Technology Innovation News Survey

Entries for December 1-31, 2018

Market/Commercialization Information

ENVIRONMENTAL MULTIPLE AWARD (EMAC) SOLICITATION FOR ENVIRONMENTAL REMEDIATION SERVICES
Naval Facilities Engineering Command, NAVFAC Southwest, San Diego, CA.
Federal Business Opportunities, Solicitation N6247316R8013, 2019

This solicitation is issued as a firm-fixed-price IDIQ small business set-aside. The intent is to award three to five FFP/IDIQ multiple-award contracts under NAICS code 562910 (Remediation Services), size standard 750 employees. Contracts will be awarded for a base period of 24 months and two ordering periods of 18 months each for a maximum total of 5 years. The aggregate value of all task orders issued under the contracts will not exceed $240M. Proposals are due by March 5, 2019. https://www.fbo.gov/spg/DON/NAVFAC/N6271AGA/N6247316R8013/listing.html

EMERGENCY RESPONSE SERVICES
Department of the Air Force, Air Force Materiel Command, AFTC/PZIO - Eglin, FL.
Federal Business Opportunities, Solicitation FA282319Q4001, 2019

This solicitation is a total small business set-aside under NAICS code 562910 Exception 2, size standard 750 employees. The Air Force Test Center, Installation Operational Contracting Division intends to award a firm-fixed-price contract for emergency response services at Eglin AFB, Florida. Most emergency response operations are related to aircraft hangers or facility fire suppression foam systems cleanups, fuel spills and removal of fuel-contaminated soil, aircraft recovery operations in the Gulf of Mexico, and hazardous material response and cleanups. The contractor shall provide services 24 hours a day, 365 days a year when mobilized for emergency response operation tasks. The contractor shall be a Certified Oil Spill Removal Organization and certified for rivers, canals, and inland operating environments in District 8, Sector Mobile. Place of performance includes but is not limited to the 724 square miles of Eglin Reservation. Offers are due by 10:00 AM CT on March 1, 2019. https://www.fbo.gov/notices/54f39b19c999dae3d20c579437a0735e

ENVIRONMENTAL TECHNOLOGY DEMONSTRATIONS
Environmental Security Technology Certification Program (ESTCP).
Federal Business Opportunities, Solicitation W912HQ19S00003, 2019

Researchers from federal organizations, universities, and private industry are invited to apply for ESTCP 2020 technology demonstration funding in proposals relevant to the listed solicitation Topic Areas. The following represent areas of interest relevant to environmental remediation for which ESTCP requests pre-proposals from non-DoD entities:

- Innovative technology transfer approaches.
- Management of contaminated groundwater: Innovative technologies and approaches for managing sites and the associated risks where contamination will persist for a significant period of time after an initial remedy is selected, particularly for chlorinated solvents, 1,4-dioxane, energetic compounds, PFASs, or mixtures of these compounds.
- Long-term management of contaminated aquatic sediments: Innovative technologies that specifically address the management, risk characterization, remediation, or monitoring of sediments contaminated with PAHs, PCBs, heavy metals, or mixtures of these contaminants.
- Detection, classification, and remediation of military munitions in underwater environments.

More information is available on the ESTCP website at https://serdp-estcp.org/Funding-Opportunities/ESTCP-Solicitations. Pre-proposals are due by 2:00 PM ET on March 7, 2019. https://www.fbo.gov/spg/USA/COE/DACA72/W912HQ19S00003/listing.html

SERDP AND ESTCP BROAD AGENCY ANNOUNCEMENTS (BAAs)
Department of the Army, U.S. Army Corps of Engineers, USACE HEC, Ft. Belvoir, VA.
Federal Business Opportunities, Solicitations W912HQ-19-S-0004 & W912HQ-19-S-0005, 2019

Businesses both large and small are encouraged to respond to the SERDP and ESTCP BAAs, which are open for about one year, until January 29, 2020. SERDP and ESTCP intend to competitively fund R&D for environmental research that addresses the topic areas set forth in the announcements at https://www.serdp-estcp.org/Funding-Opportunities/Open-BAA. Those wishing to respond must submit a white paper in accordance with the instructions there. Awards will take the form of contracts. Specific areas of interest include the following:

1. Demonstration of technologies for the assessment or long-term monitoring of chemical contamination or biogeochemical indicators in soils, sediments, and water.
2. Demonstration of innovative tools, methodologies, or technologies that can reduce DoD's cost to complete for contaminated groundwater or aquatic sediments by improving performance assessment or optimizing treatment, particularly at sites contaminated with PFASs, chlorinated solvents, munitions constituents, PCBs, and PAHs.
3. Demonstration of innovative tools, methodologies, or technologies that can reduce source loading of munitions constituents during routine operations/demilitarization activities.
4. Stormwater treatment.
5. Wastewater treatment, particularly systems that operate in an energy-neutral configuration, produce power or materials that can easily be converted into power, or are capable of generating water for potable or nonpotable re-use.
6. Risk assessment demonstrations to improve the military's ability to assess and predict human and ecological risk from contaminants of concern (e.g., PFASs, chlorinated solvents, munitions constituents, PCBs, and PAHs).

Additionally, the SERDP BAA is open to submissions relevant to Munitions Response and to Resource Conservation and Resiliency and the ESTCP BAA to submissions relevant to Installation Energy needs, Munitions Response, Resource Conservation and Resiliency, Weapons Systems and Platforms, and innovative technology transfer approaches.

ASBESTOS ABATEMENT AT PIQUA, OH
Department of Energy, Navarro Research and Engineering Inc.,North Las Vegas, NV.
Federal Business Opportunities, Solicitation LMCP6707B, 2019

Navarro Research & Engineering Inc., Support Contractor to U.S. DOE's Office of Legacy Management, invites firms to submit a proposal for subcontractor services to abate asbestos-containing material (ACM) at the Piqua, Ohio, reactor site. Abatement Subcontractor shall have a minimum of 10 years experience in performing ACM abatement. Currently leased to the City of Piqua, the site consists of two structures: a decommissioned Reactor Building and an Administrative Building. The 4380 sf (square footage at main level) decommissioned Reactor Building has an aboveground containment dome that extends 68 ft high and a 44-ft below-ground portion that contains an entombed thermal reactor decommissioned and buried in place in 1969. Several levels lie below the main level with varying square footages. Routine surveillance is performed to ensure that no radiological exposures occur at the site. The Administrative Building consists of three stories above grade and a full basement totaling 11,718 sf, including stairways. Ten homogenous material groups (e.g., floor tile, pipe dope, pipe insulation) were determined to be ACM. More site information can be found at https://www.lm.doe.gov/piqua/Sites.aspx. Proposals are due by 4:00 PM ET on February 19, 2019. https://www.fbo.gov/spg/DOE/SNIV/NNSANV/LMCP6707B/listing.html

FENCE-TO-FENCE ENVIRONMENTAL SERVICES AT BEALE AFB, CA
General Services Administration, Federal Acquisition Service, Fort Worth, Texas.
Federal Business Opportunities, Solicitation ID07180034, 2019

This requirement is an open-market 8(a) competitive procurement, NAICS code 541620. Offerors shall use the GSA IT Solution Shop (ITSS) to receive the RFQ and all amendments. The environmental services required to support the Air Force Civil Engineer Center encompass the full range of methods, technologies, and supporting activities necessary to conduct environmental restoration/remediation, operations, and environmental compliance needs at Beale AFB, California, and at the four geographically separated units: Lincoln Receiver Site (Placer County), NEXRAD Site (Butte County), Point Arena Air Force Station (Mendocino County), and Tulelake (Siskiyou County). Offers must be received via the GSA ITSS web-based order processing system by 2:00 PM CT on February 25, 2019. https://www.fbo.gov/notices/f6a28083750608 4d499c9cf67cede695

LONG-TERM MANAGEMENT AT MULTIPLE SITES AT DOBBINS ARB, GA
Department of the Air Force, AFICA - CONUS, JBSA Lackland, Texas.
Federal Business Opportunities, Solicitation FA8903-19-R-0020, 2019

