Technology Innovation News Survey

Entries for September 16-30, 2019

Market/Commercialization Information

FY18 GUIDELINES FOR BROWNFIELDS PROGRAM GRANTS
U.S. Environmental Protection Agency, 2019

EPA's Brownfields Program provides funds to empower states, communities, tribes, and nonprofits to prevent, inventory, assess, clean up, and reuse brownfield sites. For the following types of grants, the closing date for applications is December 3, 2019. • **Assessment Grants:** EPA-OLEM-OBLR-19-05. FY20 Guidelines for Brownfields Assessment Grants are posted at http://www.epa.gov/grants/fy20-guidelines-brownfields-assessment-grants. About 100 awards are anticipated from the estimated total program funding of $31M. https://www.grants.gov/web/grants/view-opportunity.html?oppId=321496.
•**Revolving Loan Fund Grants:** EPA-OLEM-OBLR-19-06. FY20 Guidelines for Brownfields Revolving Loan Fund Grants are posted at http://www.epa.gov/grants/fy20-guidelines-brownfield-revolving-loan-fund-grants. About 8 awards are anticipated from the estimated total program funding of $8M. https://www.grants.gov/web/grants/view-opportunity.html?oppId=321498.
•**Cleanup Grants:** EPA-OLEM-OBLR-19-07. FY 2018 Guidelines for Brownfields Cleanup Grants are posted at http://www.epa.gov/grants/fy20-guidelines-brownfield-cleanup-grants. About 18 awards are anticipated from the estimated total program funding of $9M. https://www.grants.gov/web/grants/view-opportunity.html?oppId=321499.

FUEL SPILL CLEAN-UP FOR BLG. 47
Department of the Air Force, Air Education and Training Command, Vance Air Force Base Contracting, OK
Federal Business Opportunities, Solicitation JB1164, 2019

The Arctic Slope Regional Corporation Communications LTD (ASRCC) contemplates a solicitation to characterize a fuel spill that contains BTEX, LNAPL, and total petroleum hydrocarbons, found in the soil in four boreholes 16-18 feet below ground surface at Building 47. A November 2018 investigation indicated a piping leak had occurred. Contractor will determine the extent of contamination and prepare a remedial action plan with cost estimates to remediate the site. Contractor shall furnish all supervision, labor, equipment, consumable materials, supplies, tools, and other items to complete the tasks listed in the SOW and shall coordinate all work with ASRCC construction management and environmental management before starting any investigation work. Sealed bids will be accepted only through mail service or hand delivery by 2:00 PM CT on Tuesday, November 19, 2019. Funds are not presently available for this effort. No award will be made under this solicitation until funds are available. https://www.fbo.gov/spg/USAF/AETC/VC/JB1164/listing.html

NANOCAPSULAR RADIATION TRACK ETCH INDICATOR
DOE, Oak Ridge National Laboratory - UT Battelle LLC (DOE Contractor), Oak Ridge, TN.
Federal Business Opportunities, Solicitation ORNL-TT-2019-07, 2019

Radioactive contamination from spills of radioactive materials and accumulation of radon gas within homes can be colorless, odorless, and essentially invisible without proper detection equipment. Oak Ridge National Laboratory (ORNL) is seeking a technology transfer commercialization partner for a Nanocapsular Radiation Track Etch Indicator technology. While conventional track etch materials used for detection of radioactive materials require lab processing, ORNL is developing a nanocapsular track etch material that delivers a visible indication following exposure to alpha-particle radiation without lab processing. The technology can be implemented on small, fixed surfaces such as wipes and sticky notes to provide low-cost single-point test strips or aerosol-dispersed to larger surfaces, including entire laboratories, to facilitate safe and effective cleanup following radiological spill events. The technology, formulated as low-cost test strips, will also significantly impact in-home testing for radon. ORNL's Office of Technology Transfer will accept licensing applications until 11:59 PM ET on November 15, 2019. https://www.fbo.gov/spg/DOE/ORNL/ORNL/ORNL-TT-2019-07/listing.html

