Technology Innovation News Survey

Entries for August 1-15, 2020

Market/Commercialization Information

NATIONWIDE LOW-LEVEL/MIXED LOW-LEVEL WASTE TREATMENT SERVICES
U.S. DOE, Office of Environmental Management Consolidated Business Center, Cincinnati.
Contract Opportunities at Beta.SAM, Solicitation 89303320REM000060, 2020

Multiple Basic Ordering Agreements (BOAs) are anticipated from this solicitation. The BOA between DOE and Contractor is for providing all personnel, facilities, equipment, material, supplies, and services necessary for the treatment of radioactive waste for final compliant disposition of liquid, solid, sludge, and/or gaseous low-level waste (LLW), and mixed LLW, including high gram quantities that could also contain TSCA chemicals, such as PCBs, and the performance of other ancillary waste services, including Bulk Survey for Release materials. This service supports the DOE-EM mission of safely completing the cleanup of the environmental legacy from five decades of nuclear weapons development and nuclear energy research. The BOA task orders are fixed price. The method of determining prices under the BOA will be determined at the competitive task order level. Period of performance: December 5, 2020, to December 4, 2025. The NAICS code is 562211. Offers are due via FedConnect by 4:00 PM ET on September 30, 2020. https://beta.sam.gov/opp/bcce18d4e28e4b2ca5d4a144df76a22b/view

U.S. EPA OFFICE OF LAND & EMERGENCY MANAGEMENT - ORCR ERAS ECONOMIC AND ANALYTICAL SUPPORT
Environmental Protection Agency, Headquarters Acquisition Div., Washington, DC.
Contract Opportunities at Beta.SAM, Solicitation 68HERH19R0004, 2020

U.S. EPA is issuing this RFP as a full and open competition under NAICS code 541620 to obtain contractor services to provide economic and analytical support for the Office of Land and Emergency Management's Office of Resource Conservation and Recovery (ORCR). EPA has a requirement to provide services for ORCR for the assessment of potential risks, benefits, costs, economic impacts, and other effects associated with the generation and management of hazardous solid waste. Details are available on FedConnect at https://www.fedconnect.net/FedConnect/?doc=68HERH19R0004&agency=EPA. Offers are due by 4:30 PM ET on September 30, 2020. https://beta.sam.gov/opp/73fa7c2911dc469f8f82b709ba91b690/view

REGION 9 ARCHITECT AND ENGINEER SHORT SELECTION LIST
Eastern Region USDA Forest Service, Milwaukee, WI.
Contract Opportunities at Beta.SAM, Solicitation 1256A120Q0006, 2020

The USDA Forest Service Eastern Region is accepting new and updated qualification information for its AE Short Selection List. The NAICS code is 541330. The Forest Service utilizes the Short Selection List to award AE contracts valued at less than the simplified acquisition threshold in all states within the Forest Service Eastern Region (Illinois, Indiana, Maine, Michigan, Minnesota, Missouri, New Hampshire, New York, Ohio, Pennsylvania, Vermont, West Virginia, and Wisconsin). The shortlist will contain all of the unexpired submissions from previous announcements and all qualified, interested AE firms that respond to this announcement. Among the list of examples of the types of work that might be awarded are environmental (RCRA, CERCLA, CWA, etc.) investigations, reviews, inventories, audits, and coordination of RCRA and other waste disposal. Responses are due by 4:30 PM CT on October 1, 2020. A list of frequently asked questions is attached to the notice at Beta.SAM. https://beta.sam.gov/opp/401a928d353c413898070048dd88e2225/view

PORTSMOUTH GASEOUS DIFFUSION PLANT (GDP) DECONTAMINATION
U.S. DOE, Office of Environmental Management Consolidated Business Center, Cincinnati.
Contract Opportunities at Beta.SAM, Solicitation 89303320NEM000026, 2020

