Technology Innovation News Survey

Entries for July 16-30, 2020

Market/Commercialization Information

OPTIMIZED REMEDIATION CONTRACT - COLUMBUS AFB, MS; KEESLER AFB, MS
Air Force Installation & Mission Support Center, 772 ESS PK JBSA, Lackland, TX.
Contract Opportunities at Beta.SAM, Solicitation FA8903-20-XXXX-MSORC-RFI01, 2020

This RFI constitutes market research and is issued for planning purposes only. The requirement is for environmental remediation activities at Columbus AFB and Keesler AFB (Mississippi) under NAICS code 562910. Contractor shall undertake environmental remediation activities to achieve performance objectives at 16 Installation Restoration Program sites. The range of activities under the Optimized Remediation Contract includes maintenance of established remedies, optimization at applicable sites, and achievement of site-specific objectives. Statements of interest and capability are due by 3:00 PM CT on September 25, 2020. https://beta.sam.gov/opp/c2bf5eafcf924d9191fbbc9d273ef4c2/view

PROJECT MANAGEMENT, ENVIRONMENTAL REMEDIATION SYSTEM O&M, MONITORING AND REPORTING FOR SE REGION AND DFSP VERONA
Defense Logistics Agency-Energy (DLA-Energy), Fort Belvoir, VA.
Contract Opportunities at Beta.SAM, Solicitation SPE60320R0521, 2020

This procurement is 100% set aside for small business under NAICS code 562910 size standards. DLA-Energy is issuing this request for proposal for performance of project management, environmental remediation system O&M, monitoring, and reporting for Defense Fuel Support Point (DFSP) Charleston, Fort Hood, DFSP Hunter, Fleet Logistics Center Jacksonville, DFSP Tampa, and DFSP Verona. The requirements include environmental assessment, long-term management, and emergency response services to advance restoration sites to site closure in the most cost-effective manner. DLA-Energy would like to reduce long-term environmental liabilities and life-cycle costs through accelerated achievement of site closure. Period of performance is a four-year base period from November 1, 2020, to October 31, 2024. Proposals are due by 1:00 PM ET on September 28, 2020. https://beta.sam.gov/opp/a4d42379b2ed4569808131808063921/view

AIR FORCE R&D FUNDING OPPORTUNITIES
Air Force Research Laboratory, Dayton, OH.
Contract Opportunities at Beta.SAM, Solicitations X20_3 and X20_C, 2020

The Air Force SBIR and STTR programs' objectives include stimulating technological innovation, strengthening the small business role in meeting DoD R&D needs, fostering and encouraging minority and disadvantaged persons in technological innovation, and increasing commercial application of DoD-supported R/R&D results. The AF SBIR and STTR programs are managed separately. Small business firms are invited to submit proposals under the SBIR commercial solutions opening, and small business firms and research institutions are invited to submit JOINT proposals under the STTR commercial solutions opening. The NAICS code is 541715. Although the research sought is primarily of interest to the warfighter, environmental remediation is among the topics of interest listed under the broad area of Human Performance in the funding opportunities descriptions of both programs. See details in the attachments at beta.sam.**SBIR Commercial Solutions Opening AF Ventures Topics** (X20_3) - The window of opportunity for submitting proposals falls between September 23 and 12:00 noon ET on October 22, 2020. https://beta.sam.gov/opp/c02e518a995c4e2982691309df88a9ca/view **Small Business Technology Transfer (STTR) Program Commercial Solutions Opening** (X20_C) - The window of opportunity for submitting proposals falls between September 22 and 12:00 noon ET on October 22, 2020. https://beta.sam.gov/opp/43bebf8be9f14bd7b0a293e12e903ac7/view