SUPERFUND ENVIRONMENTAL SUPPORT SERVICES
Environmental Protection Agency, Region IV, Atlanta, GA.
Federal Business Opportunities, Solicitation 68HE0420R0003, 2019

U.S. EPA Region 4 is issuing a request for information/sources sought notice to qualified 8(a) contractors capable of providing investigative support services to the Agency for a follow-on Enforcement Support Services Contract in accordance with the Performance Work Statement (PWS) posted on FedConnect at https://www.fedconnect.net/FedConnect/?doc=68HE0420R0003&agency=EPA. Interested 8(a) Contractors are invited to submit a brief capabilities statement to support the requirements contained in the PWS. Responses are due by or before 1:00 PM ET on November 18, 2019. The period of performance consists of a one-year base period from August 18, 2020, to August 17, 2021, plus four option years. https://www.fbo.gov/spg/EPA/OAM/RegIV/68HE0420R0003/listing.html

Cleanup News

SOURCE REMOVAL COMBINED WITH DRINKING WATER TREATMENT ON A PFAS-CONTAMINATED GROUNDWATER
Woodard, S. and M. Sinnett. | CRC Care International Cleanup Conference, 8-12 September, Adelaide, Australia, 18 slides, 2019

The U.S. Air Force Civil Engineering Center (AFCEC) has conducted response activities to remediate groundwater impacted by PFOA and PFOS at the fire training area (FTA) of the former Pease Air Force Base in New Hampshire. AFCEC conduct a pilot test in 2016 in parallel with the City of Portsmouth, NH, whose drinking water was affected by contamination from the FTA. The pilot tests compared the ability, scalability, design parameters, and sizing of an LC1 ion exchange (IX) resin and F400 granular activated carbon (GAC) system to remove PFAS from the Haven Well and FTA groundwater. AFCEC chose the IX system for full-scale application, based on system performance and a lower overall lifecycle. A 12.5 L/sec system installed from fall 2017-spring 2018 has been consistently non-detect for 13 PFAS compounds. Five successful resin regenerations were performed by late April 2019. The original super-loading media is still operational, having removed and concentrated >99.99% of the recovered PFAS mass. The IX resin substantially outperformed GAC on 12 PFAS in the drinking water pilot test. The GAC column was operated until PFOA/PFOS breakthrough reached 0.07 µg/L, at ~13,000-bed volumes (BV). The IX resin effluent remained well below the 0.07 µg/L HAL, even after treating more than 171,000 BVs. Based on the results of the comparative pilot test and the associated lifecycle cost comparison, the City selected LC1 IX resin for full-scale implementation to remove PFAS from the Haven water supply. http://adelaide2019.cleanupconference.com/wp-content/uploads/2019/09/M42f.pdf *More information on the Portsmouth PFAS system:* https://www.cityofportsmouth.com/publicworks/water/portsmouth-water-system-pfas-update.

IN SITU BIOREMEDIATION OF 1,2-DIBROMOETHANE (EDB) IN GROUNDWATER TO PART-PER-TRILLION CONCENTRATIONS USING COMETABOLISM
Hatzinger, P.B., J.F.Begley, D.R.Lippincott, A. Bodour, and R. Forbes.
Journal of Contaminant Hydrology 218:120-129(2018)

A groundwater recirculation system was installed at the FS-12 EDB plume on Joint Base Cape Cod (JBCC) to facilitate in situ treatment using ethane as a primary substrate to stimulate the aerobic, cometabolic biodegradation of EDB. Groundwater was taken from an existing extraction well; amended with ethane, oxygen, and inorganic nutrients; and then recharged into the aquifer upgradient of the extraction well, creating an in situ reactive zone. The concentrations of EDB, ethane, oxygen, and anions in groundwater were measured with time in a series of nested monitoring wells installed between the extraction and injection well. EDB concentrations in the six monitoring wells that were hydraulically well-connected to the pumping system declined from ~0.3 µg/L to

REMEDIATION OF THE MARWELL TAR PIT: USING ENHANCED THERMAL CONDUCTION (ETC) FOR THE REMEDIATION OF EXTREME HYDROCARBON IMPACTS IN WHITEHORSE, YUKON TERRITORY
Howardson, J. and C. Belenky | RemTech 2019: Remediation Technologies Symposium, 16-18 October, Banff, 48 slides, 2019