This requirement is a 100% small business set-aside, NAICS code 562910 (size standard 750 employees). The 772 ESS/PKB intends to award a single firm-fixed-price contract to provide long-term management (LTM) for multiple sites at Dobbins Air Reserve Base, Georgia. The work encompasses the full range of methods, technologies, and supporting activities necessary to perform LTM of land use controls (LUCs) and groundwater monitoring wells; development of LUC reports for 9 sites; and annual groundwater monitoring well sampling at 5 sites, analyzing samples collected for fuels, metals, VOCs, SVOCs, and pesticides. Proposals are due by 1:00 PM CT on February 25, 2019. https://www.fbo.gov/notices/18e61a7fa0dca245bde6b730f79eee53

ENVIRONMENTAL ENGINEERING PROFESSIONAL AND TECHNICAL SUPPORT SERVICES
Department of the Army, National Guard Bureau, Operational Contracting.
Federal Business Opportunities, Solicitation W9133L-19-R-0037, 2019

This notice constitutes market research for the collection and analysis of information to determine the capabilities and capacity of contractors for the Environmental Engineering Professional and Technical Support Services (EEPTSS) program. The Government anticipates a multiple-award IDIQ contract for EEPTSS for a base period of one year and four option years under NAICS code 562910 (Environmental Remediation Services), small business size standard 750 employees. The anticipated contract(s) will provide environmental services for National Guard installations across the United States and its surrounding territories in support of the Environmental Restoration Program, Environmental Quality Program, Environmental Planning Program, and Natural and Cultural Resources Program. Interested firms are invited to submit a brief (5 pages max) capabilities statement via email. Responses are due by 5:00 PM ET on February 25, 2019. https://www.fbo.gov/spg/USA/NGB/DAHA90/W9133L-19-R-0037/listing.html

Cleanup News

FORMER NIKE C-32 SITE, PORTER, INDIANA: FINAL DECISION DOCUMENT (FUDS NO. G05IN000102)
U.S. Army Corps of Engineers - Louisville District, Louisville, KY. 108 pp, 2018

This decision document presents the selected remedy for the Former Nike C-32 site in Porter, Indiana. DoD acquired the site between 1956 and 1957 and used it as an Ajax missile battery (1957-1959) and then as a Hercules missile battery until the site was deactivated in 1974. The Former Nike C-32 site comprised the Launch area and the Control area. This document applies to the Launch Area portion of the site, which was purchased by a private party in 1976. The selected remedy for addressing chlorinated VOCs (TCE, cis-DCE, 1,2-DCA) in groundwater is limited excavation and offsite disposal, in situ chemical reduction via soil mixing with zero-valent iron, monitored natural attenuation, and institutional controls. https://www.lrl.usace.army.mil/Portals/64/Users/116/64/2164/Final%20Nike%20C-32%20DD_08172018.pdf?ver=2018-08-20-133230-360

FUSRAP (FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM) STAKEHOLDER REPORT
U.S. DOE, Office of Legacy Management, 28 pp, 2018

DOE has operated FUSRAP since 1974 to identify and remediate sites that were contaminated with radioactive materials in support of the nation's early atomic energy programs. DOE remediated FUSRAP sites until 1997, when the task was assigned to the U.S. Army Corps of Engineers. DOE's Office of Legacy Management (LM) is responsible for protecting human health and the environment at 31 remediated FUSRAP sites. DOE evaluates risk for the sites and defines long-term surveillance and maintenance requirements to monitor site conditions, prevent unsafe activities where needed, and keep stakeholders informed. Most FUSRAP sites have been remediated to a condition that allows unrestricted use. For all sites, LM manages site information to preserve knowledge of site conditions and a record of site activities. This report presents background on FUSRAP, lists the completed and active remediation sites in the program, and provides a link to more detailed information for each site. https://www.energy.gov/sites/prod/files/2018/08/f54/2018_FUSRAP_Stakeholder_Report.pdf

DESIGN/BUILD OF AN EMERGENCY GRANULAR-ACTIVATED CARBON SYSTEM TO REMOVE PERFLUOROCARBONS FROM DRINKING WATER, WRIGHT-PATTERSON AIR FORCE BASE, OH
Scoville, B., T. Bashore, and J. Frehse.
Florida Remediation Conference 2018, 5-6 December [Abstract only] 2018

When PFOS and PFOA were detected in two drinking water wells on Wright-Patterson Air Force Base, the existing groundwater treatment process was modified under a rapid response contract issued by the U.S. Army Corps of Engineers-Omaha District to meet the U.S. EPA health advisory standard of 70 ppt of PFOS, PFOA, or their combined concentration. The design phase included evaluating alternatives to address the increased back pressure generated by adding GAC vessels; assessing treatment system location options based on ease of line access, available footprint, and truck access to deliver GAC during change-outs; and conducting rapid column tests using the proposed GAC to demonstrate the removal effectiveness of the proposed system. Following construction performed from January through May in 2017, system startup took place in June 2017. By July 1, 2018, the system had treated more than 325 million gals with no sign of breakthrough and no need for backflushing. The low-maintenance design requires Additional information at https://pfasproject.com/wright-patterson-air-force-base-dayton-ohio/

PILOT TO CLOSURE: COMBINED REMEDIES FOR A HIGH CONCENTRATION CHLORINATED SOLVENTS MIXTURE
Brown, B.
Florida Remediation Conference 2018, 5-6 December [Abstract only] 2018

An enhanced anaerobic bioremediation (EAB) system was used at a former industrial manufacturing facility in Orlando to address high concentrations (>100,000 µg/L) of chlorinated solvents in the surficial aquifer. One well showed a concentration as high as 2,000,000 µg/L. Source-zone contamination was remediated using EAB with potassium lactate and groundwater circulation to biostimulate indigenous *Dehalococcoides* bacteria. As concentrations approached groundwater cleanup target levels, zero-valent iron and in situ chemical oxidation via sodium persulfate injections were used in zones of contamination outside the EAB treatment area. Within 33 months, total contaminant mass fell from an estimated 2,800 lbs to 100,000 µg/L to See information on earlier results for this project in an article at http://pubs.awma.org/gsearch/em/2010/4/turner.pdf.

REMEDIATION OF A FORMER CHEMICAL BLENDING FACILITY UTILIZING MULTIPLE METHODS INCLUDING IN SITU CHEMICAL OXIDATION AND SOIL TREATMENT
Knafla, A. and L. Vickerman.
RemTech 2018, 10-12 October, Banff, Alberta, Canada. 25 slides, 2018

Five techniques were used to optimize remediation efficiencies at a site affected to a depth of 9 m by petroleum hydrocarbons and solvents (ketones, alcohols, aldehydes, chlorine substituted): Tier 2 guideline development; a field mobile screening lab (GC-PID); ex situ and in situ chemical oxidation; and a mixed soil/bentonite cutoff wall. The field screening lab supported in-field waste classification and segregation. Ex situ chemical oxidation treatment of the appropriate waste classes resulted in notable landfill cost savings. A similar approach was used to treat a portion of soils to below Tier 2 guidelines, allowing the material to be used for backfilling instead of landfilling. In situ chemical oxidation achieved remediation of clay loam soils and a sand/gravel seam beneath the facility within a 6-month injection timeframe thanks to intensive injection grid spacing. Post-injection drilling confirmed Tier 2 guidelines had been met and no subsequent remediation was required.
Slides: https://www.esaa.org/wp-content/uploads/2018/10/18-Knafla.pdf
Longer abstract: https://www.esaa.org/wp-content/uploads/2016/05/Abstracts-RT2018-56.pdf

INTERIM MEASURE COMPLETION REPORT: 1149 SW WINDING ROAD, TOPEKA, KANSAS

Kansas Dept. of Health and Environment, Bureau of Environmental Remediation, 105 pp, 2017

