chemical contaminants, consisting of 29 per- and polyfluoroalkyl substances (PFAS) and lithium using analytical methods developed by EPA and consensus organizations. Labs interested in this opportunity must first complete the UCMR 5 Laboratory Approval Program, which includes passing proficiency testing studies for all the UCMR 5 EPA analytical methods (i.e., 200.7, 533 and 537.1). EPA expects to undergo the competitive contract-award process prior to the end of the PT program, which is anticipated to conclude in late 2022. The tentative PT schedule for 2021 is as follows: May, August, and November. Monitor FedConnect for updates at https://www.fedconnect.net/FedConnect/?doc=68HERC21R0109&agency=EPA. To qualify to participate in a PT study, labs must submit complete method documentation to EPA by the end of the month preceding the respectively scheduled PT study. https://beta.sam.gov/opp/239eec357fe3db109589c8dd4345b31d/view

Cleanup News

EVALUATION AND APPLICATION OF THE PURGE ANALYZER TOOL (PAT) TO DETERMINE IN-WELL FLOW AND PURGE CRITERIA FOR SAMPLING MONITORING WELLS AT THE STRINGFELLOW SUPERFUND SITE IN JURUPA VALLEY, CALIFORNIA, IN 2017
Harte, P.T., Perina, T., Becher, K., Levine, H., Rojas-Mickelson, D., Walther, L., and Brown, A., 2021, U.S. Geological Survey Scientific Investigations Report 2020–5140, 54 p., 2021

USGS and U.S. EPA are developing analytical tools to assess the representativeness of groundwater samples from fractured-rock aquifers. Monitoring wells from the Stringfellow Superfund site were field-tested to collect information to help evaluate and apply in-well flow as computed by the PAT, which computes in-well groundwater travel times for simple piston transport of inflowing groundwater from open intervals of a monitoring well to the pump intake. PAT can also provide insight into optimal purging parameters (duration, rate, and pump position) needed to collect representative groundwater samples. Hydraulic, chemistry, and dye tracer analysis were conducted to investigate travel times in wells under pumping conditions. PAT was able to replicate travel times for one of three wells that had appreciable inflow from the aquifer but not the other two wells, which are screened in low-permeability sediments and rock, where flow was dominated by borehole storage. A set of criteria was established to help assess the ability to collect representative groundwater chemistry from monitoring wells. *Download the report and related work at* https://pubs.er.usgs.gov/publication/sir20205140.

TECHNOLOGY UPDATE & REVIEW - ACTIVATED CARBON FOR CONTAMINANT CONTROL AND SITE REMEDIATION
Pare, J. | Smart Remediation, 4 February, virtual, 24 slides, 2021

This presentation reviews the principles around the use of activated carbon in situ and how the technology can be used to remediate organic contaminants in soil and groundwater, including field application and drawbacks and limitations. Real-life case studies are included that identify some of the major considerations in screening, selecting, designing, implementing, and monitoring a full-scale treatment project.
https://2ziaphmm3zh1x23mj335yjxt-wpengine.netdna-ssl.com/wp-content/uploads/2021/01/SMART-Remediation-Virtual-Session-1-Feb-4-2021-Jean-Pare-1.pdf

IN-SITU SOIL REAGENT MIXING TECHNOLOGIES FOR INTEGRATED REMEDIATION AND RESTORATION OF CONTAMINATED SITES
Schifano V. | Smart Remediation, 4 February, virtual, 24 slides, 2021

This presentation includes case histories that illustrate applications of in situ soil reagent mixing technologies, including innovative approaches relying on simultaneous introduction of oxidizing agents and binders to couple the contaminant mass-reduction remedial mechanisms of chemical oxidation with leaching control mechanisms and geotechnical improvement of the treated materials that allow immediate reuse of the site.
https://2ziaphmm3zh1x23mj335yjxt-wpengine.netdna-ssl.com/wp-content/uploads/2021/01/SMART-Remediation-Virtual-Session-3-Feb-18-2021-Vito-Schifano-1.pdf