ENVIRONMENTAL PROTECTION AGENCY BROWNFIELDS PROGRAM GRANTS

EPA's Brownfields Program provides funds to empower states, communities, tribes, and nonprofit organizations to prevent, inventory, assess, clean up, and reuse brownfield sites. Guidance on how to apply for Brownfield Multipurpose, Assessment and Cleanup grants has been posted at Grants.gov. Applications are due by October 28, 2020.
FY21 Guidelines for Brownfield Multipurpose (MP) Grants - EPA-OLEM-OBLR-20-05
About 10 awards are anticipated out of total estimated program funding of $8M. https://www.grants.gov/web/grants/view-opportunity.html?oppId=328706
More information: https://www.epa.gov/grants/fy21-guidelines-brownfield-multipurpose-mp-grants
FY21 Guidelines for Brownfield Assessment Grants - EPA-OLEM-OBLR-20-06 About 87 awards are anticipated out of total estimated program funding of $32M. https://www.grants.gov/web/grants/view-opportunity.html?oppId=328707
More information: https://www.epa.gov/grants/fy21-guidelines-brownfield-assessment-grants
FY21 Guidelines for Brownfield Cleanup Grants - EPA-OLEM-OBLR-20-07 About 26 awards are anticipated out of total estimated program funding of $13M. https://www.grants.gov/web/grants/view-opportunity.html?oppId=328728
More information: https://www.epa.gov/grants/fy21-guidelines-brownfield-cleanup-grants

BROAD AGENCY ANNOUNCEMENT (BAA) FOR INNOVATIVE ENVIRONMENTAL TECHNOLOGIES AND METHODOLOGIES
Naval Facilities Engineering Command, Expeditionary Warfare Center, Port Hueneme, CA.
Contract Opportunities at Beta.SAM, Solicitation N3943020S2242, 2020

This BAA for the NAVFAC Engineering and Expeditionary Warfare Center (NEXWC) is open for one year from the date of publication (i.e., until March 23, 2021). Proposals may be submitted at any time during this period. To reduce environmental impacts from current and past Navy operations, NEXWC is interested in environmental technologies and methodologies that are either new, innovative, advance the state of the art, or increase knowledge or understanding of a technology or methodology, and address one of the following areas of interest: (1) Environmental assessment, restoration and cleanup. (2) Conservation of natural resources. (3) Unexploded ordnance. (4) Technologies/methodologies addressing emerging contaminants. (5) Environmental compliance. (6) Resilient infrastructure crucial for enduring environmental protection. (7) Remote sensing and web-based data processing and reporting of environmental data. This announcement is for abstracts/white papers only. Abstract submittals can be made using the form attached to the announcement at beta.sam. As no funding for contracts has been reserved in advance, NAVFAC EXWC will be sharing qualified abstracts with other federal Government activities to seek demonstration sites and/or funding. This opportunity closes on March 23, 2021. https://beta.sam.gov/opp/c4a405ec30114fe58c5a668a3ad6b2dc/view

Cleanup News

BOEING PLANT 2 SEDIMENT REMEDIATION: POST REMEDY MONITORING AND THE SEARCH FOR LONG-TERM SUCCESS
Webb, R.S., B. Anderson, J. Flaherty, P. Fuglevand, and C. Whitmus.
International Conference on the Remediation and Management of Contaminated Sediments, 11-14 February, New Orleans, Louisiana, 27 slides, 2019

Remediation and habitat restoration at the Boeing Plant 2 on the Lower Duwamish Waterway (LDW) in Seattle was completed in 2015. Located at the upstream end of the Superfund site, the Plant 2 Early Action Area contained some of the more broadly elevated concentrations of PCBs within the LDW. A series of remedial dredging methods were implemented to increase certainty of remedial action success while managing risks associated with resuspension, releases, and residuals. The presentation includes ongoing monitoring results for depositional material thickness and PCB concentrations of newly deposited material. This unique data provides information on the time history of surface status within the remediated area for several years following remedy implementation. Questions and uncertainties remain regarding source control, contaminant recycling within the watershed, and long term effectiveness of the remedy. These factors may negatively impact the ability of active remedial actions to meet sediment cleanup criteria.
https://www.battelle.org/docs/default-source/conference-proceedings/2019-sediments-conference-proceedings/a2_monitoring-and-evaluating-remedy-effectiveness/a2_1145_-524_webb_pdf?sfvrsn=774e58f8_2 **Longer abstract:** https://www.battelle.org/docs/default-source/conference-proceedings/2019-sediments-conference-proceedings/a2_monitoring-and-evaluating-remedy-effectiveness/524.pdf?sfvrsn=87dadafd_2

CINDERELLA & STICKEL CLEANERS BIOSPARGING REMEDY
Dom, J. and C. Dockter, C.
Kansas Environmental Conference, 13-15 August, Manhattan, Kansas, 30 slides, 2019