This Interim Measures Completion Report describes the in situ chemical oxidation and enhanced bioremediation injections performed on behalf of SB Ventures LLC at its former property located at 1149 SW Winding Road. The field activities associated with this work were conducted August 7-16, 2017, and consisted of injection of Provect-OX® compound (Provectus Environmental Products Inc.) into the affected water-bearing zone to increase the rate of oxidation and/or bioremediation of dissolved- and sorbed-phase total petroleum hydrocarbons high-range hydrocarbons. Provect-OX is a dry powder containing sodium persulfate and ferric oxide. The ferric iron activates the persulfate to oxidize petroleum hydrocarbons in soil and groundwater. This process also enhances utilization of sulfate and iron as electron acceptors to facilitate redox reactions to enhance biodegradation. Long-term, sustained secondary bioremediation processes to manage any residuals and prevent concentration rebound are anticipated. http://kenyas.kdhe.state.ks.us:1776/berisl/getDocument.kdhe_ber;?documentId=2000000C21_0WWSNPD2191C

FULL-SCALE ISCR AND EISB TO TREAT CHLORINATED SOLVENTS IN UNSATURATED SOILS AT A FORMER CHLORINATED SOLVENTS MANUFACTURING PLANT
Daniels, J. and M. Motylewski.
Eleventh International Conference on Remediation of Chlorinated and Recalcitrant Compounds, 8-12 April, 2018. Battelle Press, 14 slides, 2018

The Ethyl Corporation operated a former chlorinated solvent manufacturing plant in Baton Rouge, Louisiana. Shallow soils were affected to ~15 feet bgs by carbon tetrachloride, 1,2-DCE, 1,1,2-TCA, TCE, and PCE, with concentrations >100 ppm in multiple locations. Review of historical data identified in situ chemical reduction and enhanced in situ bioremediation as appropriate technologies to meet project goals. After a successful feasibility test, full-scale remediation took place December 2016-February 2017. Results showed chlorinated VOC concentration reductions at several locations, stability of overall microbial population, an increase in anaerobic and fermenting microbes, and conditions still favorable for continued biodegradation. https://www.gesonline.com/sites/default/files/2018-05/Daniels_FullScaleISCR-EISB_Battelle2018.pdf

ROD AND WIRE MILL INTERIM MEASURES PROGRESS REPORT, AUGUST 2018, TRADEPOINT ATLANTIC, SPARROWS POINT, MARYLAND
Maryland Department of Environment, 1309 pp, 2018

Trenches installed in 2016 provided new interim measures for remediating groundwater at the RWM by reducing dissolved Cd and Zn concentrations mainly in the groundwater intermediate zone, thus eliminating the potential for future unacceptable groundwater discharges from there to surface water. Groundwater in the shallow zone was noted to have a higher pH due to placement of slag fill, and as a result the metals contamination in the shallow zone has not migrated. During remedial trench installation, the approach for addressing the elevated dissolved Cd and Zn in the intermediate groundwater zone was to precipitate the dissolved metals in situ by raising the groundwater pH from ~4 to ~9.5-10 via addition of alkaline reagents into groundwater zone at select high concentration areas. Excavated soils were replaced with alkaline charges that react with acidic groundwater to create slightly alkaline conditions within the aquifer and remove the dissolved metals from solution. The alkaline charges utilized a combination of fast-acting TerrabondMG (40% by weight) in conjunction with limestone aggregate (60% by weight) emplaced in the trenches in a staggered/offset alignment perpendicular to the anticipated groundwater flow. The interim groundwater treatment goals are to increase the pH above 7 to effect a > 90% reduction in dissolved Cd and Zn concentrations within the source areas as compared to existing conditions. https://mde.maryland.gov/programs/LAND/MarylandBrownfieldVCP/Documents/RWM%20IM%20Progress%20Report%20August%202018%20ew0%2011-2-2018%20(1).pdf

Demonstrations / Feasibility Studies

SEWERS AND UTILITY TUNNELS AS PREFERENTIAL PATHWAYS FOR VOLATILE ORGANIC COMPOUND MIGRATION INTO BUILDINGS: RISK FACTORS AND INVESTIGATION PROTOCOL
McHugh, T. and L. Beckley.
ESTCP Project ER-201505, 2018

The objectives of this demonstration project were to (1) develop and validate an effective protocol to determine the presence or absence of a sewer/utility tunnel preferential pathway during a vapor intrusion (VI) investigation (i.e., is a sewer/utility transporting VOCs from a subsurface source causing unacceptable buildings impacts?); (2) apply the validated protocol at VI sites to evaluate how often sewer/utility preferential pathways play a role in VOC transport into buildings; and (3) use the results to develop a detailed conceptual model for preferential pathways that identifies the types of sites at risk and the key mechanisms and processes involved in VOC transport through preferential pathways. The following reports have been completed: **Final Report** (790 pp); **Executive Summary** (26 pp); **Conceptual Model** (20 pp); and **Investigation Protocol** (27 pp).
https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Contaminated-Groundwater/Emerging-Issues/ER-201505

EVALUATING THE EFFICACY OF BIOAUGMENTATION FOR IN-SITU TREATMENT OF PCB IMPACTED SEDIMENTS
Sowers, K.R., U. Ghosh, and H.D. May.
ESTCP Project ER-201215, 154 pp, 2018

The project objective was to demonstrate and validate a recently developed in situ treatment for degrading PCBs in contaminated sediments under field conditions. The innovative aspect of the technology is the application of activated carbon pellets as a solid substrate for: 1) delivery of microorganisms into sediments and 2) sequestration and concentration of hydrophobic PCBs in close proximity to the PCB-transforming bacteria. Both anaerobic halorespiring and aerobic PCB-degrading bioamendments were mass cultured, transported to a site, and delivered through a water column to sediments without loss of viability. Treatment with the bioamendment mixture reduced the mean total PCB concentration by an average of 52% and the aqueous PCB fraction by 95% after 13.5 months. Costs of the treatment were less than thick caps and dredging, and the approach is suited to treat ecologically sensitive and difficult to reach areas.
https://www.serdp-estcp.org/content/download/48048/457538/file/ER-201215%20Final%20Report.pdf

LIMITATIONS FOR PHYTOEXTRACTION MANAGEMENT ON METAL-POLLUTED SOILS WITH POPLAR SHORT ROTATION COPPICE: EVIDENCE FROM A 6-YEAR FIELD TRIAL
Michels, E., B. Annicaerta, S. De Moor, L. Van Nevel, M. De Fraeye, L. Meiresonne, J. Vangronsveld, F.M.G. Tack, Y.S. Ok, and E. Meers.
International Journal of Phytoremediation 20(1):8-15(2018)

Poplar clones were studied for their Cd and Zn phytoextraction capacity in the second growth cycle (6-year growth) on a site in the Belgian Campine region contaminated via historic atmospheric deposition from nearby zinc smelter activities. The field trial revealed regrowth problems for some clones that could not be predicted in the first growth cycle. Four allometric relations were assessed for their capacity to predict biomass yield in the second growth cycle. A power function based on the shoot diameter best estimates the biomass production of poplar with R2 values between 0.94 and 0.98. The woody biomass yield ranged from 2.1-4.8 ton woody dry mass/ha/yr. Although the primary goal was to reduce soil concentrations of metals caused by phytoextraction, increased metal concentrations were determined in the topsoil, possibly due to the input of metals through litterfall. The phytoextraction option with poplar short rotation coppice in this setup did not lead to the intended soil remediation in a reasonable time span; therefore, harvest of the leaf biomass is put forward as a crucial part of the strategy for soil remediation through Cd/Zn phytoextraction. *See a manuscript version of the paper at* https://pureportal.inbo.be/portal/files/15643343/appicaert2016.pdf

SANDIA NATIONAL LABORATORIES, NEW MEXICO: ENVIRONMENTAL RESTORATION OPERATIONS CONSOLIDATED QUARTERLY REPORT, APRIL-JUNE 2018
New Mexico Environment Department, 115 pp, 2018

Results of the in situ bioremediation treatability study pilot test in Technical Area (TA)-V are summarized in Section 3 of this report. TCE and nitrate were identified as COCs in groundwater at TA-V. The EPA MCLs and the State of New Mexico drinking water standards for TCE and nitrate are 5 µg/L and 10 mg/L (as nitrogen), respectively. A substrate solution containing ethyl lactate and nutrients for biostimulation was prepared in aboveground tanks. The substrate solution and augmenting bacteria (KB-1) were gravity-fed to groundwater via injection wells between November 21 and November 27, 2017. See **PDF pages 58-63** for additional information at
https://hwbdocuments.env.nm.gov/Sandia%20National%20Labs/2018-10-19%20ER%20Operations%20Consolidated%20Quaterly%20Rpt%20Apr%202018%20-%20Jun%202018.pdf