This Sources Sought is issued for the purpose of conducting market research for the acquisition planning stage for the potential contract award for completion of the Portsmouth Gaseous Diffusion Plant (GDP) life-cycle D&D project. The NAICS code is 562910. The project will include demolition and disposal of all GDP facilities, process equipment, related process buildings, and other ancillary GDP facilities in addition to remediation of contaminated soils and groundwater. The major elements of scope are identified in an attachment at beta.sam. The purpose of this notice is to solicit input via capability statements from interested parties with the specialized capabilities necessary to meet all of the major elements of scope for the upcoming competitive procurement. DOE is also seeking feedback from contractors and other interested parties regarding options for innovative approaches for performance of the major elements of scope as well as insight into potential contracting alternatives. Responses are due by 5:00 PM ET on October 9, 2020.https://beta.sam.gov/opp/40c1169a8d124da4a40dcd16f8cac88e/view

DRAFT RFP W9128F20R0046 - $49M ERS WEST SATOC - SB SET-ASIDE
U.S. Army Corps of Engineers (USACE), Omaha District, Omaha, NE.
Contract Opportunities at Beta.SAM, Solicitation W9128F20R0046, 2020

The purpose of this special notice is to promote early exchanges of information about a future acquisition. At a yet-to-be-determined future date, the Government anticipates awarding under this solicitation number an IDIQ single-award task-order contract for environmental remediation services with Military Munitions Response Program capabilities under NAICS code 562910 in support of the USACE Omaha District and its customers in the Continental United States, Alaska, Hawaii, and U.S. territories, with the western half of the United States as primary coverage. Contracts likely will have a basic ordering period of four years plus one three-year option period or until the $49M total capacity is reached. A DRAFT RFP is attached to the notice at beta.sam for which the USACE Omaha District is requesting industry input. Submit questions, comments, and suggestions via ProjNet as part of the Bidder Inquiry via https://www.projnet.org/projnet/ using Bidder Inquiry Key 3T3U8A-P4MY6V. https://beta.sam.gov/opp/a922b229494f4d1faad53ff354483d45/view

Cleanup News

PARTITION AND FATE OF PHTHALATE ACID ESTERS (PAES) IN A FULL-SCALE HORIZONTAL SUBSURFACE FLOW CONSTRUCTED WETLAND TREATING POLLUTED RIVER WATER
Zheng, L., T. Liu, E. Xie, M. Liu, A. Ding, B.-T. Zhang, X. Li, and D. Zhang.
Water 12(3):865(2020)

The distribution and fate of four PAEs (dimethyl phthalate [DMP], diethyl phthalate [DEP], di-n-butyl phthalate [DBP], and bis (2-ethylhexyl) phthalate [DEHP]) was measured inside a full-scale horizontal subsurface flow constructed wetland. In effluent, concentrations decreased 19.32% (DMP), 19.18% (DEP), 19.40% (DBP), and 48.56% (DEHP), respectively. Within the wetland, PAEs partitioned in water (0.18-1.12 µg/L, 35.38-64.92%), soil (0.44-5.08 µg/g, 1.02-31.33%), plants (0.68-48.6 µg/g, 0.85-36.54%), and air and underwent biological transformation (2.72-33.21%). Soil and plant adsorption contributed to the majority of PAE removal. Moreover, the adsorption was affected by both octanol/water partition coefficient and transpiration stream concentration factors. https://www.mdpi.com/2073-4441/12/3/865/pdf

SOURCE AREA REMEDIATION REPORT REED MANUFACTURING SERVICES FRANKLIN, INDIANA
Indiana Department of Environmental Management, 649 pp, 2020

Previous activities on the Reed Manufacturing site contaminated soil and groundwater with PCE and TCE at the southeastern portion of the property. Remediation began with the excavation of ~2,524 tons of contaminated soil, which was disposed of offsite. Five shallow trenches were dug in the bottom of the excavation to install an infiltration gallery to perform in situ chemical oxidation using potassium permanganate ($KMnO_4$) to remediate groundwater. Each injection line was installed in a trench and backfilled with pea gravel, generally perpendicular to groundwater flow to facilitate downgradient groundwater treatment. A total of 7,025 gals of water was mixed with 3,087 lbs of $KMnO_4$. To monitor the effectiveness of the source area removal and subsequent groundwater treatment, groundwater will be sampled for VOCs. It is expected that quarterly monitoring will continue for 1 to 2 years, depending on the observed contaminant trends.
https://ecm.idem.in.gov/cs/idcplg?IdcService=GET_FILE&dID=82958630&dDocName=82958035&Rendition=web&allowInterrupt=1&noSaveAs=1&fileName=82958035.pdf