Historical chlorinated solvent releases associated with dry cleaning activities from the Cinderella Cleaners and Stickel Cleaners facilities led to a PCE, TCE, cDCE, and VC plume that extended ~4,000 ft toward Manhattan public water supply wells. Two enhanced anaerobic bioremediation groundwater treatments injected ~17,600 gals CAP-18™ food grade vegetable oil into 59 injection points to construct five substrate treatment curtains. Subsequent monitoring showed decreasing PCE and TCE concentrations in groundwater within the source area, but an increase in VC and cDCE concentrations downgradient. Two MATRIX Oxygen Injection Systems were installed at the City Retention Basin, each with 24 injection points to deliver oxygen into the VC and cDCE plume. After addressing operation and maintenance issues, contamination levels began to decrease less than one month after startup of the system. Groundwater monitoring will continue for the foreseeable future to ensure biodegradation continues. https://www.kdheks.gov/sbcs/2019_Presentations/Case_Studies_-_BFR_Biosparging_Groundwater_Remediation_-_Stickel_Cleaners_Manhattan_-_Craig_Dockter_&_Joe_Dom.pptx [Note: It might be necessary to copy and paste the URL into your browser for direct access.] *See Corrective Action Report for a description of the Matrix system:* http://kensas.kdhe.state.ks.us:1776/herist/getDocument.kdhe_her;jsessionid=52BEF75B56D2D1811BBE19A8F8B6512?documentId=2000000540_0X5VGQDHK43B
For all site documents, see http://kensas.kdhe.state.ks.us:1776/herist/getIdentifiedSiteListing.kdhe_her?projectCode=CS-081-20782&siteName=CINDERELLA%20CLEANERS

CASE STUDY: BOEING GROUNDWATER REMEDIATION, WICHITA
Carlson, R., and A. Richards.
Kansas Environmental Conference, 13-15 August, Manhattan, Kansas, 34 slides, 2019

The long history of industrialization at the Boeing site left a legacy of VOCs, including PCE, TCE, cDCE, VC and benzene, toluene, ethylbenzene, and xylene(s) in soil and groundwater throughout the area. A combination of remedies was selected in 2013 to address site contamination. The presentation focuses on the numerous pilot- and full-scale enhanced anaerobic bioremediation projects Boeing has initiated onsite, such as those ongoing at the Ramp 500 (sodium lactate and ethanol injections), Englewood (zero-valent iron [ZVI]), and Activity Center (ZVI/palladium) areas. Overall, bioremediation is effectively reducing VOCs in groundwater. Additional projects include nutrient injections at the Industrial Park Building 2 and Industrial Waste Treatment Plant Lake areas and sodium lactate injections at the Plant 2 area.
https://www.kdheks.gov/sbcs/2019_Presentations/Case_Studies_-_BFR_Boeing_Groundwater_Remediation_-_Wichita_-_Randy_Carlson_&_Alex_Richards.ppt [Note: It might be necessary to copy and paste the URL into your browser for direct access.] *To access all site documents, see* http://kensas.kdhe.state.ks.us:1776/herist/getIdentifiedSiteListing.kdhe_her2projectCode=C2-087-00015&siteName=BOEING%20WICHITA

REMEDIATION OF A FORMER OIL WELL, LEAKING INTO A FRESHWATER LAKE
Pawlukiewicz, S., D.S. Kilmer, D. Bandlow, J.M. Rice, and K. Vater.
International Conference on the Remediation and Management of Contaminated Sediments, 11-14 February, New Orleans, Louisiana, 22 slides, 2019

A weathered crude oil LNAPL has been venting upward through sediment, causing sheens in the Fenner's Ditch Canal as early as 1978. The source was surmised to be from a former oil well known as the Dolly Damm #4. Following a focused remedial investigation, a focused feasibility study selected an innovative capping system to contain and capture the LNAPL as the preferred remedy. The innovative capping system used passive recovery to capture LNAPL moving upward due to buoyant forces, as well as ebullition-facilitated transport. The 5,200 ft^2 cap was constructed in five weeks. Subsequent monitoring indicate the "cap and trap" system is effective at containing the LNAPL, and natural degradation of the oil is occurring within the system as designed. https://www.battelle.org/docs/default-source/conference-proceedings/2019-sediments-conference-proceedings/c6_napl-and-mgp-sites/c6_1620_-44_pawlukiewicz_pdf?sfvrsn=f23c789c_2 *Longer abstract:* https://www.battelle.org/docs/default-source/conference-proceedings/2019-sediments-conference-proceedings/c6_napl-and-mgp-sites/44.pdf?sfvrsn=9484296a_2

