Technology Innovation News Survey

Entries for May 1-15, 2021

Market/Commercialization Information

DOE OFFICE OF ENVIRONMENTAL MANAGEMENT BUSINESS OPPORTUNTIES FORUM
Dept of Energy, Environmental Management Consolidated Business Center, Cincinnati, OH
Contract Opportunities at SAM.gov, Solicitation EM_BUSINESS_OPPORTUNITIES_FORUM_6-2021

This solicitation is under NAICS code 562910. DOE's Office of Environmental Management (EM) will hold a virtual Business Opportunities Forum via a Zoom webinar on June 24, 2021, from 3:00 PM to 4:15 PM ET to discuss the latest news on doing business with EM. To receive the connection information, Pre-register by June 22, 2021. https://beta.sam.gov/opp/139dfa3ef7504f3fa4539b50d0e41825/view

INTERNATIONAL REMEDIATION AND ENVIRONMENTAL SERVICES - GENERATION TWO (IRES2), MULTIPLE AWARD TASK ORDER CONTRACT
U.S. Army Engineering and Support Center, Huntsville, AL.
Contract Opportunities at SAM.gov, Solicitation W912DY-21-R-0026, 2021

This requirement is being competed on an unrestricted basis under NAICS code 562910. The U.S. Army Engineering and Support Center, Huntsville, in support of the Ordnance & Explosives Directorate, intends to award multiple IDIQ-type contracts to support sites located outside the continental United States, primarily at international locations such as Afghanistan, Iraq, Japan, Jordan, Kuwait, Lebanon, Poland, South Korea and Ukraine. Contractors will perform military munitions response services involving (1) munitions and explosives of concern, material potentially presenting an explosive hazard, chemical warfare material, and biological warfare material; (2) environmental compliance and remediation services primarily for hazardous, toxic and radioactive waste, including biological waste and munitions constituents; and (3) other munitions-related services. This MATOC will have a base ordering period of 36 months with two 12-month options under a total programmatic capacity of $750M. Individual capacities will not be assigned to each contract. Task orders will be awarded as firm fixed price and cost plus fixed fee. Offers are due by 9:00 AM CT on July 1, 2021. https://beta.sam.gov/opp/3bcde3c6999f4b548e21d3d5027b357d/view

WASTE ISOLATION PILOT PLANT (WIPP) MANAGEMENT AND OPERATING (M&O) ACQUISITION
Dept of Energy, Environmental Management Consolidated Business Center, Cincinnati, OH.
Contract Opportunities from SAM.gov, Solicitation 89303320REM000077, 2021

DOE's Waste Isolation Pilot Plant M&O acquisition will be conducted as a full and open competition. DOE has released the final RFP for the WIPP M&O acquisition in a .zip file at SAM.gov and on the WIPP M&O procurement website at https://www.emcbc.doe.gov/SEB/wippcontract/. The WIPP M&O final RFP reflects a cost-plus-award-fee M&O contract with an IDIQ CLIN. The contract will include a four-year base and six one-year options under an estimated contract value of about $3B, including all option periods. The contract will also include a 90-day transition period. Proposals are due by 4:00 PM ET on July 19, 2021. https://beta.sam.gov/opp/51d291cd4a844c9ea07e46ccfb00d34f/view

BUILDING RESILIENCY: EMERGENCY WATER TREATMENT SYSTEM
U.S. EPA Research Webinar, 18 Mar 2021

EPA researchers partnered with WaterStep, a nonprofit whose mission is to provide safe water and sanitation to communities, to develop a modular, mobile water treatment system known as Water on Wheels -- Emergency Mobile Water Treatment System (also known as the WOW Cart). This partnership was developed through the Federal Technology Transfer Act cooperative research and development agreement (CRADA), which allows the federal government to work directly with private companies. This emergency water treatment system is designed so the treatment train can be configured on-site to treat a broad spectrum of contaminants (chemical, biological, or radionuclide) without utilizing other unnecessary and costly unit processes and without producing large amounts of contaminated waste. The WOW Cart is an inexpensive and versatile water treatment system about the size of a shopping cart. Configured with multiple treatment technologies and equipped with alternative power sources, the system is easily deployed and operated to support emergency response activities. A patent application has been filed, and a license from EPA or WaterStep is required for use of the technology by non-federal third parties. WOW Webinar: https://www.youtube.com/watch?v=OQEeZaR_2oE - WOW Design: https://cfpub.epa.gov/si/si_public_record_report.cfm?Lab=CESER&dirEntryId=348196 - WOW User Manual: https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=P1010W5A.txt