The Marwell Tar Pit dates to the 1940s when the site was used as a disposal location for waste tar generated from a decommissioned World War II oil refinery. The pit was capped with gravel in the 1960s after it became an unpermitted dumpsite for liquid. In 2011, the governments of Canada and Yukon commissioned a multi-phase remediation project on the tar pit. To remediate the tar-saturated soils, an innovative enhanced thermal conduction (ETC) technology was used to effectively break down the recalcitrant hydrocarbons associated with tar. Soils treated through the ETC process were clean enough to be placed back in the excavation, avoiding the need for off-site disposal of soils. Many challenges were encountered during the remedial program, including technical issues and extreme northern weather events. The presentation highlighted the successes and lessons learned during remediation and demonstrated the ETC process to treat highly contaminated soils that. The technology can be utilized on remote sites and in extreme climates. **Slides:** https://www.esaa.org/wp-content/uploads/2019/10/19-Howardson.pdf **Longer abstract:** https://www.esaa.org/wp-content/uploads/2019/09/36-RT-2019-Abstract.pdf

REMEDIATING F2 IMPACTS IN SOIL VIA HYDROGEN PEROXIDE INJECTIONS
Galbraith, F., S. Foy, D. Fursevich, and W. Govenlock.
RemTech 2019: Remediation Technologies Symposium, 16-18 October, Banff, 34 slides, 2019

A full scale in situ hydrogen peroxide injection program was designed and implemented at the Muncho Lake maintenance camp along the Alaska Highway. Soils at the active maintenance camp were impacted with F2 hydrocarbons from operation and maintenance activities linked to the construction of the Alaska Highway. Hydrogen peroxide injection was identified as the most effective approach for remediating hydrocarbon impacts in soils in the smear zone at a depth of 7.5 to 11 m, covering an estimated 5,000 m2. The approach was first pilot tested, followed by a first stage injection program. Following completion of the first stage injection program and identification that ≤70% reduction in F2 concentrations was achievable, a full-scale injection program was designed to target elevated F2 concentrations associated with the smear zone. The full-scale program involved injecting over 4.7 million L of hydrogen peroxide at 568 injection locations at a concentration of 17.5%. The program development process was presented from pilot testing to full-scale hydrogen peroxide injection and included results, conclusions, and lessons learned for the completion of the hydrogen peroxide injection programs. **Slides:** https://www.esaa.org/wp-content/uploads/2019/10/19-Galbraith.pdf **Longer abstract:** https://www.esaa.org/wp-content/uploads/2019/09/37-RT-2019-Abstract.pdf

Demonstrations / Feasibility Studies

YEAR 1 MONITORING REPORT: ENHANCED NATURAL RECOVERY/ACTIVATED CARBON PILOT STUDY LOWER DUWAMISH WATERWAY
U.S. EPA Region 10, 70 pp, 2019

A pilot program is underway on the Lower Duwamish Waterway to test the use of activated carbon (AC) to augment enhanced natural recovery (ENR) using sand or gravelly sand materials and reduce the bioavailability of PCBs in sediment. Parallel ENR and ENR+AC subplots were successfully placed in three separate 1-acre plots: one in the deeper navigation channel, one in a berthing area subject to prop scour and one in an intertidal location subject to waves and wakes. Construction occurred from November 2016-February 2017. Monitoring is scheduled for three years to evaluate and compare ENR and ENR+AC performance in reducing the bioavailability of PCBs in the uppermost 10-cm surface layer. Monitoring events already completed include baseline sampling before construction, post-construction monitoring in February-March 2017, and the Year 1 monitoring event completed May-June 2018. Monitoring metrics are used to evaluate ENR and ENR+AC stability, including the stability of carbon in the ENR+AC layers, and chemical bioavailability using whole sediment and porewater analyses.
https://ldwg.org/wp-content/uploads/2019/04/Final-ENR-AC-Year-1-Monitoring-Report_04032019.pdf *Also see poster by V.S. Magar, et al.:* https://www.battelle.org/docs/default-source/conference-proceedings/2019-sediments-conference-proceedings/h3_-mnr-and-enhanced-mnr/h3_-329_poster_magar.pdf?sfvrsn=c90c5782_2.