PEACE OF MIND AGAINST UNWANTED INTRUDERS: CASE STUDY ON SUB-SLAB VAPOUR INTRUSION PROTECTION MEASURES
Patel, P. | Smart Remediation, 4 February, virtual, 27 slides, 2021

One of the many contaminant management strategies to prevent soil vapor intrusion in a building involves installing a sub-slab depressurization system (SSDS). An SSDS consisting of a void form using Cupolex® was installed at a multi-tenant residential property when the presence of groundwater containing elevated concentrations of PCE and TCE had an impact on the air quality within the unoccupied basement. Following the operation of the SSDS at the property, the indoor air quality within the affected areas met the Ontario Ministry of the Environment, Conservation and Parks Health-Based Indoor Air Criteria for contaminants of the concern that exceeded previously.
https://2ziaphmm3zh1x23mj335yjxt-wpengine.netdna-ssl.com/wp-content/uploads/2021/01/SMART-Remediation-Virtual-Session-3-Feb-18-2021-Paresh-Patel.pdf

EVALUATION OF LONG-TERM PERFORMANCE OF STABILIZED SEDIMENT FOR BENEFICIAL USE
Maher, A., R. Miskewitz and R. Nazari, Rutgers, State of New Jersey Department of Transportation, And U.S. DOT Federal Highway Administration, 24 pp, 2020

Six sites in NJ were visited where stabilized dredged materials (SDM) had been used to augment and/or replace borrowed materials. Site records and studies were reviewed. Each site had a different type of soil, waste, and pollution and employed different binder and remediation system. The data revealed no evidence of chemical releases, likely because the sites were capped or filled with SDM. The geotechnical requirements of the material were generally met except the National Lead site, most likely due to the initial mixing during stabilization. Based on the six sites, the authors concluded that SDM does not break down or fail to maintain its design functionhttps://cait.rutgers.edu/wp-content/uploads/2019/01/cait-utc-nc54-final.pdf

THE IN SITU TREATMENT OF TCE AND PFAS IN GROUNDWATER WITHIN A SILTY SAND AQUIFER
McGregor, R. and Y. Zhao | Remediation 31(2):7-17(2021)

At a former industrial site, shallow groundwater contained concentrations of TCE, cis-1,2-DCE, and VC as high at 585, 258, and 54 µg/L, respectively. Groundwater also contained maximum concentrations of the following PFAS: 12,800 ng/L perfluoropentanoic acid, 3,240 ng/L perfluorohexanoic acid, 795 ng/L perfluorobutanoic acid, 950 ng/L perfluorooctanoic acid, and 2,140 ng/L perfluorooctanesulfonic acid. A combination of remedial approaches was selected, with adsorption being used for PFAS and adsorption, chemical reduction, and anaerobic biodegradation used for the chlorinated ethenes. Two years of groundwater sampling indicated that the detected PFAS were treated to either their detection or below the analytical detection limit over the monitoring period. Post-injection results for the chlorinated ethenes indicated that the concentrations decreased by an order of magnitude within 4 months, with TCE decreasing to below the analytical detection limit over the 2-year monitoring period. Cis-1,2-DCE, and vinyl chloride concentrations decreased by over 90% within 8 months of injections, remaining at or below these concentrations during the 2-year monitoring period. Analyses of *Dehalococcoides*, ethene, and acetylene over time suggest that microbiological and reductive dechlorination were occurring in conjunction with adsorption within the aquifer.