F -- EPA ENFORCEMENT SUPPORT AND SERVICES CONTRACT
U.S. EPA, Region 9 Contracting Office, San Francisco, CA.
Contract Opportunities at SAM.gov, Solicitation 68HE0921R0004, 2021

This procurement will be 100% set aside for SBA-certified small business concerns under NAICS code 541620. U.S. EPA Region 9 is seeking businesses interested in submitting a proposal for a fixed-rate IDIQ contract to provide professional, scientific, and technical services to support enforcement activities in Region 9 (California, Nevada, Arizona, Hawaii, Guam, American Samoa, the Territories in the Pacific and Tribal Land) as well as EPA Regions 7, 8, and 10. Contract duration will have a one-year base and four option years. This procurement is intended to obtain professional and technical support, products, and services for EPA staff involved in a wide range of enforcement and litigation support activities. Contractor shall assist EPA Regions 7, 8, 9, and 10 in their continuing efforts to identify and involve PRPs responsible for releases or threatened releases of hazardous substances, and involve them in EPA's cleanup processes and activities. Enforcement support includes PRP search activities at all types of sites, including removal and remedial sites and sites that have not yet been evaluated for potential placement on the NPL. Details are posted on FedConnect at https://www.fedconnect.net/FedConnect/?doc=68HE0921R0004&agency=EPA. Proposals are due via FedConnect no later than 4:30 PM ET on July 12, 2021. Award is anticipated on or about November 15, 2021. https://beta.sam.gov/opp/e6f83a922aad4e6eb2b8a3856fc597e/view

Cleanup News

IN-SITU AMENDMENT AND DELIVERY METHODS: DESIGN AND CONSTRUCTION CONSIDERATIONS
Strong, M., G. Iosue, C. Ross, J. Ruf, and R. Cramer.
DCHWS 2021 Design and Construction at Hazardous Waste Sites Virtual Symposium, 29-30 March and 1 April, Virtual, 58 slides, 2021

This webinar discusses design and construction considerations across project stages of in situ remedies, including best management practices, common pitfalls, setting expectations, costs, and sustainability. Case studies using 3-D visualization and high-resolution site characterization, and hydraulic fracturing to deliver amendments in bedrock and horizontal remediation wells are presented.
https://clu-in.org/conf/tio/DCHWS16/slides/4Slide_Presentation_for_Rich_Evan_P.E._Mark_Strong_P.E._Glenn_Iosue_P.E._Chapman_Ross_P.E._&_Jason_Ruf_P.G..pdf

OPERATIONAL RISK CONTROL & ADAPTIVE CHANGE MANAGEMENT DURING AN ACCELERATED IN-SITU THERMAL TREATMENT SCHEDULE
Geckeler. G. and P. Kakarla. | DCHWS 2021 Design and Construction at Hazardous Waste Sites Virtual Symposium, 29-30 March and 1 April, Virtual, 12 slides, 2021

This presentation highlights adaptive change management in the remedial design at a site with PCE and TCE concentrations as high as 20,000 mg/kg and 1,400 mg/kg, respectively, in the underlying glacial deposits. Site redevelopment plans drove the schedule for remediation. Thermal conduction heating was selected to remediate the contaminated soil, and the volatilized contaminants were extracted, condensed, and treated onsite. Challenges included the presence of subsurface utilities and utility restrictions.
https://clu-in.org/conf/tio/DCHWS16/slides/9Slide_Presentation_for_Grant_Geckeler_ISOTEC.pdf