LESSONS LEARNED FROM THIN LAYER COVER PLACEMENT PILOT APPLICATION IN BRUNSWICK ESTUARY, GEORGIA, USA
Mohan, R., M. Reemts, P. Gupta, R. Galloway, T. Johnson, R. Brown, and T. Donegan.
10th International Conference on the Remediation and Management of Contaminated Sediments, 11-14 February, New Orleans, Louisiana, 27 slides, 2019

The LCP Chemicals Superfund Site consists of a mix of tidal creeks, marshes, and brackish estuary and an adjacent upland area. Site contaminants of concern include mercury, Aroclor 1268, lead, and PAHs. In spring 2018, a pilot project was completed to test placement methods and the layer's remedy performance in preparation for a larger remedy implementation. Sand and higher organic content fines were tested as placement materials. Primary placement occurred using a hydraulic nozzle spray method that resulted in generally uniform distribution and thickness of the cover. A mat-based access road was installed to allow equipment to move the pipeline and spray nozzle within the pilot marsh area. The study successfully placed 6-12 inches of material within a 2/3-acre marsh area. A 30- to 45-degree spray yielded the best distribution of materials. Placement of sandy material was faster and more uniform than fines due to the enhanced settling characteristics and ease of distribution of the material. A modified topsoil-fines mix with a baffle plate eventually permitted optimal placement of fines within the study area while keeping target organic content. Material thickness is expected to be sufficient to encourage natural vegetative recovery over a time span of 2 to 3 years. Vegetative monitoring will be conducted over a period of 2 years to document natural recovery and thin cover effectiveness for the remedy. https://www.battelle.org/docs/default-source/conference-proceedings/2019-sediments-conference-proceedings/c5_-restoration-and-revitalization-strategies/c5_1210_-180_mohan.pdf?sfvrsn=7d82143f_2 *See 6 month post-pilot screening summary:* https://semspub.epa.gov/work/04/11115324.pdf.

AN INTEGRATED APPROACH SUPPORTING REMEDIATION OF AN AQUIFER CONTAMINATED WITH CHLORINATED SOLVENTS BY A COMBINATION OF ADSORPTION AND BIODEGRADATION
Ciampi, P., C. Esposito, P. Viotti, J. Boaga, G. Cassiani, and M.P. Papini.
Applied Sciences 9:4318(2019)

In Bologna, Italy, ~1,000,000 m^3 of chlorinated solvent-contaminated soil was excavated to create a new high-speed railway station. Simultaneously, a bypass system equipped with activated carbon was installed to treat groundwater contaminated with TCE and PCE. Heterogeneous data, including geological/hydrological, geophysical, and chemical data, were stored and centralized in an information management and analysis platform. The data were used as a "cockpit" to assist in the design, remedy selection/implementation, and monitoring of a groundwater remediation pilot test. The selected remediation strategy involved creating reactive zones using the combined actions of PlumeStop™ and HRC™ to adsorb contamination and stimulate dechlorination. Results of post-treatment monitoring revealed abatement of the chlorinated solvents and intense biological dechlorination activity. Achieving the remediation objectives and project closure is based on the integration of multidisciplinary data using a multiscale approach.https://www.mdpi.com/2076-3417/9/20/4318/pdf

PERFORMANCE OF A NEW ACTIVATED CARBON AMENDMENT FOR BIOREMEDIATING PETROLEUM-IMPACTED SITES
Thoreson, K., P. Erickson, B. Hicks A. Punsoni, S. Sittler, D. Taggart, and K. Clark.
RemTech 2019: Remediation Technologies Symposium, 16-18 October, Banff, 33 slides, 2019