Demonstrations / Feasibility Studies

IN SITU FIELD METHOD FOR EVALUATING BIODEGRADATION POTENTIAL OF BTEX BY INDIGENOUS HETEROTROPHIC DENITRIFYING MICROORGANISMS IN A BTEX-CONTAMINATED FRACTURED-ROCK AQUIFER
Han, K., U. Hong, S. Park, S. Kwon, and Y. Kim.
Environmental Technology [Published online 25 Sept 2019 prior to print]

An in situ method was developed to assess the degradation potential of benzene, toluene, ethylbenzene, and xylene (BTEX) compounds present as a mixture under NO^{3-} injecting conditions through a series of single-well push-pull tests and well-to-well tests (WWTs). During the first and second WWTs, biological heterotrophic dissimilative NO^{3-}denitrification was confirmed by simultaneous detection of both NO2- and N_2O and significant production of CO during NO^{3-} degradation. The biodegradation fractions of NO^{3-} injected during the first and second WWTs were 1.7% and 5.0%, respectively. The concentrations of benzene, ethylbenzene, and xylenes measured were similar to values calculated when considering only dilution, but the measured concentrations of toluene were significantly lower than calculated values.

HORIZONTAL SUBSURFACE-FLOW-CONSTRUCTED WETLANDS WITH TROPICAL VEGETATION FOR THE TREATMENT OF LANDFILL LEACHATE: CASE STUDY IN CARTAGENA, COLOMBIA
Torres Gil, L.K., M. Saba, and M. Eljaiek-Urzola.
Journal of Environmental Engineering Vol. 146, Iss. 10(2020)

Constructed wetlands with a horizontal subsurface flow were used to treat raw landfill leachate and leachate pretreated with photo-Fenton at the Loma de Los Cocos landfill. Wetland modules included one without vegetation (HC), one with *Rhizophora mangle* (HM), and one with *Typha latifolia* (HE), all operated using an eight-day hydraulic retention time and a 16-day operating time. For the photo-Fenton pretreatment, the pH of the leachate was adjusted to values between 2 and 3 using a molar ratio Fe^{2+}/H_2O_2 of 0.6 at a retention time of 40 minutes. In general, wetlands had higher efficiencies with pretreated leachate. During the pretreated leachate test, the HE constructed wetland had pollutant removals that were slightly higher than the HM wetland. Still, horizontal subsurface-flow constructed wetlands with both vegetation are a viable alternative for the treatment of leachate from the landfill.

HYDRAULIC PERFORMANCE OF THE HORIZONTAL REACTIVE MEDIA TREATMENT WELL: PILOT AND NUMERICAL STUDY
Nzeribe, B.N., W. Li, M. Crimi, G. Yao, C.E. Divine, J. McDonough, and J. Wang.
Groundwater Monitoring & Remediation 40(3):30-41(2020)

A field pilot-scale study and numerical simulations using a finite element method were conducted to verify the horizontal reactive treatment well (HRX Well®) concept and test the validity of HRX well-simplified equations. The hydraulic performance results from both studies were within a close agreement to the simplified equations and their hydraulic capture width about five times greater than the well diameter. During pilot testing, the well captured 39% of flow while representing 0.5% of the test pit cross-sectional volume. While uncertainty in the aquifer and well properties may have caused minor differences in the results, data from this study indicate that the simplified equations are valid for the conceptual design of a field study. A full-scale HRX Well was installed at Site SS003 at Vanderberg Air Force Base, California, in 2018 based on outcomes from this study. *See the ESTCP report for results on the Vanderberg pilot study:* http://www.environmentalrestoration.wiki/images/e/ec/Divine2020_ER201631.pdf