HEXACHLOROCYCLOHEXANE PHYTOREMEDIATION USING *EUCALYPTUS DUNNII* OF A CONTAMINATED SITE IN ARGENTINA
Gotelli, M.J., A. Lo Balbo, G.M. Caballero, and C.A. Gotelli.
International Journal of Phytoremediation 22(11):1129-1136(2020)

In 1996, a diagnostic study performed in a 16-ha field located in Buenos Aires Province found 1,2,3,4,5,6-hexachlorocyclohexane (HCH) contamination ranging from 10-20,000 mg/kg dry soil (706.4 mg/kg average). A 1997 forestation plan employed ~12,300 *Eucalyptus dunnii* seedlings to remediate contamination. In 2005 when the trees had grown 8-10 m high, analysis indicated that HCH was incorporated into leaves and logs, and phytoremediation of soil was progressing. Final quantitation analysis of HCH in soil in 2016 demonstrated that 97.2% of the field area was effectively decontaminated with 98.1% overall average efficiency.

SEVENTH SEMI-ANNUAL VRP PROGRESS REPORT IMTT SAVANNAH NORTH TERMINAL SAVANNAH, CHATHAM COUNTY, GEORGIA
Georgia Department of Natural Resources, 109 pp, 2019

Petroleum refining and storage contaminated groundwater at the IMTT with LNAPL. To prevent migration offsite, a 20 ft deep, ~1,500 ft long polyethylene polywall was installed in 1996 along the Savannah River at the downgradient edge of the site. Portions of the polywall exposed by excavation in 2015 did not show signs of delamination, degradation, or deterioration, indicating it successfully limited plume migration. After approval into Georgia's Voluntary Remediation Program, additional investigations were conducted to determine recovery approaches to remediate LNAPL. Long-term LNAPL recovery is being conducted in five in-well air-powered, and two-month intermittent recovery efforts are being conducted using skimming systems at seven other wells. Within the reporting period, ~1,400 gals of LNAPL were recovered from wells, with >13,000 gals recovered since skimming operations began in the Spring of 2016. The extent of the LNAPL plume continues to remain stable with no indications of additional sources or migration of LNAPL. https://epd.georgia.gov/document/document/progress-report-20/download

NATURAL ATTENUATION OF A CHLORINATED ETHENE PLUME DISCHARGING TO A STREAM: INTEGRATED ASSESSMENT OF HYDROGEOLOGICAL, CHEMICAL AND MICROBIAL INTERACTIONS
Ottosen, C.B., V. Ronde, U.S. McKnight, M.D. Annable, M.M. Broholm, J.F. Devlin, et al.
Water Research 186:116332(2020)

Several methods were combined in a multi-scale interdisciplinary in situ approach to assess and quantify the near-stream attenuation of a plume, primarily consisting of cDCE and VC that is discharging to a stream. Monitoring was conducted over seven years. At first, the site exhibited limited degradation from 2012-16 despite seemingly optimal conditions but presented notable degradation levels in 2019. Despite the increased degradation in the near-stream plume core, the contaminant attenuation was still incomplete in the discharging plume. A conceptualization of flow, transport, and processes clarified that hydrogeology was the main control on the natural attenuation, as short residence times of 0.5-37 days restricted the time in which dechlorination could occur.