PetroFix® Remediation Fluid was field-tested on a contaminated plume downgradient of a former bulk petroleum storage facility in South Bend, IN. Historical remedial efforts included LNAPL recovery and air sparging/soil vapor extraction, but relatively high concentrations of petroleum hydrocarbons remained in the groundwater. PetroFix was injected by low-pressure direct-push methods in an area surrounding a single monitoring well with >50 ppm total petroleum hydrocarbons in the diesel and gasoline range combined. Groundwater samples were monitored at baseline and at regular intervals post-application for standard chemical and geochemical parameters, as well as by QuantArray® Petro for quantification of the bacterial communities. Baseline microbial analysis indicated a moderate presence of both aerobic and anaerobic petroleum degraders. At one and three months post-injection, contaminant concentrations fell ≥90%. At three months, RNA analysis showed *Methylibium petroleiphilum* , a known BTEX degrader, replicating robustly. Another line of evidence for biodegradation was the rapid reduction of NO_3^- followed by a more gradual loss of SO_4^{2-}. Dissolved methane initially dipped, before climbing to over twice the pre-application concentration, which is consistent with increased hydrocarbon biodegradation, despite the dramatic removal of contamination from the dissolved phase. **Slides:** https://www.esaa.org/wp-content/uploads/2019/10/19-Punsoni.pdf **Longer abstract:** https://www.esaa.org/wp-content/uploads/2016/05/13-RT-2019-Abstract.pdf **More information:** https://petrofix.com/wp-content/uploads/2019/05/002-REGENESIS-Case_Study-Petro-Fix-2019-05-16-05.pdf

Research

MOLECULAR DESIGN OF EFFECTIVE AND VERSATILE ADSORBENTS FOR EX SITU TREATMENT OF AFFF-IMPACTED GROUNDWATER
MOLECULAR DESIGN OF EFFECTIVE AND VERSATILE ADSORBENTS FOR EX SITU
TREATMENT OF AFFF-IMPACTED GROUNDWATER

Results of this limited-scope project confirmed the potential of protein-based sorbents for PFAS remediation by identifying, through a complementary model-experiment approach, proteins that associate strongly with both long- and short-chain PFAS. Of particular benefit is the ability to tune an adsorbent, by incorporating multiple protein-based moieties and/or by use of strategic changes in feed composition (ionic strength, pH), to address a wide variety of PFAS structures. The

combination of molecular modeling and batch testing used here forms the basis of a robust and powerful design framework for developing protein-based sorbents for PFAS water treatment.
https://www.serdp-estcp.org/content/download/49855/491219/file/ER18-1417%20Final%20Report.pdf

USE OF MULTIPLE LINES OF EVIDENCE TO RESOLVE THE CSM FOR A COMPLEX GROUNDWATER TCE DISTRIBUTION
Lane, R. and M. Rasch. | CRC Care International Cleanup Conference, 8-12 September, Adelaide, Australia, 21 slides, 2019

The Tonsley Innovation District comprises a 61-ha area that was operated from 1964-2008 as a car manufacturing facility by Mitcubishi Motors Australia Ltd (MMAL) and lies within a broader industrial precinct that contains the former Reckitt & Colman (R&C) facility. Previous environmental investigation over 20 years identified a very complex dissolved-phase groundwater TCE distribution within the industrial precinct and surrounding areas, including ≤8 plumes of varying size and concentrations within the uppermost quaternary aquifer across the investigation area that extended into residential areas to the west and south. From 2017-2018, a wide range of investigation techniques were employed to provide lines of evidence to understand the complex plume architecture across the investigation area. Results indicated that TCE impacted wastewater originating from the former R&C site leaked from a historical private sewer, causing the large TCE plume present beneath the south-west corner of the MMAL site. The wastewater stream then flowed 300 m to the north-west in the public sewer to a second release point within the suburb of Mitchell Park beyond the low hydraulic conductivity zone in an area of much higher hydraulic conductivity, giving rise to the large off-site groundwater plume extending 1.5 km north-west of the MMAL site. https://adelaide2019.cleanupconference.com/wp-content/uploads/2019/09/M27e.pdf *See investigation report for more information:* https://renewalsa.sa.gov.au/wp-content/uploads/2018/08/Tonsley-VSCAP-Investigations-Further-Groundwater-Soil-Vapour-Investigations-November-2017-to-April-2018-report.pdf