A CASE STUDY ON ADAPTIVE MANAGEMENT AND THE OPTIMIZATION OF A PILOT BANK STABILIZATION REMEDY FOR A MERCURY-IMPACTED RIVER
Collins, J., C. Dixon, M.R. Liberati, and N.R. Grosso.
The 39th Annual North American SETAC Meeting in Sacramento, November 4-8, 2018

Introduction of legacy Hg impacted soils to State of Virginia's South River through bank erosion is the highest source of Hg loading to the system. In 2009, a bank stabilization pilot was constructed along a 500-ft reach of the river to assess whether control of Hg loading to the water column and sediment through eroding banks could reduce Hg concentrations in the aquatic environment. The design to abate localized bank erosion incorporated three main components: (1) a rock toe at the base of the bank for slope protection; (2) soil lifts to engineer a more stable and gradually sloping bank; and (3) native vegetation planted on both the slope and top of the bank to provide further stability and habitat. Monitoring results since installation showed significant reduction in near-bank sediment and pore water Hg concentrations within 3-5 yrs. *See additional information about this project at* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4321986/ *and also a poster at* http://southriversciencteam.org/news/documents/Posters/AQC%204_STM_Poster_Battelle_2017.pdf

UPDATE ON ELECTROKINETIC BASED SOIL DESALINIZATION FIELD TEST
Athmer, C. and D. Andersen.
2018 IPEC: 25th International Petroleum Environmental Conference, October 30 - November 1, 2018, Denver, Colorado. 29 slides, 2018

Electrokinetics (EK) technology can provide an approach to remediation of brine-contaminated soils via the application of DC electric fields in the soil mass to induce electromigration of the soluble ions. During desalinization, the chloride ions migrate toward anode wells and sodium ions migrate toward cathode wells, where they are removed. A full-scale EK desalinization process, installed in a wetlands area in North Dakota in May 2016, has been operated for 3 summer periods and shut down during the winter months. The system contains a grid of 93 electrode wells, DC rectifier, and simple peristaltic fluid management system. The electrode wells were installed using a Geoprobe® unit. A trailer containing the rectifier and remote data monitoring equipment was placed adjacent to the site. This presentation describes EK system installation at the North Dakota site, operations and maintenance, and results to date. **Slides:**
https://cese.utulsa.edu/wp-content/uploads/2018/11/IPEC-2018-Implementation-of-Electrokinetic-Based-Soil-Desalinization.pptx

ASSESSMENT OF PLUMESTOP TO MANAGE BACK DIFFUSION AT A FRACTURED SANDSTONE SITE
Brown, M., M. Burns, T. Huff, S. Kretschman, and S. Schoenmann.
Abstract Book: AEHS Foundation 34th Annual International Conference on Soils, Sediments, Water and Energy, 15-18 October 2018, p 172, 2018

Application of an activated carbon-based amendment (PlumeStop) and bioremediation treatment of chlorinated aliphatic hydrocarbons (CAHs) were evaluated in a fractured sandstone aquifer. PlumeStop, fermentable electron donor, buffer, nutrients, and organohalide-respiring microbes were injected into the aquifer to transfer dissolved CAHs to the solid phase and stimulate biodegradation of the sorbed contaminants. Contaminant concentrations rapidly declined in the aqueous phase, with total VOC concentrations decreasing as much as 80% at one month post injection and 98% at four months post injection. Daughter products, including ethene and ethane, were detected in groundwater and in situ microcosm (ISM) samples. Corresponding isotopic fractionation of parent compounds and moderate to high *Dehalococcoides* abundances were also measured in sandstone ISM samples. *A video presentation of this project is available to those who choose to register for it at* http://www2.regenesis.com/webinar-matt-burns

USING IONIC LIQUID MODIFIED ZEOLITE AS A PERMEABLE REACTIVE WALL TO LIMIT ARSENIC CONTAMINATION OF A FRESHWATER LAKE: PILOT TESTS
Liao, L., Z. Li, G. Lv, L. Mei, H. Wang, S. Shi, Y. Wei, X. Wang, P. Ning, and Y. Wei.
Water 10(4):448(2018)

In 2008, severe As contamination was reported in the lake of Yangzonghai, Yunnan, China. After 28 months of restoration, As concentration was maintained at 80% reduction in As after surface water moved through the PRB over a 6-month sampling period. https://www.mdpi.com/2073-4441/10/4/448/htm

AUTONOMOUS SCREENING OF GROUNDWATER REMEDIATION TECHNOLOGIES IN THE SUBSURFACE USING THE IN SITU MICROCOSM ARRAY (ISMA)
Kalinowski, T., K. McClellan, T.A. Bruton, R. Krajmalnik-Brown, E.M. Driver, and R.U. Halden.
Journal of Hazardous Materials 367:668-675(2019)

The In Situ Microcosm Array (ISMA) was developed to improve the representativeness of lab-scale treatability studies and aid in remedial technology implementation. Field demonstrations of the instrument were performed in two aquifers, one contaminated with TCE and Cr(VI) and the other with perchlorate. *The ISMA demonstration was accomplished under ESTCP Project ER-200914, which is further documented at*
https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Contaminated-Groundwater/Monitoring/ER-200914

Research

REDUCTIVE HEXACHLOROETHANE DEGRADATION BY $S_2O_8^{\bullet-}$ WITH THERMAL ACTIVATION OF PERSULFATE UNDER ANAEROBIC CONDITIONS
Zhu, C., F. Zhu, C. Liu, N. Chen, D. Zhou, G. Fang, and J. Gao.
Environmental Science & Technology 52(15):8548-8557(2018)

In this study, persulfate radical was found to degrade hexachloroethane (HCA) efficiently under anaerobic conditions, whereas HCA degradation was negligible in the presence of oxygen. PCA, PCE, and Cl as dechlorination products were observed during HCA degradation, which suggests that HCA degradation is mainly a reductive process under anaerobic conditions. Free radical quenching and electron paramagnetic resonance experiments confirmed that persulfate radical forms from the reaction between sulfate radical and persulfate ion, the dominant reactive species in HCA degradation. Density functional theory calculations were used to elucidate the pathways of HCA degradation and persulfate radical decomposition. Further investigation showed that persulfate radical can degrade HCA and DDTs in soil efficiently via reduction during the thermal activation of persulfate under anaerobic conditions.

BIMETALLIC POROUS IRON (PFE) MATERIALS FOR REMEDIATION/REMOVAL OF TC FROM AQUEOUS SYSTEMS
Li, D., S. Murph, D.I. Kaplan, K. Taylor-Pashow, M. Denham, and J. Seaman.
Savannah River National Laboratory, 2017 LDRD: Laboratory Directed Research and Development Program, SRNL-STI-2018-00143:41-47(2018)

Remediation of technetium (Tc) remains an unresolved challenge at the Savannah River Site and other DOE facilities. The objective of this project was to develop novel bimetallic porous iron (pFe) materials for Tc removal from aqueous systems. Bimetallic porous iron (pFe) was much more effective in removing TcO_4^- (x30) and ReO_4^- (x8) from artificial groundwater than granular iron. Tc K-edge XANES spectroscopy indicated that Tc speciation on the pFe was 18% adsorbed TcO_4^-, 28% Tc(IV) in Tc dioxide, and 54% Tc(IV) into the structure of Fe hydroxide. A variety of catalytic metal nanoparticles (i.e., Ni, Cu, Zn, Ag, Sn and Pd) were successfully deposited on the pFe using scalable chemical reduction methods. The Zn-pFe was outstanding among the six bimetallic pFe materials, with a capacity increase of >100% for TcO_4^- removal and of 50% for ReO_4^- removal, compared to the pFe. *See* ***pages 41-47*** *at*
https://srnl.doe.gov/LDRD/pdf/FY17_SRNL_LDRD_Report.pdf