FATE AND TRANSPORT OF SULFIDATED NANO ZEROVALENT IRON (S-NZVI): A FIELD STUDY
Garcia, A.N., H.K. Boparai, C.V. de Boer, A.I.A. Chowdhury, C.M.D. Kocur, et al.
Water Research 170:115319(2020)

Results are reported from a field-scale project that used sulfidated nano zero-valent iron (S-nZVI) to remediate cVOCs in groundwater. S-nZVI was prepared on-site by first synthesizing carboxymethyl cellulose (CMC) stabilized nZVI with sodium borohydride as a reductant and then sulfidating the nZVI suspension by adding sodium dithionite. This CMC-S-nZVI suspension was gravity fed into a sandy material and monitored through multiple multi-level monitoring wells. Samples collected from upgradient and downgradient wells suggest very good radial and vertical iron distribution. Analysis from the recovered well samples also indicates the presence of both nZVI-like particles as well as the larger flake-like structures, similar to those found in the injected CMC-S-nZVI suspension.

OFF-SITE GROUNDWATER TREATMENT PILOT STUDY FRANKLIN POWER PRODUCTS, INC./AMPHENOL CORPORATION
EPA Region 5, 20 pp, 2019

A former owner of the Franklin Power/Amphenol site released VOCs and other chemicals into the environment, including into on-site sewers, which transported the contamination outside the property boundaries to the neighborhood south of

the facility. Removal of soil and groundwater surrounding the sanitary sewer system was conducted to perform targeted source removal. A pilot study is being conducted both in and outside the removal area to evaluate a potential supplemental groundwater remedy for the site. In the removal area, 3,600 lbs of PlumeStop® and 200 lbs of Sulfidated-MicroZVI™ (S-MZVI™) will be injected into six injection wells placed within the backfill of a newly installed sewer main trench. In addition to serving as VOC treatment in the base of and within the trench, injections will also act as a barrier to treat any VOCs that back diffuse out of the surrounding soil. Outside the excavated area, 3,200 lbs of PlumeStop and 100 lbs of S-MZVI™ will be injected into five injection points placed around monitoring well 35, which exhibits a high dissolved TCE concentration. Groundwater sampling will be conducted immediately before and one month after implementation of the study. Success will be based on the observed decrease in dissolved chlorinated VOC concentrations in groundwater as well as the generation of ethenes and ethanes.
https://www.epa.gov/sites/production/files/2019-10/documents/off-site_groundwater_treatment_pilot_study_epa_id_ind_044_587_848_october_9_2019.pdf

Research

FACTORS AFFECTING POLYCYCLIC AROMATIC HYDROCARBON BIODEGRADATION BY *ASPERGILLUS FLAVUS*
Al-Dossary, M.A., S.A. Abood, and H.T. Al-Saad.
Remediation [Published online 18 August 2020 prior to print]

The ability of fungi isolated from highly contaminated soil to biodegrade PAH compounds was investigated, as was the effect of several parameters on their biodegradation ability. The top-performing fungi, *Aspergillus flavus* and *Aspergillus fumigatus*, were selected to test their ability to biodegrade PAH compounds as single isolates. After 15 days of incubation, *A. flavus* degraded 82.7% of the total PAH compounds, with the complete degradation of six compounds, whereas *A. fumigatus* degraded 68.9% of the total PAHs, with four aromatic compounds completely degraded. The degradation process was optimal at a temperature of 30°C, pH of 5.5, and with nitrogen in the form of yeast extract. Under these conditions, 95.87% of the total PAHs, including 11 aromatic compounds, were completely degraded after incubation. This suggests that *A. flavus* is a potential microorganism for the degradation of PAH compounds in aqueous cultures.

NEW DATA SET OF POLYCHLORINATED DIBENZO-P-DIOXIN AND DIBENZOFURAN HALF-LIVES: NATURAL ATTENUATION AND RHIZOREMEDIATION USING SEVERAL COMMON PLANT SPECIES IN A WEATHERED CONTAMINATED SOIL
Terzaghi, E., L. Vergani, F. Mapelli, S. Borin, G. Raspa, E. Zanardini, C. Morosini, et al.
Environmental Science & Technology 54(16):10000-10011(2020)

A new data set of polychlorinated dibenzo-p-dioxin and dibenzofuran (PCDD/Fs) half-lives (HLs) in soil were derived from a greenhouse experiment performed with an aged contaminated soil obtained from a site in Northern Italy under semi-field conditions. Ten different treatments combining seven plant species with different soil conditions along with controls were tested for their ability to stimulate biodegradation over 18 months. The *Festuca arundinacea* plant proved to be the best treatment (~11-24% reduction, depending on the congener), reflecting HLs ranging from 2.5-5.8 years. Simulations performed with a dynamic air-vegetation-soil model confirmed that the HLs were mostly due to biodegradation rather than other loss processes.