BIOTRANSFORMATION OF PER- AND POLY-FLUOROALKYL SUBSTANCES IN SOIL USING ENHANCED BIOREMEDIATION METHODS
Stevanoni, J. | CRC Care International Cleanup Conference, 8-12 September, Adelaide, Australia, 20 slides, 2019

Sandy clay (A soil) and clay (B soil) soils collected and spiked with AFFF 3M Light Water™ were amended using brown wastes, nutrients, and soil ameliorants to facilitate fungal growth and incubated in 1.5-L Pyrex bioreactors for 41 days. The soil ameliorants comprised equal weights of straw, woodchips and poultry manure and were mixed into the soils at ~40% wet weight to provide a low pH, high oxygen environment to grow fungi. Two bioreactors containing A soil were spiked with a starting concentration of ~106 mg/kg PFOS+PFHxS, and two bioreactors containing B soil were spiked with ~8 mg/kg. All the containers had water-saturated air pumped through the mixture to limit drying and provide oxygen. Samples were collected on days 0, 7, 12, 21, 27, 34, 41 and analyzed for 10 PFAS compounds. White rot fungal hyphae were observed at various times throughout the experiment but were more abundant in A soil. All soils showed an initial PFAS increase, attributed to bacterial precursor transformation. Overall, PFAS in A soils decreased 18-57%. PFOA and PFOS decreased by 53% and 57%, respectively. Trends in B soils increased throughout the 41 days for 7 compounds. From day 12-27, PFHpS, PFHxS, and PFOS decreased by 9%-18%. PFOA decreased by 17%. Differences between the two soils are attributed to differences in oxygen and sorption of enzymes onto the soils and in PFAS concentrations. Soil B did not allow sufficient oxygen for strong fungal activity, allowing bacteria to become dominant. Further research should examine PFAS bioremediation in various soil types, examining both enzyme sorption to soil and the sorption of PFAS to various soil types. http://adelaide2019.cleanupconference.com/wp-content/uploads/2019/09/M32b.pdf

ANALYTICAL AND NUMERICAL MODELING OF SOLUTE INTRUSION, RECOVERY, AND REBOUND IN FRACTURED BEDROCK
Nagare, R.M., Y.-J. Park, T. Butterfield, C. Belenky, and S. Scyrup.
Groundwater [Published online 18 April 2019 prior to print]

This study presents a set of analytical solutions to estimate diffusive mass intrusion into matrix blocks, validated by comparing the results with (1) numerical model results using the same model parameters and (2) observed chloride mass recovery, rebound concentration, and concentration in pumped groundwater at a highly fractured bedrock site in Alberta, Canada. The analytical solutions can be used to estimate the total mass stored in the fractured bedrock prior to any remediation, providing insights into site contamination history. Predictive results show that successful remediation by pumping depends largely on a diffusive intrusion period. The results of initial mass from the analytical model were used to successfully calibrate a 3-D discrete fracture network numerical model, further highlighting the utility of the simple analytical solutions in supplementing the more detailed site numerical modeling.

THE APPLICATION OF DIFFERENT BIOLOGICAL REMEDIATION STRATEGIES TO PCDDS/PCDFS CONTAMINATED URBAN SEDIMENTS
Urbaniak, M., A. Wyrwicka, G. Siebielec, S. Siebielec, P. Kidd, and M. Zielinski.
Water 11(10):1962(2019)

Four different environmentally-friendly strategies were tested to remediate soil mixed with urban bottom sediments contaminated with PCDDs and PCDFs: natural attenuation, phytoremediation with *Tagetes patula L.* and *Festuca arundinacea Schreb.*, rhizobacterial inoculation with *Streptomyces costaricanus* RP92 and *Massilia niastensis* P87, and rhizobacteria-assisted phytoremediation using both sets of plants and bacterial strains. The study also evaluated the effect of the urban sediment and remediation on soil phytotoxicity (using an *L. sativum* plant), plant biomass, total soluble protein content, total chlorophyll content, and chlorophyll a/b ratios. The added sediment positively affected the *L. sativum*, growing 90% better in amended soils. Application of rhizobacteria-assisted phytoremediation further increased the growth of *L. sativum* and improved the efficiency of PCDDs/PCDFs removal, resulting in a maximum 44% reduction of its content. This strategy alleviated the negative impact of urban sediments on *T. patula* and *F. arundinacea* biomass and had a beneficial effect on protein and chlorophyll content in the studied plants. *This article is* ***Open Access*** *at* https://www.mdpi.com/2073-4441/11/10/1962.