A DUAL BIORECIRCULATION SYSTEM TO FACILITATE VOC MASS REDUCTION AND HYDRAULIC CONTROL IN FRACTURED BEDROCK
Bamer, J.| Design and Construction Issues at Hazardous Waste Sites Virtual Meeting, 26-28 October, 24 slides, 2020

This case study presentation summarizes two biorecirculation loops that employ pulsed extraction of groundwater, the addition of amendment with electron donor, and reinjection of the amended water to treat contaminated groundwater. Groundwater within the bedrock and downgradient alluvial deposits is contaminated with chlorinated solvents. Hydraulic fracturing of the bedrock was performed to enhance hydraulic conductivity and the efficiency of extraction and injection wells. Challenges encountered included the presence of DNAPL, site access constraints (light rail bridges, major arterial streets, and freeways), preferential flow pathways in fractured rock, and redevelopment efforts. Operational data, challenges, and best practices for installation and operation of a biorecirculation system in fractured bedrock were presented as well as general concepts regarding biorecirculation feasibility for other sites.
https://clu-in.org/conf/tio/DCHWS10/slides/4Slide_Presentation_for_Jeff_Bamer_CDM_Smith.pdf

FATE OF MERCURY AND METHYLMERCURY IN FULL-SCALE SLUDGE ANAEROBIC DIGESTION COMBINED WITH THERMAL HYDROLYSIS
Liu, J., X. He, Y. Xu, Z. Zuo, P. Lei, J. Zhang, Y. Yin, and Y. Wei.
Journal of Hazardous Materials 406:124310(2021)

This study presents the results for an investigation of the fate of mercury and MeHg in wastewater treatment using full-scale anaerobic digestion combined with Cambi thermal hydrolysis. After one year of sampling, results showed that the advanced anaerobic digestion increased total Hg from 4.35 ± 0.43 mg/kg in raw sludge to 6.37 ± 1.05 mg/kg in digested sludge. MeHg decreased from 1.61 to 8.94 ng/g in raw sludge to 0.21-2.03 ng/g after anaerobic digestion. The demethylation of MeHg was dominant in both thermal hydrolysis and anaerobic digestion, although microbial methylation or demethylation was deemed negligible in terms of Me Hg transformation.

A CASE STUDY OF ORGANIC MICROPOLLUTANTS IN A MAJOR SWEDISH WATER SOURCE - REMOVAL EFFICIENCY IN SEVEN DRINKING WATER TREATMENT PLANTS AND INFLUENCE OF OPERATIONAL AGE OF GRANULATED ACTIVE CARBON FILTERS
Troger, R., S.J. Kohler, V. Franke, O. Bergstedt, and K. Wiberg.
Science of The Total Environment 706:135680(2020)

Water samples from Sweden's second-largest water source were analyzed for a range of organic micropollutants (n = 163) representing several compound categories (pharmaceuticals, pesticides, PFAS, flame retardants, phthalates, food additives, drugs, and benzos). Raw water and finished drinking water were also sampled from seven drinking water treatment plants and one drinking water plant after six granulated active carbon filters of varying operational ages. Twenty-seven organic micropollutants were detected in the river, with increasing concentrations downriver (up to 120 ng/L total) reflecting the impact of human activities. The study looked at the removal efficiency of the treatment plants, which depended on the treatment strategy and operational age of carbon filters. The addition of fresh granulated active carbon seemed to improve the removal of hydrophobic organic compounds, particularly dissolved organic carbon and per- and polyfluorinated alkyl substances.

Demonstrations / Feasibility Studies

APPLICATION OF PORTABLE GAS CHROMATOGRAPHY-MASS SPECTROMETER FOR RAPID FIELD BASED DETERMINATION OF TCE IN SOIL VAPOUR AND GROUNDWATER
Wang, L., Y. Cheng, R. Naidu, S. Chadalavada, D. Bekele, P. Gell, M. Donaghey, and M. Bowman. | Environmental Technology & Innovation 21:101274(2021)