Demonstrations / Feasibility Studies

LESSONS FROM LONG-TERM FIELD PHYTOSTABILISATION STUDIES
Siebielec, G., S. Siebielec, T. Stuczynski, and P. Sugier.
16th International Conference on Environmental Science and Technology, 4-7 September, Rhodes, Greece, 2019

This paper combines experience from greenhouse testing of soil amendments and long-term field experiments to optimize phytostabilization of toxic smelter waste deposits. The paper compares impacts of soil amendments combined with traditional materials on metal solubility and the response of plants, soil organisms, and microbial activity. Field evaluations involved long-term smelter wasteland site reclaimed with biosolids and by-product limestone combined with the implementation of resistant grass species. The data on metal extractability and bioavailability, plant cover, microbial activity, abundance, and biodiversity is presented.
https://cest2019.gnest.org/sites/default/files/presentation_file_list/cest2019_00527_oral_paper.pdf

A NOVEL HORIZONTAL SUBSURFACE FLOW CONSTRUCTED WETLAND PLANTED WITH *TYPHA ANGUSTIFOLIA* FOR TREATMENT OF POLLUTED WATER
Gaballah, M.S., O. Abdelwahab, K.M. Barakat, and D. Aboagye.
Environmental Science and Pollution Research 27:28449-28462(2020)

Three constructed wetland configurations, including *Typha angustifolia* planted with enhanced atmospheric aeration by using perforated pipes networks (CWA), planted without perforated pipe network (CWR), and a control non-planted and without perforated pipes wetland, were tested on polluted water in the Marriott Lake of Egypt. Changes in physicochemical properties and microbial community over four seasons and the hydraulic loading rate (HLR) (50, 100, 200, 300, and 400 L/day/m) were monitored in influent water. The removal performance followed the sequence CWA>CWR>control. Seasonal variation and variation in HLRs had a significant effect on performance. The modified planted CWA system enhanced the removal of pollutants and could present a novel route for reducing the cost associated with integrating artificial aeration into wetlands.

TREATMENT OF BALILI RIVER IN BENGUET, PHILIPPINES WITH CONSTRUCTED WETLAND PLANTED WITH DOMINANT LOCAL MACROPHYTES
Napaldet, J.T. and I.E. Buot, Jr.
International Journal of Phytoremediation 21(14):1463-1473(2019)

Phytoremediation using the macrophytes *Amaranthus spinosus, Eichhornia crassipes*, Eleusine indica, and *Pennisetum purpureum* was explored in the Balili River, Philippines, by constructing pilot-scale constructed wetlands subjected to varying hydraulic retention time (HRT) treatments. The macrophytes had high phytoremediation performance in almost all water quality parameters. Also, HRT significantly affected the pollution reduction efficiency of the macrophytes. Significant pollution reduction was observed as early as HRT day 1, but the optimal HRT for all the macrophytes was 3-4 days. Among the macrophytes, *P. purpureum* generally had the best pollution reduction efficiency.

LABORATORY-SCALE AND PILOT-SCALE STABILIZATION AND SOLIDIFICATION (S/S) REMEDIATION OF SOIL CONTAMINATED WITH PER- AND POLYFLUOROALKYL SUBSTANCES (PFASS)
Sorengard, M., P. Gago-Ferrero, D.B. Kleja, and L. Ahrens.
Journal of Hazardous Materials 402:123453(2020)

S/S was evaluated at pilot-scale to treat 6 tons of soil contaminated with PFAS-containing aqueous film-forming foam. The study compared long-term PFAS removal over six years of precipitation in leachate from non-treated contaminated reference soil and S/S-treated soil with 15% binder and 0.2% granular activated carbon. PFAS removal rate from leachate was >97% for PFHxA, PFOA, PFHxS, and PFOS, but 3% for PFPeA. During the study, PFAS sorption strength increased 2- to 40-fold for both reference and S/S-treated soil, which were higher but correlated well with lab tests. Seven PFASs were tentatively identified using an automated suspect screening approach. Among these, perfluorohexanesulfonamide and 3:2 fluorotelomer alcohol were tentatively identified, and the latter had low removal rates from leachate (<12%) in S/S treatment.