REMOVAL OF PERFLUORINATED COMPOUNDS FROM POST-EMERGENCY WASTEWATER BY ADVANCED OXIDATION PROCESS AND GRANULAR ACTIVATED CARBON ADSORPTION
Dyson, Sean M., Master's thesis, Air Force Institute of Technology, Wright-Patterson AFB, OH. AFIT-ENV-MS-18-M-197, 129 pp, 2018

In a novel approach for removing per- and polyfluoroalkyl substances (PFAS) from wastewater with high (~100 mg/L) total organic carbon (TOC) concentrations, a UV/H_2O_2 advanced oxidation process (AOP) was followed by filtration using Calgon Filtrasorb® 600 (F600) granular activated carbon (GAC). The UV/H_2O_2 AOP experiments were conducted to determine whether TOC concentrations could be reduced as a pretreatment step before filtering the water with F600-GAC. At a 250 mg/L H_2O_2 concentration and 8-hr operation of the UV/H_2O_2 AOP system, TOC was reduced in solution by >98%. Rapid small-scale column tests were used to determine whether pretreatment with AOP affected GAC adsorption capacity for PFAS, specifically PFOS and PFOA. The AOP pretreatment process increased GAC capacity through 10% breakthrough (BV10) for PFOS by 1800% (increasing the adsorbent's solid-phase concentration from 3 mg-PFOS/g-GAC without pre-treatment up to >52 mg-PFOS/g-GAC with pretreatment). The pretreatment process also improved GAC capacity through BV10 for PFOA by 1100% (1.1 mg-PFOA/g-GAC up from 0.1 mg-PFOA/g-GAC) when operating the AOP for 8 hr versus 2 hr. http://www.dtic.mil/dtic/tr/fulltext/u2/1056482.pdf

MULTIPLE LINES OF FIELD EVIDENCE TO INFORM FRACTURE NETWORK CONNECTIVITY AT A SHALE SITE CONTAMINATED WITH DENSE NON-AQUEOUS PHASE LIQUIDS
Parker, B.L., S.W. Chapman, K.J. Goldstein, and J.A. Cherry.
Groundwater in Fractured Bedrock Environments: Managing Catchment and Subsurface Resources. Geological Society of London, Special Publications 479:1-27(2018)

At a site contaminated with chlorinated solvents in shale, prior borehole testing in eight holes under open-hole ambient and pumping conditions identified 14 flow zones (140 m bedrock interval) with zero to five zones per hole. Cross-hole testing showed few cross-connections between transmissive fractures. The initial conceptual model thus featured a sparse fracture network with few dominant fractures. Detailed profiles (hydraulic head, rock core VOCs, groundwater VOCs from packer and multi-level sampling, cross-hole multi-level monitoring of permanganate injections) collected from several holes revealed a well-connected fracture network with many hydraulically active fractures not influenced by open-hole cross-connection. This contrasting conceptual model contained numerous well-connected horizontal and vertical fractures that allowed chlorinated solvents to penetrate the upper 50-60 m of bedrock as DNAPLs, followed by diffusion-driven mass transfer from fractures into the porous rock matrix, such that nearly all the contaminant mass resided as dissolved and sorbed phases measurable in rock core without cross-contamination during drilling. The difference in the two conceptual models has important implications for source zone and plume attenuation.

BIOREMEDIATION STRATEGIES AIMED AT STIMULATING CHLORINATED SOLVENT DEHALOGENATION CAN LEAD TO MICROBIALLY MEDIATED TOLUENE BIOGENESIS
Moe, W.M., S.J. Reynolds, M.A. Griffin, and J.B. McReynolds.
Environmental Science & Technology 52(16):9311-9319(2018)

At a contaminated site located near Baton Rouge, Louisiana, a fermentable substrate (agricultural feed grade cane molasses) was injected into the subsurface to provide electron donor for reductive dechlorination of chlorinated solvent contamination in the groundwater. Subsequently, toluene was transiently observed in the groundwater at concentrations sometimes far exceeding the U.S. drinking water MCL of 1 mg/L. Investigation of site data suggested that the indigenous microorganisms were able to produce toluene by conversion of phenylacetic acid, phenylalanine, phenyllactate, and phenylpyruvate. When grown in defined medium with phenylacetic acid at concentrations ≤350 mg/L, the molar ratio between toluene accumulated and phenylacetic acid supplied was highly correlated with a toluene yield exceeding 0.9:1. Experiments conducted using ^{13}C-labeled compounds (phenylacetic acid-2-^{13}C and l-phenylalanine-3-^{13}C) produced toluene-alpha-^{13}C, confirming that toluene was synthesized from these precursors by two independently developed enrichment cultures. *See more on this study in M.A. Griffin's thesis at* https://digitalcommons.lsu.edu/gradschool_theses/4369/.

COST EFFECTIVENESS OF ENVIRONMENTAL LEAD RISK MITIGATION IN LOW- AND MIDDLE-INCOME COUNTRIES
Ericson, B., J. Caravanos, C. Depratt, C. Santos, M. Gomez Cabral, R. Fuller, and M.P. Taylor.
GeoHealth 2(2):87-101(2018)

A review of the cost effectiveness of the remediation of a lead-contaminated site in the Dominican Republic that posed a health risk to the surrounding community showed that the project reduced a significant health burden for an acceptable cost according to thresholds established by the World Health Organization.https://agupubs.onlinelibrary.wiley.com/doi/full/10.1002/2017GH000109

EVALUATION OF PERCHED WATER POST-EXTRACTION REMEDY TECHNOLOGIES: INTERIM STATUS REPORT
Saslow, S.A., M.M.V. Snyder, A.R. Lawter, L. Zhong, B.N. Gartman, K.J. Cantrell, et al.
PNNL-28054, 64 pp, 2018

Perched water at the Hanford 200-DV-1 Operable Unit contains elevated concentrations of uranium, technetium-99, and nitrate and serves as a future flux of contamination into the groundwater. A pumping system currently removes contaminant mass from the perched water zone, but contamination that remains after pumping needs to be addressed with post-extraction mitigation approaches along with appropriate monitoring and selection of a suitable remediation endpoint. This report documents candidate post-extraction remediation option evaluations initiated in FY18: (1) a sequential reductive and sequestration approach; (2) permeation grouts for immobilization; and (3) a quasi-3D cylindrical model calibrated against pumping tests to identify potential extraction enhancements for the current pump-and-treat system. In addition, an alternative method for stimulating calcite precipitation was investigated with the injection of CO_2 gas. https://www.osti.gov/biblio/1485489-evaluation-perched-water-post-extraction-remedy-technologies-interim-status-report

APPLICATION OF HARDWOOD BIOCHAR AS A REACTIVE CAPPING MAT TO STABILIZE MERCURY DERIVED FROM CONTAMINATED FLOODPLAIN SOIL AND RIVERBANK SEDIMENTS
Wang, A.O., C.J. Ptacek, D.W. Blowes, B.D. Gibson, R.C. Landis, J.A. Dyer, and J. Ma.
Science of the Total Environment 652:549-561(2019)

Hardwood biochar (pyrolyzed at 700°C), a potential candidate for Hg removal, has been proposed for use as reactive capping mats along groundwater discharge zones or riverbanks to control release of Hg from contaminated riverbank sediments. The effectiveness of Hg removal using hardwood biochar was investigated under hydrogeochemical conditions representative of those present within a reactive capping mat installed in a fluvial setting. Two sets of treatment columns containing 50% v.v biochar and quartz sand were subjected to 100 weekly wetting/drying cycles that included dry air, water-saturated air, and drainage using leachate derived from two source columns as input solutions: (1) passing simulated acid rain water through floodplain soil, and (2) passing river water through riverbank sediment. Results from solid-phase extraction analyses suggest that Hg accumulated near the air/biochar-sand interface (0-2 cm) in the treatment columns at low loadings but was present at greater depths at higher loadings. Results of μ-XRF mapping and μ-XANES for the biochar collected at depths 0-2 cm in treatment columns suggest retention of Hg-bearing particles derived from riverbank sediment and floodplain soil within the biochar pore structure. Sulfur K-edge XANES analysis of unused biochar and post-treatment biochar suggest formation of Hg complexes on the biochar surface. These results indicate the potential for effective use of hardwood biochar in reactive mats for controlling Hg discharging from contaminated riverbank sediments.