THE INFLUENCE OF MOLECULAR STRUCTURE ON THE ADSORPTION OF PFAS TO FLUID-FLUID INTERFACES: USING QSPR TO PREDICT INTERFACIAL ADSORPTION COEFFICIENTS
Brusseau, M.L. | Water Research 152:148-158(2019)

Surface-tension and interfacial-tension data sets were collected from literature for input in a quantitative-structure/property-relationship (QSPR) model to calculate fluid-fluid interfacial adsorption coefficients (K_i) of 42 PFAS. K_i values varied across 8 orders of magnitude as a function of molecular structure. A QSPR model employing a molar volume descriptor predicted log K_i values for air-water interfacial adsorption of the wide range of PFAS; the model also predicted a limited dataset for organic immiscible liquid-water interfacial adsorption. The QSPR model incorporated the fluid-fluid interfacial adsorption process into transport characterization and risk assessment of PFAS in the environment. This will be particularly relevant for determining PFAS mass flux in the atmosphere, in the vadose zone, in source zones containing organic immiscible liquids, and in water/wastewater treatment systems.

EXAMINING THE EXTRACTION EFFICIENCY OF PETROLEUM-DERIVED DISSOLVED ORGANIC MATTER IN CONTAMINATED GROUNDWATER PLUMES
Zito, P., R. Ghannam, B.A. Bekins, and D.C. Podgorski.
Groundwater Monitoring & Remediation [Published online 9 August 2019 prior to print]

Five different techniques were used to extract petroleum-derived dissolved organic matter (DOM) in groundwater samples from an aquifer contaminated with crude oil to determine the optimal technique to analyze for petroleum-derived DOM. The methods tested were liquid-liquid extraction (LLE), total petroleum hydrocarbons-diesel range (TPHd), and three solid-phase extraction (SPE) stationary phases used for extraction of polar analytes from water. For LLE and TPHd, the extraction efficiency of petroleum-derived DOM decreased downgradient as the petroleum-derived DOM became increasingly polar from biodegradation. In contrast, the average extraction efficiency by the SPE methods was >65% across the gradient and was thus more efficient for extracting petroleum-derived DOM at hydrocarbon-contaminated sites.

General News

MANAGING AFFF IMPACTS TO SUBSURFACE ENVIRONMENTS AND ASSESSMENT OF COMMERCIALLY AVAILABLE FLUORINE-FREE FOAMS
Crimi, M. and J. Back, SERDP & ESTCP Webinar Series, Webinar #100, October 2019

SERDP and ESTCP sponsored two presentations on projects addressing aqueous film-forming foam (AFFF) activities at DoD sites. The first presented viable approaches for treating recalcitrant PFAS and recent related research activity. The treatment technology discussion addressed challenges and limitations, including the presence of precursors and co-contaminants and the generation of byproducts. Research is ongoing at Clarkson University to advance and optimize PFAS treatment technologies, with emphasis on treatment trains for more efficient and effective remediation. The second presentation discussed an ongoing project that aims to identify potential commercially available agents as alternatives for AFFF. A database of potential firefighting agents will be started for future reference. https://www.serdp-estcp.org/Tools-and-Training/Webinar-Series/10-17-2019.

WORLDWIDE OCCURRENCE AND ORIGIN OF PERCHLORATE ION IN WATERS: A REVIEW
Cao, F., J. Jaunat, N. Sturchio, B. Cances, X. Morvan, A. Devos, V. Barbin, and P. Ollivier.
Science of the Total Environment 661:737-749(2019)

This publication presents an overview of research on perchlorate origins, occurrences in water, and the methodology to distinguish the different perchlorate sources based on isotope analysis. All published ranges of isotopic content in perchlorate from different sources are presented, including naturally occurring and man-made perchlorate source types, as well as the effects of isotope fractionation that accompanies biodegradation processes. An example of a case study in France is included to emphasize the need for further research on this topic.