PLUMESTOP PHASE 1 PILOT STUDY AT OLD OUTFALL 002
The Chemours Company, 216 pp, 2019

Groundwater at a 2,777-acre manufacturing facility contains PFAS constituents from past deposition discharges to the Old Outfall 002 channel. Bench-scale testing of PlumeStop® was performed alongside a pilot-scale permeable reactive wall. The bench-scale studies confirmed the ability of PlumeStop to adsorb the contaminants and demonstrated that there no significant interfering species in the soil or groundwater matrix that limits the performance of PlumeStop. Of three injection techniques pilot-tested to deliver PlumeStop, injection using retractable screens following a bottom-up approach in 3-ft intervals was the best delivery method. A total of 22,000 lbs of PlumeStop applied through 48 locations created a 70-ft barrier. PFAS concentrations generally showed significant decreases in samples from three downgradient wells. Field results from post-treatment samples indicated target compounds HFPO-DA (>99%) and PFMOAA (~67-77%) and total PFAS (76-82%) reductions relative to baseline concentrations in three performance monitoring wells. Results will be used to design a full-scale system.
https://www.chemours.com/en/-/media/files/corporate/12_6_plumestop-phase-1-pilot-_2019-09-30.pdf

Research

MICROCOSM EXPERIMENT TO ASSESS THE CAPACITY OF A POPLAR CLONE TO GROW IN A PCB-CONTAMINATED SOIL
Nogues, I., P. Grenni, M. Di Lenola, L. Passatore, E. Guerriero, P. Benedetti, A. Massacci, et al.
Water 11(11):2220(2019)

Preliminary microcosm experiments were conducted in a greenhouse for 12 months to evaluate the capacity of a Monviso hybrid poplar clone to grow in microbiologically active, pre-sterilized, and hypoxic PCB-contaminated soils. The poplar clone grew efficiently in contaminated soil and promoted microbial transformations of PCBs. Plants grown in the hypoxic condition promoted the formation of more higher-chlorinated PCBs and accumulated lower PCBs in their roots, but showed a higher stress level than the other microcosms, producing higher amounts of phenolic, flavonoid, and ascorbate contents as a defense mechanism. https://www.mdpi.com/2073-4441/11/11/2220/pdf

HEAVY METAL REMOVAL BY FLOATING TREATMENT WETLANDS: PLANT SELECTION
Schuck, M., Master's Thesis, Stockholm University, 34 pp, 2019

Thirty-four wetland plant species native to Sweden were grown hydroponically for five days in a solution containing 1.2 µg/L Cd, 68.5 µg/L Cu¸ 78.4 µg/L Pb, 559 µg/L Zn, and 55.4 mg/L chloride. *Carex pseudocyperus* and *Carex riparia* quickly reduced the concentrations of all added heavy metals and kept the concentrations low for the duration of the study. Nine species removed all metals except Cd quickly. *Phalaris arundinacea* and *Glyceria maxima* had the highest chloride removal capacity. High removal capacity of metals was connected to biomass traits, mainly high amounts of fine-root biomass, leaf biomass, and transpiration. Findings indicate that the removal of both heavy metals and chloride can be achieved by floating treatment wetlands in cold climates using a combination of native plants.
https://vpp.shuf.se/Public/Documents/ProjectDocuments/b50eb414-24c9-4b18-9c72-72bc157dbd41/FinalReport/SBUF%2013167%20Lic%20avh%20Heavy%20metal%20removal%20by%20floating%20treatment%20wetlands%20Plant%20selec

ACCELERATED REMEDIATION OF ORGANOCHLORINE PESTICIDE-CONTAMINATED SOILS WITH PHYTO-FENTON APPROACH: A FIELD STUDY
Tran, T.D., N.T. Dao, R. Sasaki, M.B. Tu, G.H.M. Dang, H.G. Nguyen, H.M. Dang, et al.
Environmental Geochemistry and Health [Published online 15 May 2020 prior to print]

A six-month field trial was performed to evaluate the effect of nano- Fe_3O_4 to degrade organochlorine pesticide residues, including Lindane, *p,p'*-DDT, *p,p'*-DDE, and *p,p'*-DDD, in soils in the presence of vetiver. Vetiver was planted in three zones with different nano-Fe3O4 concentrations. DDT dechlorination mainly occurred under aerobic pathways to form DDE. In the presence of vetiver, the rate constants of DDE degradation were 0.264/month, 0.350/month, and 0.434/month with 0 mg/kg, 25 mg/kg, and 100 mg/kg of added nano- Fe_3O_4, respectively. The presence of vetiver and nano-Fe_3O_4 in the soil increased DDT removal rates, which might be linked to the involvement of Fenton/Fenton-like reactions.