APPLIED STUDIES & TECHNOLOGY VARIATION IN GROUNDWATER AQUIFERS: RESULTS OF PHASE II FIELD INVESTIGATIONS AND FINAL SUMMARY REPORT
U.S. DOE, Office of Legacy Management. LMS/ESL/S16662, ESL-RPT-2018-01, 327 pp, 2018

The catalyst for this study was the observation in 2012-2013 that concentrations of dissolved ions and selected contaminants varied with depth in groundwater monitoring wells at several former uranium-ore processing and disposal sites managed by DOE's Office of Legacy Management (LM). In some cases, the range in specific conductance (SC, an indicator of dissolved ion concentrations), uranium, and other contaminants measured over a decade or more in a well could be reproduced in several hours by sampling the well at different depths. Based on these data, LM undertook an investigation to assess the extent of vertical chemical stratification that occurs in monitoring wells at sites managed under the Uranium Mill Tailings Radiation Control Act Program. The study entailed two phases. Phase I was conducted to assess the overall prevalence of vertical stratification in site monitoring wells based on measurements of SC, a measure of salinity. Phase I culminated in a 2015 report, *Variation in Groundwater Aquifers: Results of 2013-2014 Phase I Field Investigations*. Phase II, the basis of this report, focused on investigating whether the measured vertical variation in SC corresponds to similar variation in milling-related constituents—in particular, uranium. https://www.energy.gov/sites/prod/files/2018/10/f56/S16662_VariationRpt.pdf

MERCURY REMEDIATION TECHNOLOGY DEVELOPMENT FOR LOWER EAST FORK POPLAR CREEK: FY2018 UPDATE
Peterson, M.J., S.C. Brooks, T.J. Mathews, M.A. Mayes, A. Johs, R. McManamay, et al.
ORNL/SPR-2018/912, 59 pp, 2019

Mercury (Hg) losses at and near the Y-12 National Security Complex have caused elevated levels in water and fish from East Fork Poplar Creek (EFPC). DOE is using a phased, adaptive management approach to Hg remediation at Y-12, with a focus in the next few years on construction of the Mercury Treatment Facility (MTF) to treat the most contaminated Y-12 outfall entering the creek. Once operational, the MTF will provide additional protection against inadvertent releases of Hg into the stream from decontamination and decommissioning of Y-12 Hg-use buildings. A major focus of the project has been on understanding Hg transport and fate processes in the EFPC system so that targeted, site-specific technologies can be developed. Field study data are used to define conceptual and quantitative models for EFPC to inform future remedial decision-making. Bench-scale technology development activities are also presented.
https://info.ornl.gov/sites/publications/files/Pub114693.pdf

ASSESSING THE BIOAVAILABILITY OF POTENTIALLY TOXIC ELEMENTS IN SOIL: A PROPOSED APPROACH
Rocco, C., D. Agrelli, M. Tafuro, A.G. Caporale, and P. Adamo.
Italian Journal of Agronomy 13(S1):16-22(2018)

A combination of single and sequential chemical extractions was proposed to assess the mobility and plant availability of potentially toxic elements (PTEs) in contaminated agricultural soils under remediation. The approach was tested in two pilot sites potentially affected by Cu and Zn, before and one year after phytoremediation treatment with *Eucalyptus camedulensis* L. and *Populus nigra* L. Specifically, 1 mol/L ammonium nitrate (NH_4NO_3) (readily soluble and phytoavailable PTEs) and 0.05 mol/L EDTA at pH 7 (potentially phytoavailable PTEs) single extractions, and the EU-BCR sequential scheme (presumed main geochemical PTE forms) were applied. In the study sites overall, estimation of PTE bioavailability by standardized chemical extractions appeared to be effective in monitoring the Zn and Cu plant-available fractions as well as the trend and effectiveness of phytoremediation treatment. One year from planting, a significant reduction in Cu and Zn bioavailable amounts in soil was observed (for NH_4NO_3: from 19-60% for Cu and 43-92% for Zn; for EDTA: from 4-27% for Cu and 8-76% for Zn). Plant uptake was positively related with the bioavailability of PTEs in soil, with a general underestimation of Zn extracted in ammonium nitrate. Both single and sequential extractions suggested a higher mobility of Zn with respect to Cu in soil. https://agronomy.it/index.php/agro/article/download/1348/1026/

PHYTOREMEDIATION OF VOCS FROM INDOOR AIR BY ORNAMENTAL POTTED PLANTS: A PILOT STUDY USING A PALM SPECIES UNDER THE CONTROLLED ENVIRONMENT
Teiri, H., H. Pourzamani, and Y. Hajizadeh.
Chemosphere 197:375-381(2018)

Researchers installed a common interior plant from the palm species *Chamaedorea elegans* inside a controlled environment chamber. Contribution of the entire plant, growing media, and roots toward formaldehyde removal were evaluated by continuous introduction of different concentrations of formaldehyde into the chamber (0.66-16.4 mg/m ^{3}), each over a 48-h period. The plant removed formaldehyde from polluted air by 65-100%, depending on the inlet concentrations, with sufficient exposure. A maximum elimination capacity of 1.47 mg/m^3/h was achieved with an inlet formaldehyde concentration of 14.6 mg/m^3. The removal ratio of the areal portion to pot soil and roots was 2.45:1 (71%:29%). The plants removed more formaldehyde in light rather than in a dark environment. Concentrations up to 16.4 mg/m^3 were not high enough to affect plant growth, although a trivial decrease in chlorophyll, carotenoid, and water content of treated plants was observed compared to control plants. The palm species tested showed high tolerance and good potential in formaldehyde removal from interior environments. *See other results of the research by these authors based upon the use of a common fern species at* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6106135/.

GEOCHEMICAL AND ISOTOPE STUDY OF TRICHLOROETHENE DEGRADATION IN A ZERO-VALENT IRON PERMEABLE REACTIVE BARRIER: A TWENTY-TWO-YEAR PERFORMANCE EVALUATION
Wilkin, R.T., T.R. Lee, M.R. Sexton, S.D. Acree, R.W. Puls, D.W. Blowes, C. Kalinowski, J.M. Tilton, and L.L. Woods.
Environmental Science & Technology 53(1):296-306(2019)

This study provides a 22-yr record of in situ degradation of chlorinated organic compounds by a granular iron permeable reactive barrier (PRB). Groundwater concentrations of TCE entering the PRB were as high as 10670 μg/L. Treatment efficiency ranged from 81 to >99%, and TCE concentrations from

ENHANCED REMEDIATION OF ARSENIC AND CHROMIUM CO-CONTAMINATED SOIL BY ELETROKINETIC-PERMEABLE REACTIVE BARRIERS WITH DIFFERENT REAGENTS
Xu, Y., J. Li, W. Xia, Y. Sun, G. Qian, and J. Zhang.
Environmental Science and Pollution Research 26(4):3392-3403(2019)

The effects of different reagents on an electrokinetic-permeable reactive barrier (EK-PRB) system were investigated for remediation of As and Cr co-contaminated soil. Reductants (ascorbic acid, sodium citrate) and a chelating agent (EDTA-2Na) were used to pretreat contaminated soil. The PRB contained CaAl-layered double hydroxide (CaAl-LDH) as reactive material, which captured As and Cr efficiently after EK-PRB after system startup, resulting in maximal fixed amounts of 126.5 mg/kg (As) and 1507.6 mg/kg (Cr). XRD and FTIR analyses of LDH indicated that As was mainly adsorbed on the surface of LDH, whereas Cr was intercalated into the LDH interlayer.