A practical field measurement methodology is introduced that uses a solid-phase micro-extraction (SPME) pre-concentration technique and a portable (GC-MS) system to measure VOCs in soil vapor and groundwater. The methodology was tested at an Australian site impacted by TCE. Practical in-field soil gas SPME sampling methods were developed to optimize the extraction efficiency and improve the detection limits of the portable GC-MS. Soil vapor sampling probes (SVSPs) were installed at the site in clusters at depths of 1 m, 2 m, and 3 m at each sampling location to rapidly assess soil vapor samples in subsurface soil. Using SVSPs and the portable GC-MS enabled the generation of a 3-D map and distribution contours for TCE concentrations. GC-MS results were compared with the results from TO-15 and Method 8265 methods, conventional EPA methods for soil vapor and groundwater samples, respectively. The study demonstrated that using the portable GC-MS system is capable of in-field quantitative analysis of VOCs for rapid site vapor intrusion assessment.

DISTRIBUTION OF COLLOIDAL AND POWDERED ACTIVATED CARBON FOR THE IN SITU TREATMENT OF GROUNDWATER
McGregor, R. | Journal of Water Resource and Protection 12(12)(2020)

Two types of carbon were injected using direct push technology adjacent to each other at four sites with varying geology to evaluate if powdered and colloidal activated carbon (AC) can be effectively distributed in aquifers. The aquifer was sampled prior to and post-injection for total organic carbon to evaluate distribution. Both forms of AC were effectively delivered to the targeted injection zones and were detected at least seven meters away from the point of injection. The colloidal AC cells showed good distribution throughout the four targeted injection zones, with 93% of the samples collected having colloidal AC present. The powdered AC cells were more susceptible to aquifer heterogeneity, with 67% of the samples collected having activated carbon present. Preferential accumulation of AC was observed in high horizontal hydraulic conductivity seams, especially within the powdered AC cells. Sampling of monitoring well screens installed prior to the injection of the two forms of AC showed preferential accumulation of powdered AC within the sand pack, which could result in sampling bias.

PROTOTYPING OF CO-COMPOSTING AS A COST-EFFECTIVE TREATMENT OPTION FOR FULL-SCALE ON-SITE REMEDIATION AT A DECOMMISSIONED REFINERY
Guerin, T.F. | Journal of Cleaner Production 302:127012(2021)

Pilot-scale co-composting experiment results were used to calculate costs for full-scale treatment of oil-contaminated soil and sludge at a petroleum refinery. The study also investigated contaminant leachability and petroleum fraction biodegradation based on a relatively simple windrow design with readily available organic amendments. An initial mesophilic-thermophilic phase (temperatures up to 60-65°C and weekly windrow turning) resulted in fast removal rates of total petroleum hydrocarbons (TPHs) (>3000 mg/kg/day) and PAHs (9 mg/kg/day) over the first month. The remaining period of the biphasic degradation process was passive (without windrow turning). At the end of the experiment, TPHs in the composted windrows of organic amended sludge decreased from 62% (w/w, in air-dried sludge) to 1% in the final mix, meeting the targeted solid waste disposal criteria of 1% TPHs. PAHs were reduced by 96% to below relevant solid waste and contaminated soil health investigation levels to less than 100 mg/kg. The study enabled costs for commercial scale-up to be developed and indicated on-site treatment could be achieved at ~$AUD 150 compared to off-site treatment at $AUD 1250 per tonne.

ADVANTAGES OF PASSIVE SAMPLING AS A DECISION-MAKING TOOL AND ITS APPLICATION TO CONTAMINATED GROUNDWATER UPWELLING
Pautler, B. | Smart Remediation, 4 February, virtual, 46 slides, 2021

Passive sampling devices were used to assess groundwater upwelling of parent and alkylated PAH concentrations in sediments and surface water at a site adjacent to a former wood preserving facility. C_{free} results indicated distinguishable groundwater discharge zones at the site; if corrective action were required for the sediments, the limited spatial extent would reduce remediation costs. This case study, in addition to abundant laboratory data, illustrates how effective site management practices and efficies can be realized by using passive sampling at contaminated sediment sites.
https://2ziqpbmm3zh1x23mi335yixt-wpengine.netdna-ssl.com/wp-content/uploads/2021/01/SMART-Remediation-Virtual-Session-4-Feb-25-2021-Brent-Pautler.pdf