VALIDATION OF ADVANCED MOLECULAR BIOLOGICAL TOOLS TO MONITOR CHLORINATED SOLVENT BIOREMEDIATION AND ESTIMATE CVOC DEGRADATION RATES
Michalsen, M., K. Kucharzyk, C. Bartling, J. Meisel, P. Hatzinger, J. Wilson, J. Istok, et al., ESTCP Project ER-201726, 134 pp, 2020

The objectives of this project were to use quantitative proteomics (qProt) to measure the absolute abundance of *Dehalococcoides mccartyi* (*Dhc*) reductive dechlorination biomarker proteins in laboratory-controlled microcosms and to correlate observed degradation rates with *Dhc* biomarker gene and protein abundances. Contaminant concentration and ethene measurements over time were used to determine cDCE and VC reductive dechlorination rates.
https://www.serdp-estcp.org/content/download/51730/508799/file/ER-201726%20Final%20Report.pdf

POST-REMEDIATION PERFORMANCE ASSESSMENT AT A PETROLEUM IMPACTED SITE
Popovic, J., J. Segura, T. Lewis, C. Newell, and P. Kulkarni., ESTCP Project ER- 201582, 174 pp, 2020

This project was implemented to help DoD and others make a stronger case to close legacy petroleum sites and expand users' knowledge of high-impact methods to reveal actual risk associated with LNAPL presence, helping stakeholders make more informed remediation decisions. https://www.serdp-estcp.org/content/download/51709/508635/file/ER-201582%20Final%20Report.pdf

BIOAUGMENTING THE POPLAR RHIZOSPHERE TO ENHANCE TREATMENT OF 1,4-DIOXANE
Simner, R., J. Mathieu, M.L.B.da Silva, P. Lashmit, S. Gopishetty, P.J.J. Alvarez, et al.
Science of The Total Environment 744:140823(2020)

A poplar rhizosphere was bioaugmented with *Mycobacterium dioxanotrophicus* PH-06 or *Pseudonocardia dioxanivorans* CB1190 to enhance removal of 1,4-dioxane from groundwater. All treatments tested removed 10 mg/L dioxane to

REMEDIATION OF PFAS-CONTAMINATED SOIL AND GRANULAR ACTIVATED CARBON BY SMOLDERING COMBUSTION
Duchesne, A.L., J.K. Brown, D.J. Patch, D. Major, K.P. Weber, and J.I. Gerhard.
Environmental Science & Technology [Published online 21 August 2020 prior to print]

Smoldering combustion was used to remediate PFAS-impacted granular activated carbon (GAC), both fresh and PFAS-loaded, and PFAS-contaminated soil. Both GACs were employed as the supplemental fuel supporting smoldering in mixtures with sand (≈175 mg PFAS/kg), PFAS-spiked, laboratory-constructed soil (≈4 mg PFAS/kg), and a PFAS-impacted field soil (≈0.2 mg PFAS/kg). Exceeding 35 g GAC/kg soil resulted in self-sustained smoldering with temperatures exceeding 900°C. Post-treatment PFAS soil concentrations were near or below detection limits. About 44% of the initial PFAS on GAC underwent full destruction, compared to 16% of PFAS in soil. While <1% of the initial PFAS contamination on GAC or soil were emitted, altered, shorter-chain PFAS and volatile fluorinated compounds were emitted from the treatment but were scrubbed effectively with GAC. Total organic fluorine analysis proved useful for PFAS-loaded GAC in sand, but soil analysis suffered from interference from non-PFAS. *See thesis from J. Gerhard for more information*https://dr.lib.uwo.ca/etd/6878/ [Note: It might be necessary to copy and paste the URL into your browser for direct access.]