ADDITION OF DIVALENT IRON TO ELECTRON DONOR MIXTURES FOR REMEDIATION OF CHLORINATED ETHENES: A STUDY OF 100 WELLS
Davis, D. and O.J. Miller.
Remediation Journal 29(1):37-44(2018)

The objective of this study was to assess the effects of adding soluble divalent iron (DVI) to emulsified electron donor mixtures to promote the biogeochemical destruction of four common chlorinated ethenes—PCE, TCE, cis-1,2-DCE, and VC—as part of electron donor mixture-enhanced reductive dechlorination treatments in groundwater. The study encompassed 24 project sites comprising 100 performance monitoring wells across the United States. Wells that received DVI treatment showed increased dechlorination rates, improved contaminant reduction, and limited daughter product formation relative to untreated wells. Following injection of electron donor treatments and DVI, the time required for a well to reach 90% reduction from a peak concentration was improved for the 25, 50, and 75% confidence intervals for the four chlorinated ethenes studied relative to an approach using electron donor mixture treatments alone. The total improvement in time to degrade chlorinated ethenes through VC was also improved. Daughter product formation was less for wells where DVI was added to the electron donor mixture. The cost to add a DVI amendment was less than $3 per cubic yard as applied.

ASSESSMENT OF WATER TREATMENT RESIDUALS AS SORBENT MATERIAL IN PERMEABLE REACTIVE BARRIERS: APPLICATION TO A COPPER-CONTAMINATED SITE
Walkons, C., A. Mayer, R. Datta, and D. Sarkar.
Remediation Journal 29(1):45-51(2018)

In designing a pilot-scale permeable reactive barrier (PRB) for removal of copper from groundwater in Keweenaw Peninsula, Mich., drinking water treatment residuals (WTRs)—i.e., residuals of alum coagulants used in a local drinking water treatment plant—were selected as the reactive barrier material. Synthetic precipitation leaching procedure tests indicated that concentrations of hazardous elements leached from the residuals do not exceed U.S. EPA limits and hence could be safely recycled as PRB material. Batch reactor tests showed high equilibrium sorption of copper, fitting a Langmuir-type isotherm. Tests of different mixtures of the WTRs and an inert support material (pea gravel) helped to determine the ideal mix to match the hydraulic conductivity of the field site. The dimensions of a PRB to meet the Michigan Department of Environmental Quality target level of 0.031 mg/L total Cu were calculated based on the results of kinetic and column experiments. S*ee additional information in C. Walkons' thesis at* https://digitalcommons.mtu.edu/etdr/249/.

DEVELOPMENTS IN BIOCHAR APPLICATION FOR PESTICIDE REMEDIATION: CURRENT KNOWLEDGE AND FUTURE RESEARCH DIRECTIONS
Varjani, S., G. Kumar, and E.R. Rene.
Journal of Environmental Management 232:505-513(2019)

This review provides comprehensive information on biochar amendment for the remediation of persistent organic pollutants, such as pesticides. Following a brief introduction of different types of pesticides and their hazards to life forms, biochar production and its characteristics and applications are detailed. Biochar addition in a pesticide-contaminated environment offers the following advantages: increased soil water-holding capacity, improved soil aeration conditions, and habitat provision for microorganism growth, thereby facilitating the microbial community for metabolic activities and pesticide degradation. This paper also provides an up-to-date review of knowledge gaps and future research directions to evaluate the effect of biochar addition on environmental and agricultural performance.

SUPPORT TOOL FOR IDENTIFYING IN SITU REMEDIATION TECHNOLOGY FOR SITES CONTAMINATED BY HEXAVALENT CHROMIUM
Beretta, G., A.F. Mastorgio, L. Pedrali, S. Saponaro, and E. Sezenna.
Water 10:1344(2018)

Chemical and biological in situ treatment technologies with good potential in terms of environmental sustainability have recently been designed and implemented on a wide scale for Cr(VI). This paper presents a review of potentially applicable technologies (given specific site characteristics) with the aim of providing a useful decision-support tool. The actual efficacy of a technology for a particular site should be verified in lab trials and pilot tests.
https://www.mdpi.com/2073-4441/10/10/1344/pdf

NOVEL APPLICATIONS OF MICROBIAL FUEL CELLS IN SENSORS AND BIOSENSORS
Ivars-Barcelo, F., A. Zuliani, M. Fallah, M. Mashkour, M. Rahimnejad, and R. Luque.
Applied Science 8(7):1184(2018)

An overview of new applications of microbial fuel cells (MFC) in sensors includes the provision of required electrical current and power for remote sensors and detection of pollutants, biochemical oxygen demand (BOD), and specific DNA strands by MFCs without an external analytical device. The reviewers also discuss procedures of MFC operation as a power supply for pH, temperature, and organic loading rate sensors and explore self-powered biosensors of toxicity, pollutants, and BOD. https://www.mdpi.com/2076-3417/8/7/1184/htm

General News

TECHNICAL MEASUREMENT GUIDANCE FOR LNAPL NATURAL SOURCE ZONE DEPLETION

CRC for Contamination Assessment and Remediation of the Environment, CRC CARE Technical Report No. 44, 281 pp, 2018

Natural source zone depletion (NSZD) is a term used to extend the traditional understanding of natural attenuation to the LNAPL source zone. It describes the collective, naturally occurring processes of dissolution, volatilization, and biodegradation that result in mass losses of LNAPL petroleum hydrocarbon constituents from the subsurface. This document provides a knowledge base and procedures for consistency in the measurement of NSZD by a variety of methods, including aqueous, soil gas flux, biogenic heat, and LNAPL compositional change method based on chemical analysis of oil. The guide is generally applicable to a wide range of environmental remediation sites containing petroleum hydrocarbon impacts in the subsurface. It is intended for use at sites that have a need for theoretical, qualitative, or quantitative understanding of NSZD processes.
https://www.crccare.com/files/dmfile/CRCCARETechnicalreport44_TechnicalmeasurementguidanceforLNAPLnaturalsourcezonedepletion.pdf

MINERAL PROCESSING TECHNOLOGIES FOR THE REMEDIATION OF SOILS POLLUTED BY TRACE ELEMENTS

Boente, C., C. Sierra, E. Rodriguez-Valdes, D. Baragano, J.L. Rodriguez Gallego, et al.
Proceedings 2(23):1458(2018)

Soil washing is usually conducted in mobile plants on site; however, prior to field implementation of the treatment, detailed soil characterization and trials are required to optimize the process. In this work, soils affected by heavy metals as a result of mining, metallurgical, and industrial activities were evaluated and treated at pilot scale. The diversity of soils and residues treated in combination with the variety of the methodologies employed enabled the elaboration of a general feasibility protocol for pilot-scale soil washing studies. https://www.mdpi.com/2504-3900/2/23/1458/pdf

ALTERNATIVES FOR THE DEMILITARIZATION OF CONVENTIONAL MUNITIONS

National Academies of Sciences, Engineering, and Medicine.
The National Academies Press, Washington, DC. ISBN: 978-0-309-47732-1, 132 pp, 2019

The U.S. military has a stockpile of ~400,000 tons of excess, obsolete, or unserviceable munitions. About 60,000 tons are added to the stockpile each year. Munitions include projectiles, bombs, rockets, landmines, and missiles. Open burning/open detonation (OB/OD) of these munitions has been a common disposal practice for decades, although it has decreased significantly since 2011. OB/OD is relatively quick, procedurally straightforward, and inexpensive; however, OB and OD also release contaminants from the operation directly into the environment. Over time, technology alternatives to OB/OD have become available and more are in research and development. Alternative technologies generally involve some type of contained destruction of the energetic materials, including contained burning or contained detonation as well as contained methods that forego combustion or detonation. This report reviews the current conventional munitions demilitarization stockpile; analyzes existing and emerging disposal, treatment, and reuse technologies; identifies and evaluates barriers to full-scale deployment of alternatives to OB/OD or non-closed loop incineration/combustion; and provides recommendations to overcome the barriers.*Download a free PDF or read online at* https://www.nap.edu/catalog/25140/alternatives-for-the-demilitarization-of-conventional-munitions

2018 EPA INTERNATIONAL DECONTAMINATION RESEARCH AND DEVELOPMENT CONFERENCE

U.S. EPA, National Homeland Security Research Center, 2018

EPA's Office of Research and Development's National Homeland Security Research Center has organized and hosted an international conference on decontamination research and development since 2005. The 2018 conference was held May 8-10 at EPA's Research Triangle Park Campus in North Carolina. Decontamination is one of the critical challenges that the United States and EPA would face in recovering from a major chemical, biological, or radiological (CBR) incident. The conference is designed to facilitate presentation, discussion, and further collaboration on R&D focused on an all-hazards approach to cleaning up contaminated buildings (both interior and exterior), infrastructure, and other areas/materials. The conference focuses strongly on matters involving CBR threat agents while including all hazard elements. *View the conference abstracts at* https://www.epa.gov/sites/production/files/2018-05/2018_decon_conference_abstracts.docx. *See the agenda and speaker biographies at* https://www.epa.gov/homeland-security-research/2018-epa-international-decontamination-research-and-development.