Demonstrations / Feasibility Studies

EVALUATION OF VAPOR INTRUSION RISK FROM ETHYLENE DIBROMIDE (EDB) USING THE VERTICAL SCREENING DISTANCE APPROACH
Kolhatkar, R.V., H. Luo, E.C. Berns, C. Gaule, and J. Watterson.
Groundwater Monitoring & Remediation [Published online 14 March prior to print]

Soil-gas and groundwater concentrations from 8 petroleum underground storage tank sites were analyzed for EDB using the vertical screening distance analytical method. The study assessed the frequency of EDB detections (soil-gas detection limit of ≤0.16µg/m^3) at various vertical separation distances. EPA's PVIScreen model was used to predict vertical screening distances for EDB in different vadose zone soil types above dissolved-phase and LNAPL sources. Ranges of estimated aerobic biodegradation rate constants for EDB, air exchange rates for residential buildings, and source vapor concentrations for other constituents were combined with conservative estimates of EDB source concentrations as model inputs. Concentrations of EDB in soil-gas indicated that the EPA-recommended vertical screening distances are protective of VI risk from EDB. Conversely, vertical screening distances predicted by modeling were >6ft for sites with sand and loam soil above dissolved phase sources and >15ft for sites with sand soil above LNAPL sources, highlighting the importance of soil characterization for VI screening at sites with EDB sources. https://ngwa.onlinelibrary.wiley.com/doi/epdf/10.1111/gwmr.12442

DECONTAMINATION OF DENSE NONAQUEOUS-PHASE LIQUIDS IN GROUNDWATER USING PUMP-AND-TREAT AND IN SITU CHEMICAL OXIDATION PROCESSES: A FIELD TEST
Xie, T., Z. Dang, J. Zhang, Q. Zhang, R.-H. Zhang, C.-J. Liao, and G.-N. Lu.
RSC Advances, 11:4237-4246(2021)

This field study combined pump-and-treat (P&T) and in situ chemical oxidation (ISCO) to remove DNAPLs from groundwater. Underground water pH, electrical conductivity, dissolved oxygen concentration, and SO_4^{2-} concentration provided indirect evidence of in situ chemical reactions. The P&T-ISCO process, which used 1.5% sodium persulfate and 0.03% sodium hydroxide, had a remarkable effect on DNAPLs. DNAPL diffusion distance was much higher under pumping conditions than under natural conditions. Pollutant concentration positively correlated with the pH, electrical conductivity, and dissolved oxygen concentration and negatively correlated with the SO_4^{2-} concentration during remediation. .
https://pubs.rsc.org/en/content/articlepdf/2021/ra/d0ra10010h

REMEDIATING CONTAMINATED GROUNDWATER WITH AN AERATED, DIRECT-PUSH, OXIDANT DELIVERY SYSTEM
Reece, J., M. Christenson, A. Kambhu, Y. Li, C.E. Harris, and S. Comfort.
Water 12:3383(2020)

A novel aerated, slow-release, oxidant delivery system continuously bubbled air beneath a slow-release oxidant in situ to create an airlift pump. The pump disperses water and oxidant from the top of the outer screen and draws it in at the bottom, creating a continuous circulation pattern around each drive point. This facilitates the spreading of the oxidant as it slowly dissolves from the wax matrix. Given that the aeration rate controls the outward flow of oxidant from the outer screen in all directions, the radius of influence around each drive point is largely a function of the outward velocity of the oxidant exiting the screen and the advection rate opposing the upgradient and lateral spreading. Results from temporal sampling from three field sites treated with the aerated oxidant system show that contaminant concentrations typically decreased 50-99% within 6-9 months after installation. Supporting flow tank experiments that demonstrate oxidant flow patterns and treatment efficacy are also presented. *This article is* ***Open Access*** *at* https://www.mdpi.com/2073-4441/12/12/3383.

FIELD-SCALE DEMONSTRATION OF IN SITU IMMOBILIZATION OF HEAVY METALS BY INJECTING IRON OXIDE NANOPARTICLE ADSORPTION BARRIERS IN GROUNDWATER
Mohammadian, S., B. Krok, A. Fritzsche, C. Bianco, T. Tosco, E. Cagigal, B. Mata, V. Gonzalez, M. Diez-Ortiz, V. Ramos, D. Montalvo, E. Smolders, R. Sethi, and R.U. Meckenstock. | Journal of Contaminant Hydrology 237:103741(2021)