A MIXED MICROBIAL COMMUNITY FOR THE BIODEGRADATION OF CHLORINATED ETHENES AND 1,4-DIOXANE
Polasko, A.L., A. Zulli, P.B. Gedalanga, P. Pornwongthong, and S. Mahendra.
Environmental Science & Technology Letters 6(1):49-54(2019)

A microbial community was developed capable of biodegrading mixtures of chlorinated ethenes and 1,4-dioxane under varying redox conditions. The mixed community, composed of KB-1 and *Pseudonocardia dioxanivorans* CB1190, reduced TCE in anaerobic environments and oxidized 1,4-dioxane in the presence of oxygen. Aerobic biodegradation of *cis*-1,2-DCE by CB1190 was also confirmed, decreasing the accumulation of TCE transformation products. The assembled microbial community survived significant redox changes and sequentially biodegraded chlorinated ethenes and 1,4-dioxane.

TWO-STAGE OZONATION-ADSORPTION PURIFICATION OF GROUND WATER FROM TRICHLOROETHYLENE AND TETRACHLOROETHYLENE WITH APPLICATION OF COMMERCIAL CARBON ADSORBENTS
Tkachenko, I., S.N. Tkachenko, E.S. Lokteva, N.A. Mamleeva, and V.V. Lunin.
Ozone: Science & Engineering 42(4):357-370(2020)

Three carbon sorbents (AUT-M, CAUSORB-221, and AG-3) were tested in a two-stage ozone-sorption method to remediate groundwater containing both TCE and PCE. Prolonged tests demonstrated that the highest achievable efficiency of destruction with ozone was 94% for TCE and 38% for PCE. Ozonation-sorption treatment achieved TCE and PCE removal efficiencies of 96-97% and 92-94%, respectively. The most efficient carbon sorbent was AUT-M, which decreased TCE and PCE concentrations to below 5 µg/L.

REMEDIATION OF PETROL HYDROCARBON-CONTAMINATED MARINE SEDIMENTS BY THERMAL DESORPTION
Falciglia, P.P., L. Lumia, M.G. Giustra, E. Gagliano, P. Roccaro, F.G.A. Vagliasindi, et al.
Chemosphere 260:127576(2020)

Ex situ thermal desorption was applied to hydrocarbon-contaminated marine sediment at temperatures up to 280°C for 5-30 min. Temperatures from 200-280°C led to a total petrol hydrocarbon (TPH) removal efficiency of 75-85% when heated for 10 min. The maximum removal efficiency of 89% was obtained at 200°C for 30 min. The technology demonstrated that a 5-min remediation time (or lower temperatures of 160 and 180°C with longer times can remediate marine sediments to the TPH standard limit. Obtained results add relevant information to be used as a basis for future scaling-up investigations of ESTD for hydrocarbon-contaminated marine sediments.

General News

SUPERFUND, MEET SUPER PLANTS
Yan, W., New York Times website, April 7, 2020

Poplar trees are becoming a popular phytoremediation method to remediate contaminants in soil and water. The trees are enhanced with endophytes, which are microbes that naturally colonize poplar trees and provide a boost, enabling the trees to survive and even thrive in toxic landscapes. The PDN3 strain of endobacteria not only helps the trees uptake TCE but also degrades the contaminant into carbon dioxide and salt. The method has been applied at more than 20 polluted groundwater sites across the country in Texas, Kentucky, California, New York, and the Midwest. One such site is the Naval Air Station Moffett Field Superfund site, where 1,000 endophyte-assisted poplars were planted to remediate TCE in groundwater. https://www.nytimes.com/2020/04/07/science/superfund-plant-microbiome.html *See EPA fourth Five Year Review for preliminary results of the study at the Moffett Field site* https://semspub.epa.gov/work/09/100018492.pdf

APPLICATION OF FLOATING AQUATIC PLANTS IN PHYTOREMEDIATION OF HEAVY METALS POLLUTED WATER: A REVIEW
Ali, S., Z. Abbas, M. Rizwan, I.E. Zaheer, I. Yavas, A. Unay, M.M. Abdel-DAIM, et al.
Sustainability 12:1927(2020)

This article reviews the use of aquatic plants for use in phytoremediation to show the broad applicability of phytoremediation.

