

Technology Innovation News Survey

Entries for February 1-15, 2018

Market/Commercialization Information

GRCA CERCLA TECHNICAL SUPPORT ORPHAN MINE

Department of the Interior, National Park Service, Flagstaff, AZ.
Federal Business Opportunities, FBO-5952, Solicitation 140P1518R0008, 2018

This requirement is a total small business set-aside under NAICS code 541620 to provide technical support services to the National Park Service (NPS) for all CERCLA activities relating to the Orphan Mine Site located near Grand Canyon Village, Arizona. NPS is conducting CERCLA response actions to address the releases of hazardous substances at or from the uranium mine's two operable units; determine the nature and extent of contamination; and select appropriate cleanup actions. A draft Engineering Evaluation/Cost Analysis (EE/CA) for OUI was completed in 2015, and issuance of the final EE/CA is anticipated in early 2018. OUI is in the initial phase of the investigation and needs to be fully addressed. Proposals must be received by 5:00 PM ET on April 6, 2018. See details on FedConnect at <https://www.fedconnect.net/FedConnect/?doc=140P1518R0008&agency=DOI>. [Note: It might be necessary to copy and paste the URL into your browser for direct access].

FY 2018 RAPID INNOVATION FUND

Other Defense Agencies, Washington Headquarters Services, DC.
Federal Business Opportunities, FBO-5937, Solicitation HQ0034-18-BAA-RIF-0001A, 2018

The Rapid Innovation Fund facilitates the rapid insertion of innovative technologies into military systems or programs that meet critical national security needs. DoD seeks mature prototypes for final development, testing, evaluation, and integration. These opportunities are advertised under NAICS codes 541714 and 541715. Awardees may receive up to \$3M in funding and will have up to two years to perform the work. The two phases of source selection are (1) white paper submission and (2) invited proposal submission. The window of opportunity for submitting white papers is March 8 - April 12, 2018 (due by 3:00 PM ET). Among the numerous R&D opportunities described in the BAA are topics relevant to the development of environmental monitoring and emergency response tools:

- Handheld automated post-blast explosive analysis device (USD&E-18-BAA-RIF-RTTO-0001). Handheld automated detection and characterization of explosive residue collected on-scene after an explosion.
- Handheld networked radiation detection, indication and computation (RADIAC) (DTRA-17-BAA-RIF-0004). A lighter, more compact system for integration into CBBNE situational awareness software architecture of Mobile Field Kit and Tactical Assault Kit.
- 3-D scene data fusion for rapid radiation mapping/characterization (DTRA-17-BAA-RIF-0005).
- Immediate decontamination (CBO-18-BAA-RIF-0001). A spray-on decontaminant that can be applied in a single step in ~15 minutes on hardened military equipment.
- Hyperspectral aerial sensing for chemical, biological, radiological, nuclear and explosive (CBRNE) mobile operations (PACOM-18-BAA-RIF-0001). Real-time detection via drone.
- Mobile automated object identification and text translation for lab equipment (DTRA-17-BAA-RIF-0003). A tool to help users recognize equipment, chemicals, and potentially hazardous material in real time.

<https://www.fbo.gov/ops/ODA/WHIS/REF/HQ0034-18-BAA-RIF-0001A/listing.html>
[NOTE: This BAA was also issued as HQ0034-18-BAA-RIF-0001B.]

PROVIDE UPDATE TO COMMUNITY INVOLVEMENT PLAN AT ARNOLD AFB, TENN

Department of the Air Force, AFICA - CONUS, Arnold AFB, TN.
Federal Business Opportunities, FBO-5943, Solicitation FA8903-18-R-0035, 2018

This requirement is a total small business set-aside under NAICS code 562910, size standard 750 employees. The overall objective of this project is to assist Arnold Air Force Base personnel to communicate more effectively with the surrounding community by performing an update to the base-wide Community Involvement Plan (CIP) every three years. This project will assess current community interest pertaining to remedial response actions at Arnold AFB and provide an update to the existing CIP that reflects current regulations, guidance, and best management practices. The Government intends to award a single competitive firm-fixed-price contract. Proposals must be received by 2:00 PM CT on April 3, 2018. <https://www.fbo.gov/odcas/r390a570b07d9c61a1e6fa5385262ca7>.