COST-EFFECTIVE TREATMENT TECHNOLOGIES FOR REMOVING CECS
Speth, T., U.S. EPA Tools and Resources Webinar Series, 40 slides, March 2019

Treatment technologies for three contaminants of emerging concern-PFAS, cyanotoxins, and perchlorate-were presented in this webinar with an emphasis on determining cost-effective solutions for small systems. Specifically, how contaminant properties influence treatment effectiveness, operational complexity, cost, and residual stream handling were discussed. Also, novel technologies were discussed using anaerobic biofiltration of perchlorate and nitrate as an example, and a demonstration of the impact of system size on capital and operating costs was shown. For each technology and contaminant, how to avoid unintended consequences, such as increased water corrosivity or residual handling problems, was covered. https://www.epa.gov/sites/production/files/2019-03/documents/2019-03-20_cec_treatment_state_webinar.pdf

REMEDIATION TO RESTORATION TO REVITALIZATION (R2R2R)
Hoffman, J., U.S. EPA Tools and Resources Webinar Series, 33 slides, November 2018

Remediation to Restoration to Revitalization (R2R2R) refers to the process of remediating contaminated sediments and restoring ecosystems to foster sustainable revitalization in coastal communities. R2R2R is a framework for translating ecological consequences from remediation and restoration projects into environmental and socioeconomic benefits such as swimmable water, enhanced recreational amenities, and green development. R2R2R supports states, regions, and other partners in cleaning up contaminated sites in ways that reduce health and environmental risks and help turn these sites into valuable assets for local communities. This webinar presented the R2R2R framework and how it can improve both ecological and social outcomes from remediation, focusing on its application in large-scale, aquatic sites. https://www.epa.gov/sites/production/files/2018-11/documents/r2r2r_november_14_webinar_slides_upload.pdf *See report on Ottawa River Remedy Effectiveness* https://cfpub.epa.gov/si/si_public_file_download.cfm?p_download_id=536840&lab=NRMRL

DEFINING SUSTAINABILITY AND RESILIENCY IN REMEDIATION DESIGN: NOT AN "AND" VERSUS "OR" PROPOSITION
Warner, C.D. and C.J. Ritchie. | CRC Care International Cleanup Conference, 8-12 September, Adelaide, Australia, 31 slides, 2019

Remediation designs that consider both sustainability and resiliency (but not, to the extent practicable, at the expense of each concept) are discussed in this presentation. Decisions on priority will always be important and limiting the risks to sensitive receptors will need to take precedence. Both performance and economic vitality of the remedial design will be improved greatly over historical approaches when both sustainable and resilient design are considered to be mutually beneficial and not competitive. https://www.dropbox.com/s/4uf8osk9zecvndg/M25a.pdf?dl=0

LESSONS LEARNED FROM DESIGN VERIFICATION ASSESSMENTS AT IN SITU REMEDIATION SITES
Hicks, B. | Great Lakes Environmental Remediation and Redevelopment Conference, 16-18 October, Lansing, MI, abstract, 2019

Design verification assessments can help determine what kinds of lower-cost field-based methods can provide significant insight into design and application methods to optimize in situ applications, resulting in improved remedial performance outcomes. Documenting aquifer characteristics using traditional field methods can provide the most insight for remedial design and application. Specifically, the presentation focuses on target treatment zone (TTZ) characteristics that directly affected application programs and remedial outcomes. A case study is presented where using these steps to identify the relationship between contaminants of concern mass storage and distribution units within the TTZ contributed to an overall improvement in application programs and was a key element in higher remedial success rates. *See a recording of a previous webinar by C. Sandefur, R. Gillespie, C. Lee, and S. Barnes:* https://www.youtube.com/watch?v=gDHgY2hK4-o&list=PLnPMlwLkEOfoI-4lDoCzEzZE4tGQgMI&index=2&t=2177s.

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