ROLE OF MICROORGANISMS IN THE REMEDIATION OF WASTEWATER IN FLOATING TREATMENT WETLANDS: A REVIEW
Shahid, M.J., A.A. AL-surhanee, F. Kouadri, S. Ali, N. Nawaz, M. Afzal, M. Rizwan, et al.
Sustainability 12:5559(2020)

Literature was collected and organized to provide insight into the specific role of microbes used to remove pollutants in floating treatment wetlands (FTWs). Several aspects are discussed, such as important components of FTWs, common bacterial species, rhizospheric and endophytes bacteria, and their specific role in the pollutant removal process. https://www.mdpi.com/2071-1050/11/24/6981/pdf

PHYTOREMEDIATION IN-SITU APPLICATIONS
Shmaefsky, B.R. (ed). Springer Nature Switzerland. ISBN 978-3-030-00098-1, ISBN 978-3-030-00099-8, 367 pp, 2020

This book provides in situ phytoremediation strategies well-suited for developing nations. The goal is to promote the use of field-tested phytoremediation methods for removing soil and water pollutants from agricultural, industrial, military, and municipal sources. These strategies include using algae and a variety of aquatic and terrestrial plants. The book subsequently discusses the use of crops and native plants for phytoremediation, and how phytoremediation efforts impact the rhizosphere.

ENZYMATIC TECHNOLOGIES AS GREEN AND SUSTAINABLE TECHNIQUES FOR REMEDIATION OF OIL-CONTAMINATED ENVIRONMENT: STATE OF THE ART
Osuoha, J.O. and E.O. Nwaichi.
International Journal of Environmental Science and Technology [Published online 9 August 2020 prior to print]

A concise overview of enzymes used to remediate hazardous and toxic contaminants, including the mode of action of enzymes like tyrosinase, laccase, peroxidase, and oxygenase, is presented.

ENDOPHYTE-ASSISTED PHYTOREMEDIATION: MECHANISMS AND CURRENT APPLICATION STRATEGIES FOR SOIL MIXED POLLUTANTS
He, W., M. Megharaj, C.-Y. Wu, S.R. Subashchandrabose, and C.-C. Dai.
Critical Reviews in Biotechnology 40(1):31-45(2020)

This review summarizes the taxa and physiological properties of endophytic microorganisms that may participate in the detoxification of contaminant mixtures, potential biomolecules that may enhance endophyte mediated phytoremediation, practical applications of pollutant-degrading endophytes, and current strategies for applying the bio-resource to soil phytoremediation.

SUSTAINABLE SOIL REMEDIATION: SEEKING ALTERNATIVES
Nichols, S., Institute of Environmental Sciences webinar, 3 June, 2020

This webinar examines the environmental impacts of traditional soil remediation methods, including excavation and off-site disposal, and presents possible environmentally-friendly alternatives, such as bioventing, biosparging, and landfarming. *See a recording of the webinar on YouTube* https://www.youtube.com/watch?v=uGOh7EiSsYA

THE HANDBOOK OF ENVIRONMENTAL REMEDIATION: CLASSIC AND MODERN TECHNIQUES
Hussain, C.M. (ed). Royal Society of Chemistry. ISBN: 978-1-78801-380-2, ISBN: 978-1-83916-172-8, 506 pp, 2020

This handbook brings classical and emerging techniques together for hazardous wastes, municipal solid wastes, and contaminated water sites. Chapter topics include chemical oxidation, thermal treatment, air sparging, electrokinetic remediation, stabilization/solidification, permeable reactive barriers, thermal desorption and incineration, phytoremediation, biostimulation and bioaugmentation, bioventing and biosparging, electrochemical remediation methods, nanoremediation, green sustainable remediation, economics, health and safety issues, and environmental regulations. *View the table of contents and abstracts at* https://pubs.rsc.org/en/content/ebook/978-1-78801-380-2

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