An in situ adsorption barrier was constructed with colloidal iron oxide nanoparticles in a very heterogeneous, contaminated aquifer. Groundwater contaminants included up to 25 mg/L Zn, 1.3 mg/L Pb, 40 mg/L Cu, 0.1 mg/L Ni and other minor heavy metal pollutants below 1 mg/L, and sediment contaminants included>900 mg/kg Zn, >2000 mg/kg Pb, and >190 mg/kg Ni About 1,500 kg of goethite nanoparticles (461±266 nm diameter) were injected at low pressure into the aquifer through nine screened injection wells. In all wells, a radius of influence of at least 2.5 m was achieved within 8 h, creating an in situ barrier of 22×3×9 m. Despite the extremely high heavy metal contamination and strong aquifer heterogeneity, successful immobilization of contaminants was observed. The contaminant concentrations were strongly reduced immediately after the injection, and the abatement of the heavy metals continued for a total post-injection monitoring period of 189 days. Iron oxide particles were found to adsorb heavy metals even at pH values between 4 and 6, where low adsorption would have been expected. *This article is* ***Open Access*** *at* https://www.sciencedirect.com/science/article/pii/S0169772220303302.

A NEW FOAM-BASED METHOD FOR THE (BIO)DEGRADATION OF HYDROCARBONS IN CONTAMINATED VADOSE ZONE
Bouzid, I., D.P. Herrera, M. Dierick, Y. Pechaud, V. Langlois, P.Y. Klein, J. Albaric ,N. Fatin-Rouge. | Journal of Hazardous Materials 401:123420(2021)

An innovative foam-based method to deliver Fenton reagents (FR) and bacteria was assessed at field-scale to remediate a petroleum hydrocarbon (HC)-contaminated unsaturated zone. After surfactant foam injections, reagent solutions were delivered and propagated through a network of foam lamellae with a piston-like effect. Bench-scale experiments demonstrated the feasibility of the various treatments with HC removal efficiencies as high as 96%. Compared to the direct injection, the foam-based method led to larger radii of influence and a more isotropic delivery, and no detrimental effect regarding HC oxidation. Average degradation rates were increased by 20% despite 25% of HCs being expelled from the treated zone due to foam viscosity. Foam and reagent solutions injections in soil were tracked both using visual observation and differential electric resistivity tomography at field-scale. The latter demonstrated the controlled delivery of the reactive solutions using the foam-based method.

Research

LONG-TERM TRENDS IN REGIONAL WET MERCURY DEPOSITION AND LACUSTRINE MERCURY CONCENTRATIONS IN FOUR LAKES IN VOYAGEURS NATIONAL PARK
Brigham, M.E., D.D. VanderMeulen, C.A. Eagles-Smith, D.P. Krabbenhoft, R.P. Maki, and J.F. DeWild. | Applied Sciences 11(4):1879(2021)

This study reports on aqueous total mercury, methylmercury, and sulfate from epilimnetic lake-water samples; and total mercury in aquatic biota from four lakes in Voyageurs National Park from 2001-2018. Results suggest that regional- to continental-scale decreases in both mercury and sulfate emissions have benefitted aquatic resources, even in the face of global increases in mercury emissions. . *This article is* ***Open Access*** *at* https://www.mdpi.com/2076-3417/11/4/1879/htm.

CALCIUM ALUMINATE CEMENT AS AN ALTERNATIVE TO ORDINARY PORTLAND CEMENT FOR THE REMEDIATION OF HEAVY METALS CONTAMINATED SOIL: MECHANISMS AND PERFORMANCE
Calgaro, L., S. Contessi, A. Bonetto, E. Badetti, G. Ferrari, G. Artioli, and A. Marcomini.
Journal of Soils and Sediments: Soils, Sec 3, Remediation and Management of Contaminated or Degraded Lands