REGION 4 ECOLOGICAL RISK ASSESSMENT SUPPLEMENTAL GUIDANCE: MARCH 2018 UPDATE

U.S. EPA Region 4, Superfund Division, Scientific Support Section. 9 pp, 2018

The role of an ecological risk assessment (ERA) is to (1) determine whether unacceptable risks are posed to ecological receptors from chemical stressors, (2) derive chemical levels that would not pose unacceptable risks, and (3) provide the information necessary to make a risk management decision concerning the practical need and extent of remedial action. The purpose of this supplemental guidance is to provide Regional direction for implementation of U.S. EPA's *Ecological Risk Assessment Guidance for Superfund* (ERAGS; EPA 1997). This guidance is appropriate for Superfund sites under the authority of CERCLA and regulated by the Office of Land and Emergency Management. The *Guidelines for Ecological Risk Assessment* (EPA 1998, published by the Risk Assessment Forum) provides agency-wide guidance. This supplemental guidance clarifies the National ERAGS guidance as appropriate at both RCRA and Superfund sites.
https://rais.ornl.gov/documents/era_regional_supplemental_guidance_report-march-2018_update.pdf

THE ECOREMED PROTOCOL FOR AN INTEGRATED AGRONOMIC APPROACH TO CHARACTERIZATION AND REMEDIATION OF CONTAMINATED SOILS

Fagnano, M. and N. Fiorentino (eds).
Italian Journal of Agronomy 13(S1):1-68(2018)

This special journal issue reports on the Ecoremed projects carried out for ecocompatible remediation of contaminated soils. The papers in this volume cover detailed geophysical and geochemical characterization, assessment of ecological and dietary risks, agriculture-based techniques for remediation, and evaluation of the impact of remediation on soil ecosystem services. https://agronomy.it/index.php/agro/article/download/1348/1026/

INTERNATIONAL CONFERENCE: CONTAMINATED SITES 2018, BANSKA BYSTRICA, SLOVAKIA, 8-10 OCTOBER 2018

Bradiakova, E. and K. Paluchova (eds).
Slovak Environment Agency, 197 pp, 2018

This publication contains papers and extended abstracts prepared by the Slovak Environment Agency to support CONTAMINATED SITES 2018. The conference was organized by the Slovak Environment Agency in close cooperation with the Ministry of Environment of the Slovak Republic. The proceedings—papers, extended abstracts, and presentation slides—are posted at the bottom of webpage http://contaminated-sites.sazp.sk/.

SUPERFUND AND BANKRUPTCY: SUMMARY OF IMPACTS, ISSUES AND RISKS ASSOCIATED WITH PRP BANKRUPTCY

Association of State and Territorial Solid Waste Management Officials (ASTSWMO), 22 pp, 2018

This paper is intended to help state regulators identify and understand potential issues associated with settlement negotiations under Superfund, especially financial assurance, and to consider the implications of potentially responsible party bankruptcy during the CERCLA remedial process. http://astswmo.org/files/Resources/CERCLA_and_Brownfields/Remedial_Action_Focus_Group_Bankruptcy_Paper_2018.pdf

AQUATOX (RELEASE 3.2): MODELING ENVIRONMENTAL FATE AND ECOLOGICAL EFFECTS IN AQUATIC ECOSYSTEMS

AQUATOX Release 3.2 was designed to extend the existing AQUATOX estuarine version to include improved capabilities for situations encountered in the nearshore marine environment. Changes were required to model food webs in the marine environment. Notable updates include (1) additional equations to model the physical complexity of oyster reefs and the marsh-edge environment; (2) the capability to model size-classes of oysters and crabs within the model; (3) new invertebrate-modeling capabilities, including allometric bioenergetics equations and burrowing refuge from predation; (4) reorganization of guilds used to represent marine-biology conventions; and (5) inclusion of four new nearshore-marine studies representing marsh edge, exposed beach, soft bottom, and oyster reef habitats. Numerous nearshore-marine animal- and plant-parameter records have been added to the databases.
Volume 1: User's Manual - EPA 600-B-18-233, 112 pp, 2018 https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100VIP1.txt
Volume 2: Technical Documentation - EPA 600-B-18-241, 370 pp, 2018 https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P100VIS5.txt

A PRACTICAL APPROACH FOR MODELING MATRIX DIFFUSION EFFECTS IN REMCHLOR

Falta, R.
ESTCP Project ER-201426, 2018

The objective of this project was to develop practical and efficient mathematical methods for simulating the effects of matrix diffusion in groundwater transport and remediation models. These methods will apply to various types of heterogeneous settings, including fractured porous media and sites with extensive low permeability layers and lenses. The new mathematical methods can then be implemented in the U.S. EPA groundwater remediation screening model REMChlor to develop a new generation model that considers matrix diffusion in the plume: REMChlor-MD. The following project materials have been completed: User's Manual (119 pp); REMChlor-MD Toolkit (64-bit zip file); and REMChlor-MD Toolkit (32-bit zip file). https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Contaminated-Groundwater/Persistent-Contamination/ER-201426

STRATEGIC SAMPLING APPROACHES TECHNICAL GUIDE

EPA 542-F-18-005, 26 pp, 2018

The purpose of this technical guide is to assist environmental professionals in identifying where strategic sampling approaches might benefit data collection activities at a site and what sampling approach might be most effective given site conditions. Section 1 of this guide defines the concept of strategic sampling approaches; describes the benefits of applying them; and explores opportunities for leveraging strategic sampling approaches during various phases of the project life cycle. Section 2 describes eight strategic sampling approaches that can be used to improve the effectiveness of data collection activities. EPA recognizes that other sampling approaches may be developed and has designed this technical guide to allow for the inclusion of new approaches as they are developed. https://semspub.epa.gov/src/document/11/100001800

SMART SCOPING FOR ENVIRONMENTAL INVESTIGATIONS TECHNICAL GUIDE

EPA 542-G-18-004, 19 pp, 2018

Smart scoping practices can be used during any phase of a Superfund remedial investigation's project life cycle or in accordance with other similar federal, state, or tribal regulatory authorities. Use of these practices can support the development of a robust conceptual site model, which in turn helps improve response action development, selection, and implementation. Smart scoping integrates adaptive management and site characterization. Adaptive management is an approach U.S. EPA is expanding to help ensure that informed decision-making and the expenditure of limited resources go hand-in-hand throughout the remedial process. This technical guide's purpose is twofold: (1) it broadly highlights best practices related to scoping an environmental investigation that have been developed over many years of planning and implementing investigations; and (2) it provides technical resources and references to support smart scoping activities.
https://semspub.epa.gov/src/document/11/100001799

BEST PRACTICES FOR DATA MANAGEMENT TECHNICAL GUIDE

EPA 542-F-18-003, 14 pp, 2018

The Superfund program collects, reviews, and works with large volumes of sampling, monitoring, and environmental data that are used for decisions at different scales. This technical guide identifies best practices for efficiently managing the large amount of data generated throughout the data life cycle. Thorough, up-front remedial investigation and feasibility study (RI/FS) planning and scoping combined with decision support tools and visualization can help reduce RI/FS cost and provide a more complete conceptual site model earlier in the process. In addition, data management plays an important role in adaptive management application during the RI/FS and remedial design and action. Applying best practices to data management activities increases data usefulness and allows the use of new data interpretation tools and programs. https://semspub.epa.gov/src/document/11/100001798

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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