EVALUATION OF PFAS TREATMENT TECHNOLOGY: ALKALINE OZONATION
Thomas, R., K. Jenkins, B. Landale, G. Trigger, T.M. Holsen, S. Dore, D. Pope Jr., et al.
Remediation 30(3):27-37(2020)

A treatability study was performed to evaluate the effectiveness of alkaline ozonation to remove PFAS from groundwater at a former industrial site in Michigan. The study involved testing the PFAS-impacted groundwater under alkaline ozonating conditions and a range of experimental conditions. PFAS-spiked samples were used to determine if inorganic ions such as fluoride, sulfate, formate, acetate, and trifluoroacetate were generated or if there were decreases in total organic fluorine resulting from PFAS treatment. Results indicated that decreases in PFAS concentrations were due to a combination of removal and destructive mechanisms with enhanced removal under acidic pH ozonation pretreatment conditions. Short-chain PFAS concentrations increased during the experiments, followed by an overall decrease in concentration under continuous alkaline ozonation conditions. Reductions in concentrations in PFOS of 75-97% were observed. Reductions were also observed in other PFAS, such as 6:2 FTS, PFHxS, PFOA, and PFNA.

HUMIC ACID COATED SAND AS A NOVEL SORBENT IN PERMEABLE REACTIVE BARRIER FOR ENVIRONMENTAL REMEDIATION OF GROUNDWATER POLLUTED WITH COPPER AND CADMIUM IONS
Faisal, A.A.H., M.B. Abdul-Kareem, A.K. Mohammed, M. Naushad, A.A. Ghfar, et al.
Journal of Water Process Engineering 36:101373(2020)

Inert sand was impregnated with humic acid nanoparticles extracted from sewage sludge and used as a permeable reactive barrier to treat Cu- and Cd-contaminated groundwater. Using a one-hour contact time, 0.25 g/50 mL sorbent dosage, pH of 7, a 10 mg/L initial concentration, and 200 rpm agitation speed, the coated sand removed >98% of contamination. The maximum sorption capacity of copper and cadmium reached 87.5 and 18.9 mg/g, respectively.

NATURAL ATTENUATION OF POOLS AND PLUMES OF CARBON TETRACHLORIDE AND CHLOROFORM IN THE TRANSITION ZONE TO BOTTOM AQUITARDS AND THE MICROORGANISMS INVOLVED IN THEIR DEGRADATION
Puigserver, D., J. Herrero, B.L. Parker, and J.M. Carmona.
Science of the Total Environment 712:135679(2020)

A study was conducted to assess the role of heterogeneity in the natural attenuation of carbon tetrachloride and chloroform, determine degradation processes within the transition zone, and identify dechlorinating microorganisms using groundwater concentrations, redox-sensitive parameters, and CSIA isotopic and DGGE molecular techniques. The main findings included 1) the role heterogeneity played on contaminant attenuation, 2) heterogeneity can cause highly anoxic environments and dominant sulfate-reducing conditions for more efficient natural attenuation, 3) heterogeneity showed that the transition zone constitutes an ecotone, 4) bacteria size exclusion was governed by the pore throat threshold and determined the penetration of dechlorinating microorganisms into the finest sediments, 5) reductive dechlorination caused contaminant attenuation in groundwater and porewater of fine sediments, and 6) both *A. suillum* and *Clostridiales* bacteria can be biostimulated to dechlorinate contaminants in the source and the plume in the transition zone.