A DYE TRACER APPROACH FOR QUANTIFYING FLUID AND SOLUTE FLUX ACROSS THE SEDIMENT-WATER INTERFACE
Cascarano, R.N., D.M. Reeves, and M.A. Henry.
Groundwater 59(3):428-437(2021)

This study proposed a dye tracer method to characterize fluid and solute fluxes across the sediment-water interface. Groundwater discharge zones within the streambed were first identified. Then, small volume slugs of 0.1 to 1 mL fluorescein dye were released at known subsurface depths to visually identify interface breakthrough locations and times. Dye concentrations at the point of discharge were recorded over time by a fluorometer to generate high-resolution breakthrough curves. Groundwater velocities and dispersivities were estimated by numerically fitting dye breakthroughs to the classical advection-dispersion equation. Breakthroughs across the stream-sediment interface were nonlinear with tracer release depth. Velocity estimates from breakthrough analysis were significantly more reliable than visual dye and Darcy methods, which may overestimate/underestimate groundwater velocity. Permanent injection points within the streambed and reproducibility of dye breakthroughs provided the ability to study fluid and solute fluxes under seasonally varying hydrologic conditions. The proposed approach provides a framework for the study of nonconservative, reactive solutes in the field and allows characteristic residence times at various depths in the streambed to be determined to better understand chemical and nutrient transformations.

Research

EXPERIMENTAL INVESTIGATION ON LIGHT NON-AQUEOUS PHASE LIQUIDS REMOVAL FROM GROUNDWATER USING STEAM INJECTION TECHNIQUE
Ojo, B.S., K.O. Babaremu, A.A. Adegbola, O.T. Ademosun, and O.P. Ogundile.
Journal of Physics: International Conference on Recent Trends in Applied Research 1734:012044 (2021)

A bench-scale laboratory experiment was conducted to investigate the efficacy of steam injection to remediate NAPL-contaminated (diesel) groundwater. Steam generated from a steam boiler was supplied to a sandbox at a 0.14m^3/s injection

rate under 1.5 bar of pressure and 150°C. The initial volume of diesel used was 500mL. Supplying steam to the sandbox heated the groundwater and diesel mixture to a temperature above boiling. The mixture vaporized from the chamber through an outlet/recovery side into the condenser and was separated upon cooling using a phase separator. The remediation time was from 0-6 hours. As time increased, the recovered volume of diesel increased; 66.04% of diesel was recovered after 6 hours. https://iopscience.iop.org/article/10.1088/1742-6596/1734/1/012044/pdf

PERMEABLE REACTIVE BARRIERS WITH ZERO-VALENT IRON AND PUMICE FOR REMEDIATION OF GROUNDWATER CONTAMINATED WITH MULTIPLE HEAVY METALS
Njaramba, L.K., J.-B. Park, C.-S. Lee, A.M. Nzioka, and Y.-J. Kim.
Environmental Engineering Science 38(4):245-255(2021)

An optimized method is presented to remediate metals and metalloids using a pumice permeable reactive barrier with zero-valent iron (ZVI) in a modified reactor packing bed. The study looked at the effect of the contaminant breakthrough capacity of the modified bed, volumetric discharge of treated water, and the reactive material. As, Mn, Fe, and Zn were used as reference contaminants in simulated groundwater. Contaminant breakthrough capacity was not observed in the ZVI reactor bed with pumice in a 90-day period. Applying irregular reactive bed packing enhanced gas and water transport and heavy metal(loid) removal. Although contaminant breakthrough capacity was not observed in the ZVI column reactor, clogging phenomena was characteristic. The column with only pumice exhibited Zn and Mn breakthrough capacity after 8 days due to poor adsorption characteristics, as the dominant remediation mechanism was cation exchange. The study describes the reactive material characteristics and the remediation mechanism and for each reactive system.