A High-Performance Solidification/Stabilization (HPSS®) process was applied to contaminated soil with the goals of obtaining safe and reusable granular materials and elucidating the mechanisms involved in the retention of several heavy metals. The HPSS process used ordinary Portland cement (OPC), calcium aluminate cement (CAC), and combinations of the two in different proportions. Performance was evaluated using leaching and mechanical tests, and the composition and microstructure of the treated samples were analyzed by XRD and SEM/EDX imaging. CAC performed better than OPC for most of the investigated metals, representing a good alternative to improve immobilization based on hydraulic binders. Applying a wet conditioning process improved the materials' performance. https://link.springer.com/content/pdf/10.1007/s11368-020-02859-x.pdf

ANALYSIS OF REMEDIAL SCENARIOS AFFECTING PLUME MOVEMENT THROUGH A SOLE-SOURCE AQUIFER SYSTEM, SOUTHEASTERN NASSAU COUNTY, NEW YORK
USGS in cooperation with the New York State Department of Environmental Conservation, Scientific Investigations Report 2020-5090, 94, 2020

A steady-state three-dimensional groundwater-flow model based on present conditions is coupled with the particle-tracking program MODPATH to assess the fate and transport of volatile organic-compound plumes within the Magothy and upper glacial aquifers. Once a steady-state model was developed and calibrated, eight hypothetical remedial scenarios were evaluated to hydraulically contain the volatile organic-compound plumes. Remedial scenarios were optimized to achieve full containment by altering the pumping-well locations, adjusting the pumping rates, and adjusting the discharge locations and rates. Groundwater-flow model analysis indicated that all optimal plume-containment scenarios would have negligible effects on streams and the saltwater-freshwater interface along the south shore of Long Island. https://pubs.usgs.gov/sir/2020/5090/sir20205090.pdf

DREDGED MARINE SEDIMENTS STABILIZED/SOLIDIFIED WITH CEMENT AND GGBS: FACTORS AFFECTING MECHANICAL BEHAVIOUR AND LEACHABILITY
Zhang, W.-L., L.-Y. Zhao, B.A. McCabe, Y.-H. Chen, and L. Morrison.
Science of The Total Environment 733:138551(2020)

Stabilization/solidification using Ordinary Portland cement (OPC) or Ground Granulated Blast Furnace Slag (GGBS) was investigated as a sustainable approach to recycle dredged marine sediment as construction material. The physicochemical variables were curing duration, curing temperature, and ambient pH. The results showed that S/S methods immobilized metals at a pH range of 4 to 10. Immobilization efficiencies of >99.9% for Mn, Fe, Zn, As, Ba, Pb, and >97.8% for Al, Cu, and Zn were reported over 100 days. GGBS replacement further improved sediment properties by enhancing strength, mitigating sediment alkalization, and offering better immobilization capacity for Fe, Ni, and Zn. The release of Al, Mn, Cu, As, Ba, and Pb was strongly associated with a coupling effect of the physicochemical factors. Mn mobility showed a dramatic sensitivity to ambient pH while Ba was less pH-dependent. Al release was related to strength and leached out by dissolution in all situations considered.

A SYNTHETIC BIOLOGY APPROACH USING ENGINEERED BACTERIA TO DETECT PERFLUOROALKYL SUBSTANCE (PFAS) CONTAMINATION IN WATER
Young, N.A., R.L. Lambert, A.M. Buch, C.L. Dahl, J.D. Harris, M.D. Barnhart, and J.J. Steel.
Military Medicine 186(1):801-807(2021)

The U.S. Air Force Academy International Genetically Engineered Machine Team is developing a cost- and time-efficient biological approach to detecting PFAS in environmental samples. The project involves genetically engineering *Rhodococcus jostii* strain RHA1 to contain novel DNA sequences composed of a propane 2-monooxygenase alpha (prmA) promoter and monomeric red fluorescent protein (mRFP). The prmA promoter is activated in the presence of PFAS and transcribes the mRFP reporter. The recombinant *R. jostii* containing the prmA promoter and mRFP reporter respond to exposure of PFAS by activating gene expression of the mRFP. At 100 µM of PFOA, the mRFP expression was increased 3-fold. Without exposure to PFAS compounds, *R. jostii* had no mRFP expression. With further refinement and modifications, a similar system could be readily deployed in the field around the world. *This article is* ***Open Access*** *at* https://academic.oup.com/milmed/article/186/Supplement_1/801/6119513?login=true.