MULTI-OBJECTIVE OPTIMIZATION OF PERMEABLE REACTIVE BARRIER DESIGN FOR CR(VI) REMOVAL FROM GROUNDWATER
Maamoun, I., O. Eljamal, O. Falyouna, R. Eljamal, and Y. Sugihara.
Ecotoxicology and Environmental Safety 200:110773(2020)

A practical approach was developed to design an optimized permeable reactive barrier (PRB) to remove Cr(VI) from groundwater using either nanoscale zero-valent iron (Fe^0), bimetallic nanoscale zero-valent iron (Fe^0/Cu), activated carbon (AC), or sand/zeolite mixture (S/Z). Kinetic analysis and dynamic modeling of the experimental data were implemented to determine the controlling conditions of the reactive performance of the PRB materials. Results revealed that Fe^0 and Fe^0/Cu showed high performance in Cr(VI) removal, with final removal efficiency values of 89.7 and 84.1%, respectively. A Response Surface Methodology (RSM)-optimization revealed that Fe^0 was the most feasible reactive material with respect to optimal conditions regarding the long residency and barrier thickness, with ~95.2% desirability of its optimal solution.

NONIONIC AND ANIONIC SURFACTANT-WASHING OF POLYCYCLIC AROMATIC HYDROCARBONS IN ESTUARINE SEDIMENTS AROUND AN INDUSTRIAL HARBOR IN SOUTHERN TAIWAN
Shih, Y.-J., P.-C. Wu, C.-W. Chen, C.-F. Chen, and C.-D. Dong.
Chemosphere 256:127044(2020)

Various surfactants, anionic sodium dodecylsulfate (SDS), and sodium dodecylbenzene sulfonate were used to remove PAHs from heavily contaminated harbor sediments dredged from Kaohsiung Harbor in Taiwan. Desorption/re-sorption equilibrium, kinetics, and washability of PAHs using the selected surfactants were evaluated under different critical micelle concentrations. The desorption rate of high molecular weight PAHs was greater than those of low molecular weight PAHs. SDS was relatively effective in the removal of total PAHs (>50%) compared to the other surfactants. Data suggested that hydrophobic factors affected PAH treatability more than the reactivity of PAH. Since the adsorption of anionic surfactant altered the hydrophobicity of organic matter in the sediment, PAHs preferred transferring from the sediment to the hydrophobic core of micelles in aqueous solution. The nonionic surfactant enhanced the PAH partition in the aqueous phase, increasing micellar solubilization.

EVALUATION OF ZEOLITE AS A POTENTIAL REACTIVE MEDIUM IN A PERMEABLE REACTIVE BARRIER (PRB): BATCH AND COLUMN STUDIES
Rocha, L.C.C. and L.V. Zuquette. | Geosciences 10(2):59(2020)

Natural zeolite was evaluated as a reactive material in a permeable reactive barrier (PRB) to remove inorganic contaminants from groundwater by subjecting zeolite to characterization tests, column experiments, batch tests, and a flushing process to evaluate adsorption and desorption capacities. Results indicated that zeolite has a high cationic exchange capacity and a removal efficiency of 78%. Contaminant transport parameters for K^+ ions reveal that the zeolite was resistant to ion dispersion in the barrier, indicating that the material has advantageous characteristics for use in a PRB. However, the flushing process of the material was not efficient, indicating that the appropriate use of the zeolite is in clean-up systems in which the adsorbent material can be exchanged after losing its efficiency as a reactive barrier. *This article is* ***Open Access*** *at* https://www.mdpi.com/2076-3263/10/2/59/htm.

General News

ADDRESSING THREATENED AND ENDANGERED SPECIES ON DOD LANDS
Pejchar, L. and M. Davis. | SERDP & ESTCP Webinar Series, Webinar #117, August 2020

On August 20, SERDP and ESTCP sponsored webinars that presented tools to assess conservation efforts and endangered species communities on DoD installations. Specifically, investigators discussed SERDP-funded efforts to evaluate cross-boundary habitat crediting programs and summarize experiments using environmental DNA as a method of documenting pollinator communities. https://www.serdp-estcp.org/Tools-and-Training/Webinar-Series/08-20-2020

PFAS REMOVAL IN DRINKING WATER TREATMENT SYSTEMS
Speth, T. and J. Burkhardt. | EPA Tools & Resources Training Webinar Series, 35 slides, 2020