MERCURY STABLE ISOTOPES IN FLYING FISH AS A MONITOR OF PHOTOCHEMICAL DEGRADATION OF METHYLMERCURY IN THE ATLANTIC AND PACIFIC OCEANS
Motta, L.C., J.D. Blum, B.N. Popp, J.C. Drazen, and H.G. Close.
Marine Chemistry 223:103790(2020)

Mercury isotope measurements of fish tissues containing Hg, mostly as methylmercury (MeHg), were used to assess the relative degree of photochemical MeHg decomposition across the world's oceans. In 19 samples of flying fish, the magnitude of odd isotope mass-independent fractionation (odd-MIF) varied by a factor of ~2. An estimated 56 to 80% of MeHg was photodegraded prior to entering the food web, depending on location. The proportion of MeHg degradation did not correlate with latitude, solar radiation, or estimates of the concentration of dissolved organic carbon or chlorophyll at the collection sites but did correlate with proxies for water clarity. The ratio of odd-MIF for 199Hg compared to 201Hg was constant in all flying fish sampled, suggesting that there is a common mechanism for photodegradation of MeHg in surface waters across oceans and hemispheres. The ratio of odd-MIF to mass-dependent fractionation (MDF) was generally consistent with photochemical degradation but was more variable. This suggested that there was negligible internal demethylation of MeHg in flying fish and that variable amounts of MDF occurred at different locations in the ocean, likely driven by variable rates of methylation and demethylation of Hg in the water column. *This paper is* ***Open Access*** *at* https://www.sciencedirect.com/science/article/abs/pii/S030442032030044X

UTILIZATION OF PCB-CONTAMINATED HUDSON RIVER SEDIMENT BY THERMAL PROCESSING AND PHYTOREMEDIATION
Urbaniak, M., A. Baran, S. Lee, and K. Kannan.
Science of The Total Environment 738:139841(2020)

This study evaluated the effect of 300°C and 600°C incineration temperatures on the chemical and ecotoxicological properties of sediment; selected the appropriate treatment for further phytoremediation experiments with zucchini; and assessed the impact of sediment admixture on the physicochemical parameters of soil, based on the responses of *Alivibrio fischeri* and growth of zucchini. A range of chemical), ecotoxicological, and plant morphology, and physiological analyses were conducted. Findings suggested that using sediments as a growth medium component may be a promising way to utilize and transform sediments from waste material to a valuable resource enhancing the benefits to the environment.

REMOVAL, DISTRIBUTION AND PLANT UPTAKE OF PERFLUOROOCTANE SULFONATE (PFOS) IN A SIMULATED CONSTRUCTED WETLAND SYSTEM
Qiao,W., R. Li, T. Tang, and A.A. Zuh.
Frontiers of Environmental Science & Engineering 15:20(2021)

A vertical flow constructed wetland (VFCW) was used to treat simulated domestic sewage containing PFOS. The 93%-98% PFOS removal rate suggested that VFCWs can remove PFOS efficiently from wastewater. PFOS removal depended on soil adsorption and plant uptake. Soil adsorption (61%-89%) was higher than plant uptake (5%-31%). The absorption capacity of Eichhornia crassipes (1186.71 mg/kg) was higher than that of *Cyperus alternifolius* (162.77 mg/kg) under 10 mg/L PFOS. The transfer factor of PFOS in *E. crassipes* (0.04) and *C. alternifolius* (0.58) indicated that PFOS is not easily translocated to leaves from roots of wetland plants. Roots of *E. crassipes* takes up PFOS directly from wastewater, while roots of *C. alternifolius* can only take up PFOS in soil. A 10 mg/L PFOS concentration had an obvious inhibitory effect on the removal rate of total nitrogen, total phosphorus, chemical oxygen demand, and ammonia nitrogen in the VFCW. Dosing wastewater with PFOS reduced the bacterial richness but increased the diversity in soil because PFOS stimulated the growth of PFOS-tolerant strains.