REMEDIATION OF PBDES-METAL CO-CONTAMINATED SOIL BY THE COMBINATION OF METAL STABILIZATION, PERSULFATE OXIDATION AND BIOREMEDIATION
Ma, J., Q. Zhang, F. Chen, Q. Zhu, Y. Wang, and G. Liu.
Chemosphere 252:126538(2020)

Laboratory experiments were performed to investigate the efficiency of simultaneous metal stabilization, persulfate oxidation, and bioremediation to remediate PBDEs and toxic metals from soil polluted from electronic waste recycling. Biochar and bentonite were applied to the soil to immobilize Cu, Pb, Zn, and Ni. The toxicity level declined most significantly when 20 g/kg biochar +20 g/kg bentonite were applied. A dose of 20 mmol persulfate/kg soil was found to be suitable to oxidize soil PBDEs and enhance the bioavailability of PBDEs residue. Persulfate oxidation reduced soil organic matter content and dramatically decreased bacterial density. Nevertheless, microbial activity and number recovered during 90 days of bioremediation. The hybrid treatment scheme obtained a degradation efficiency of 94.6% and a mineralization efficiency of 60.3%. Soil bacterial community changed during the treatments, and there was an enrichment of PBDE-degrading populations during bioremediation relative to that of oxidized soil.

OPTIMIZATION OF INTEGRATED PHYTOREMEDIATION SYSTEM (IPS) FOR ENHANCED LEAD REMOVAL AND RESTORATION OF SOIL MICROBIAL ACTIVITIES
Manzoor, M., I. Gul, A. Manzoor, J. Kallerhoff, and M. Arshad.
Chemosphere 277:130243(2021)

Bacteria and fungi were co-applied to develop an IPS to efficiently remove Pb and restore microbial and enzymatic activities in degraded soil. Pb-tolerant bacterial and fungal strains were analyzed for antifungal and antibacterial activities through the disc diffusion method. Co-inoculation studies subsequently were performed to investigate the effects on phytoavailability and uptake of Pb by *Pelargonium hortorum* through soil incubation and pot culture experiments, respectively. The optimized IPS effectively restored enzymatic activities and could be applied for sustainable restoration of Pb-contaminated soil.

THE BIOAVAILABILITY OF DISSOLVED, PARTICULATE, AND ADSORBED ORGANIC CARBON IN GROUNDWATER SYSTEMS
Chapelle, F.H. | Groundwater 59(2):226-235(2021)

This study tested the hypothesis that dissolved organic carbon (DOC) bioavailability in groundwater may indicate the bioavailability of associated particulate organic carbon (POC) and adsorbed organic carbon (AOC) compartments. DOC bioavailability was compared between two aquifers receiving modern atmospheric recharge, but with the recharge passing through POC/AOC sources of substantially different geologic ages. POC/AOC bioavailability was measured in sediments from two aquifers before and after injection with bioavailable DOC consisting of dissolved sugars and emulsified vegetable oil. Results were consistent with the hypothesis that DOC bioavailability in groundwater reflects the bioavailability of the associated POC and AOC compartments and vice versa. Thus, DOC bioavailability may be a useful indicator of an aquifer's potential to drive reduction/oxidation processes that affect the chemical quality of groundwater.