This webinar provides an overview of issues with removing PFAS from drinking water and EPA models that are available free to the public. The information generated from the models provides states and utilities with a better understanding of the fundamentals of carbon adsorption and what that means to the operation, performance, and costs associated with the technology. The first part of the webinar covers the background treatment issues. The second portion of the webinar is a step-by-step tutorial on how to download and run the models. *See a recording of the webinar on EPA's YouTube channel:* https://www.youtube.com/watch?v=B-is2mfD6i0&list=PL7E4YD5AdOGKGDNaMZ1eYoTbOpBQ8Tcp&index=1.
For more information about where EPA keeps PFAS treatment performance information, go to EPA's Drinking Water Treatability Database website: https://www.epa.gov/water-research/drinking-water-treatability-database-tdb.
For more information about many of the models covered, see EPA's Environmental Technologies Design Option Tool website: https://www.epa.gov/water-research/environmental-technologies-design-option-tool-etdot.

PER- AND POLYFLUOROALKYL SUBSTANCES IN SOIL AND SEDIMENTS: OCCURRENCE, FATE, REMEDIATION AND FUTURE OUTLOOK
Ahmed, M.B., M.A.H. Johir, R. McLaughlan, L.N. Nguyen, B. Xu, and L.D. Nghiem.
Science of The Total Environment 748:141251(2020)

This review examines the occurrence and toxicological effects with associated risks, fate, remediation practices of PFAS in soil and sediment, and the associated challenges and future outlook.

THE EMERGENCE OF DIGITAL TWINS IN REMEDIATION: HOW PLATFORM SYNCHRONY WILL CHANGE THE MODEL FOR DELIVERY
Horst, J., N. Welty, A. Yanites, F. Appere, M. Dupre, and S. Shaik.
Groundwater Monitoring & Remediation 40(3):14-20(2020)

This article builds upon two previously published articles (see https://ngwa.onlinelibrary.wiley.com/doi/10.1111/gwmr.12222 and https://ngwa.onlinelibrary.wiley.com/doi/10.1111/gwmr.12304) to discuss how digital twin technology fits into the future of the remediation industry.

NATURE-BASED REMEDIATION: GROWING OPPORTUNITIES IN THE HARNESSING OF NATURAL SYSTEMS
Horst, J., S. Drane, and J. Gattenby.
Groundwater Monitoring & Remediation 40(1):14-23(2020)

This article focuses on ex situ, nature-based treatment techniques using engineered wetlands and other plant-based water management, with consideration of the multiple tiers of value they can create. It also considers integrated natural systems that could be relevant for different contaminant types to show how the application of ecosystem-based remediation is an area of growing opportunity for the remediation practitioner-and aligned with the goals of improving sustainable outcomes. https://ngwa.onlinelibrary.wiley.com/doi/epdf/10.1111/gwmr.12360

LNAPL RECOVERY ENDPOINTS: LESSONS LEARNT THROUGH MODELING, EXPERIMENTS, AND FIELD TRIALS
Lari, K.S., J.L. Rayner. G.B. Davis, and C.D. Johnston.
Groundwater Monitoring & Remediation 40(3):21-29(2020)

Key findings from research with a focus on a well-validated, multiphase multicomponent modeling approach were consolidated to achieve estimates of reasonable endpoints for LNAPL recovery. The article discusses recent advances to improve estimates of the fraction of recoverable LNAPL and its transmissivity, key factors that affect the determination of LNAPL recovery endpoints, and how recovery endpoints are affected by natural source zone depletion. Based on the capabilities of the validated model, the paper also provides a basis to optimize LNAPL recovery efforts. https://ngwa.onlinelibrary.wiley.com/doi/epdf/10.1111/gwmr.12400

EVALUATING POLYMERIC SAMPLING AS A TOOL FOR PREDICTING THE BIOACCUMULATION OF POLYCHLORINATED BIPHENYLS BY FISH AND SHELLFISH
Schmidt, S.N., and R.M. Burgess.
Environmental Science & Technology 54(16):9729-9741(2020)

This review evaluated polymeric sampling as a tool to predict the bioaccumulation of PCBs by pelagic and mobile fish and shellfish. The findings provide a tool for environmental managers when assessing and managing risk associated with PCB-contaminated sediments and waters in protecting vulnerable fish and shellfish species.

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.

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.