MICRO-BUBBLES ENHANCED REMOVAL OF DIESEL OIL FROM THE CONTAMINATED SOIL IN WASHING/FLUSHING WITH SURFACTANT AND ADDITIVES
Huang, Z., Q. Chen, Y. Yao, Z. Chen, and J. Zhou.
Journal of Environmental Management 290:112570(2021)

Micro-bubbles and surfactants, chosen based on their solubilization capabilities and decontamination capabilities, were used to enhance diesel removal from contaminated soil using washing/flushing. Mixing saponin and cyclodextrin surfactants, circulating the flushing solution for 90 minutes, and using micro-bubbles were found to increase diesel removal. The soil solute, especially NO_3^-, remained in the soil, which is required for residual diesel biodegradation in loam soil.

LIGAND-ENHANCED ELECTRON UTILIZATION FOR TRICHLOROETHYLENE DEGRADATION BY ·OH DURING SEDIMENT OXYGENATION
Xie, W., P. Zhang, W. Liao, M. Tong, and S. Yuan.
Environmental Science & Technology 55(10):7044-7051(2021)

Specific ligands were shown to enhance contaminant degradation during sediment oxygenation due to increased utilization efficiency of sediment electrons. Adding 0-2 mM sodium ethylene diamine tetraacetate (EDTA) or sodium tripolyphosphate (TPP) in sediment suspension (50 g/L, pH 7.0) increased TCE (15 μM) degradation from 13% without ligand to up to 80% with 2 mM TPP. Degradation was much higher with TPP than EDTA. Electron utilization efficiency for ·OH production increased with increased ligand concentration and was enhanced by up to 6-7 times with 2 mM EDTA or TPP. Electron transfer from sediment to dissolved Fe(III)-ligand was mainly accountable for enhanced electron utilization efficiency by the ligands with low adsorption affinity, and additional variation of sediment surface Fe(II) coordination is mainly responsible for the enhancement by the ligands with high adsorption affinity.

SORBENT ASSISTED IMMOBILISATION OF PERFLUOROALKYL ACIDS IN SOILS - EFFECT ON LEACHING AND BIOAVAILABILITY
Braunig, J., C. Baduel, C.M. Barnes, and J.F. Mueller.
Journal of Hazardous Materials 412:125171(2021)

Soil contaminated with 12 PFAAs was amended with 5-30% (by weight) of RemBind® to test the sorbent's ability to reduce leachability and bioavailability. Batch tests were used to determine the leaching of PFAAs, and bioavailability to earthworms and wheatgrass was assessed in greenhouse microcosms. PFOS leaching and bioavailability were reduced by up to 99.9% at most sorbent application rates. Shorter perfluoroalkyl chain length chemicals had the lowest leaching reduction. The specific formulations of RemBind and the application rates were parameters that increased treatment effectiveness. Differences in leaching and bioavailability depended on perfluoroalkyl chain length. A preliminary assessment suggested the sorbent continued to effectively reduce PFAAs in leachates after a three-year curing period.

General News

US PATENT GRANTED TO GRAPHENE-BASED ENVIRONMENTAL REMEDIATION TECHNOLOGY
Lea, R. AZoNano Graphene, 2 June, 2021

Qualities of graphene, such as its flexibility, strength, and its make-up of atom-thick sheets of carbon atoms, can be used to remove contaminants from liquids and gas. Sparc Technologies was granted a U.S. patent to exclusively use graphene's ability to sieve gases and liquids to remove heavy metals. The material, known as polyamine-modified reduced graphene oxide (ParGO), was demonstrated to efficiently filter other contaminants, performing significantly better than current remediation methods.
https://www.technologytimes.pk/2021/06/02/us-patent-granted-to-graphene-based-environmental-remediation-tech/
Patent: https://patft.uspto.gov/netacgi/nph-Parser?Sect1=PTO2&Sect2=HITOFF&p=1&u=%2Fnetahtml%2FPTO%2Fsearch-bool.html&r=1&f=G&l=50&co1=AND&d=PTXT&s1=10864498&OS=10864498&RS=10864498

SENSORS FOR DETECTING PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS): A CRITICAL REVIEW OF DEVELOPMENT CHALLENGES, CURRENT SENSORS, AND COMMERCIALIZATION OBSTACLES
Menger, R.F., E. Funk, C.S. Henry, and T. Borch.
Chemical Engineering Journal 417:129133(2021)

This review discusses sensors developed to detect PFAS by their molecular mechanism and the goals that should be considered during sensor development. Future research needs and commercialization challenges are also highlighted.