General News

APPLICATION OF HORIZONTAL WELLS TO ENHANCE SITE REMEDIATION
NAVFAC Technical Report TR-NAVFAC-EXWC-EV-2103, 37 pp, 2020

Horizontal wells have become a cost-effective and practical tool to facilitate the remediation of contamination at challenging sites where vertical wells alone may not be able to achieve project objectives. This report provides Navy case studies where it was optimal to install horizontal wells and reviews recent advances in design and emplacement technologies for horizontal wells.
https://www.navfac.navy.mil/content/dam/navfac/Specialty%20Centers/Engineering%20and%20Expeditionary%20Warfare%20Center/Environmental/Restoration/er_pdfs/h/Horizontal%20Well%20Case%20Studies%2011_13_20_Final.pdf

EXTINGUISHING PETROLEUM VAPOR INTRUSION AND METHANE RISKS FOR SLAB-ON-GROUND BUILDINGS: A SIMPLE GUIDE
Davis, G.B., J.H. Knight, and J.L. Rayner.
Groundwater Monitoring & Remediation [Published online 14 March 2021 prior to print]

Aerobic biodegradation in the vadose zone between a subsurface source and a building foundation can eliminate risks from methane and petroleum vapor intrusion (PVI). Buildings can reduce the net flux of oxygen into the subsurface, which reduces degradation rates. This article looks at when PVI and methane risk becomes negligible or extinguished-defined by when oxygen is present across the entire sub-slab region of existing or planned slab-on-ground buildings. All building slab sizes, all depths to vapor sources, and the effect of spacings between buildings on the availability of oxygen in the subsurface are considered Comparison with field sites and example applications are provided, along with a simple 8-step screening guide set in the context of existing guidance on PVI assessment. https://ngwa.onlinelibrary.wiley.com/doi/epdf/10.1111/gwmr.12440

PITT FINDINGS ON PFAS DESTRUCTION TECHNOLOGIES
Gullett, B., EPA Tools & Resources Webinar, February 2021

This presentation highlights research results by EPA's PFAS Innovative Treatment Team (PITT), which was established in spring 2020, and presents the next steps for PFAS waste treatment technologies. The PITT was a six-month, dedicated full-time team of multi-disciplined EPA researchers brought together to concentrate their scientific efforts on exploring disposal and destruction options for PFAS-contaminated waste. During PITT's operation, the team worked together to assess current and emerging PFAS destruction technologies being explored by EPA, universities, other research organizations, and industry; explore the efficacy of these PFAS destruction technologies, including considering potentially hazardous byproducts; and evaluate the feasibility, performance, and cost of various PFAS destruction methods to better understand potential solutions. https://www.youtube.com/watch?v=QEN80hpoAmo&feature=youtu.be

ANEM: A SIMPLE WEB-BASED PLATFORM TO BUILD STAKEHOLDER UNDERSTANDING OF GROUNDWATER BEHAVIOR
Penny, G., C. Mullen, D. Bolster, B. Huber, and M.F. Muller.
Groundwater 59(2):273-280(2021)

A simple platform was developed that provides a straightforward, web-based user interface applicable to a wide variety of end-user scenarios. Groundwater behavior is modeled using images in anem, a new R package that serves as the engine for the web platform, anem-app, produced using R Shiny. Both tools allow users to define aquifer properties and pumping wells, view maps of hydraulic heads, and simulate particle tracking under steady-state conditions. These tools are platform-independent and open-source and are freely available. The tools were designed to lower the learning curve and up-front costs to building simple groundwater models. Integration with the R language allows for advanced analysis and deeper exploration of groundwater dynamics. The article describes how anem and anem-app are built in the R environment and demonstrates how planners or stakeholders might use them.

REVIEW OF AVAILABLE SOFTWARE FOR PFAS MODELING WITHIN THE VADOSE ZONE
AECOM on behalf of Michigan Department of Environment, Great Lakes, and Energy, 12 pp, 2020

This review identifies the most suitable vadose zone contaminant transport numerical modeling tools (VZMs) to simulate the transport of PFOA and PFOS from municipal biosolid-amended soils through the unsaturated zone to the underlying groundwater, evaluates and summarizes the capabilities and limitations of each VZM in a tabular format, and provides recommendations to select one or more VZMs suitable to simulate critical processes governing fate and transport of PFOS and PFOA in the subsurface. https://www.michigan.gov/documents/pfasresponse/Review_of_Available_Software_for_PFAS_Modeling_Within_the_Vadose_Zone_699324_7.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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