DRINKING WATER TREATMENT FOR PFAS SELECTION GUIDE
American Water Works Association, 50 pp, 2020

The purpose of this guide is to assist with drinking water treatment decisions for PFAS. The guide reviews treatment technologies with demonstrated ability to remove PFAS, answers technical questions important to the technology selection process, and discusses how data may be developed and organized to support decision-making. https://www.awwa.org/Portals/0/AWWA/ETS/Resources/Technical%20Reports/Drinking-Water-Treatment-PFAS.pdf?ver=2020-11-10-100226-250

INNOVATIVE SAMPLING METHODS AND DATA ANALYSIS FOR REDUCED LONG-TERM MONITORING COSTS
Naval Facilities Engineering Command, 8 pp, 2020

The Navy manages hundreds of sites with contaminant plumes in groundwater that require long-term monitoring. At most of these sites, monitoring is expected to continue for at least a decade, and in some cases, monitoring will continue into the foreseeable future. This factsheet explains ways to reduce monitoring costs, such as innovative sample collection methods and new tools to evaluate monitoring results. It also provides rules of thumb for monitoring optimization.
https://www.navfac.navy.mil/content/dam/navfac/Specialty%20Centers/Engineering%20and%20Expeditionary%20Warfare%20Center/Environmental/Restoration/er_pdfs/i/LongTermMonitoringCosts_FactSheet_091020FINAL.pdf

GROUNDWATER TO SURFACE WATER INTERFACE FACT SHEETS
Naval Facilities Engineering Command, 8 pp, 2020

These fact sheets describe the physical, chemical, and biological attenuation processes that occur at the groundwater to surface water interface (GW-SWI). Attenuation processes should be incorporated into evaluating exposure pathways at GW-SWI sites and considered in adaptive site monitoring and management strategies. An approach for identifying and assessing the GW-SWI, including various tools and techniques, is provided.
Part 1-Overview and Management:
https://www.navfac.navy.mil/content/dam/navfac/Specialty%20Centers/Engineering%20and%20Expeditionary%20Warfare%20Center/Environmental/Restoration/er_pdfs/rits/GroundWaterToSufaceWater_Fact%20Sheet_Part1.pdf
Part 2-Summary of Tools and Techniques:
https://www.navfac.navy.mil/content/dam/navfac/Specialty%20Centers/Engineering%20and%20Expeditionary%20Warfare%20Center/Environmental/Restoration/er_pdfs/rits/GroundWaterToSufaceWater_Fact%20Sheet_Part2.pdf

ENHANCED AQUIFER RECHARGE: INFLUENCE OF STORMWATER ON GROUNDWATER QUALITY AND AQUIFER RECHARGE
Johnson, T. and D. Beak, EPA Water Research Webinar Series, 28 April, 62 minutes, 2021

This webinar comprises three presentations highlighting ongoing EPA and EPA-supported research investigating the application of enhanced aquifer recharge (EAR) technologies and potential impacts on groundwater quality. Information includes (1) state of the science on information leading to best practices for EAR using stormwater; (2) methods currently being investigated to understand water movement and quality in karst aquifers; and (3) highlights of a recently completed field project supported by EPA to evaluate green infrastructure system pollutant removal performance in the arid Intermountain West and (4) to document the potential for stormwater harvesting and groundwater recovery to enhance water availability in Utah's Salt Lake Valley. https://www.youtube.com/watch?v=c365kTENhTU&feature=youtu.be

The Technology Innovation News Survey welcomes your comments and suggestions, as well as information about errors for correction. Please contact Michael Adam of the U.S. EPA Office of Superfund Remediation and Technology Innovation at adam.michael@epa.gov or (703) 603-9915 with any comments, suggestions, or corrections.

Mention of non-EPA documents, presentations, or papers does not constitute a U.S. EPA endorsement of their contents, only an acknowledgment that they exist and may be relevant to the Technology Innovation News Survey audience.