PIEGAN/RAYMOND INDOOR FIRING RANGE REMEDIATION

General Services Administration, R8 Rocky Mtn Region Acquisition Division (47PJ00), Denver.
Federal Business Opportunities, FBO-5950, Solicitation 47PJ0018R0079, 2018

This requirement is a total small business set-aside under NAICS code 562910. GSA Region 8 is initiating a project to clean all the supporting rooms adjacent to the indoor firing range in Raymond, Montana, to include lead dust remediation via cleaning of all supporting equipment, HVAC supply and return ducts and diffusers, building finishes, equipment, and surfaces throughout the identified spaces. GSA Region 8 also must decontaminate indoor areas at the Piegan Land Port of Entry in Babb, Montana, where lead dust contamination has been identified within the indoor firing range, firing range building, and one area of an adjacent building. Offers are due by 2:00 PM MT on April 6, 2018. <https://www.fbo.gov/ops/GSA/PBS/BBT/47PJ0018R0079/listing.html>

Cleanup News

EXPLANATION OF SIGNIFICANT DIFFERENCE: CINTAS-MEAD STREET SITE, WICHITA, SEDGWICK COUNTY, KANSAS

Kansas Department of Health and Environment, 20 pp, 2017

This ESD documents a significant change to the Corrective Action Decision (CAD) issued on June 26, 2013. The site soil and groundwater are affected primarily by PCE, TCE, and daughter products. The CAD remedy called for monitored natural attenuation (MNA) and land use controls to achieve the remedial action objectives for impacted groundwater. The alternative remedy in this ESD calls for enhanced reductive dechlorination (ERD) followed by MNA, groundwater monitoring, and land use controls. ERD is in situ bioremediation implemented to promote anaerobic biological dechlorination of chlorinated solvents in the subsurface by direct and cometabolic degradation processes. The ESD changes the remedial design by the construction of a temporary drum and injection equipment staging area to support direct-push injections of an emulsified vegetable oil-based substrate (SRS™) and sodium bicarbonate. After amendments injection, the remedy will revert to the MNA and land use controls. The modification is described in greater detail in the 2017 *Groundwater Remediation Work Plan*, available with the ESD at <http://www.kdheks.gov/remediation/site Remediation/Cintas.html>.

GROUNDWATER SOURCE ZONE EISB CONSTRUCTION COMPLETION REPORT, CASPER PCE PLUMES ORPHAN SITE, CASPER, WYOMING

Wyoming Department of Environmental Quality, Cheyenne. 126 pp, 2017

In 2017, contractors injected ~1,438 gal of emulsified vegetable oil (EVO) and soluble electron donor, 3,880 gal of anaerobic water, and 40 L of KB-1® microbial culture between September 5 and September 12 to implement enhanced in situ bioremediation (EISB) of the groundwater at the Casper PCE Plumes Orphan Site. The EISB injections targeted alluvium and shallow weathered bedrock materials north of the dry cleaner. The soluble electron donor (Newman Zone QR™), a blend of food-grade electron donors, nutrients, cofactors, and vitamins) and the slow-release EVO electron donor (Newman Zone HRO™) were mixed together in a polyethylene tote using a tote mixer, dosed into hydrant water, and injected into the aquifer. To enhance microbial culture survivability, all direct-push injection lifts delivered KB-1 following introduction of the total target EVO volume into each injection lift or well. <http://deq.wyoming.gov/media/attachments/Solids%20%25%20Hazardous%20Waste/Active%20Sites/casper%20PCE%20Plume/Final%20Casper%20Groundwater%20Source%20Zone%20EISB%20CR%2011-17-17-PDF>.

CLEANUP ACTION TO BEGIN AT SITE SUPERFUND SITE

New York State Dept. of Environmental Conservation (NYSDCE), 4 pp, 2018

Cleanup actions commencing early in 2018 will address contamination related to the Lee Avenue Railroad Area site located at Lee Ave./Route 23 along Railroad, Norwich, Chenango County, New York. Primary contaminants of concern on the site include TCE, 1,1,1-TCA, their associated breakdown products, PCE, and toluene. The cleanup action is based on excavation of contaminated source area soil; treatment to degrade contaminants in bedrock groundwater; and implementation of controls to prevent exposure to remaining contamination. Treatment includes injections of Newman Zone HRO™, a vegetable oil blend, into the fractured bedrock to enhance anaerobic bioremediation of the groundwater contaminants. The March 2017 Record of Decision provides additional details of the remedy and the rationale used by NYSDCE for remedy selection: http://www.dec.ny.gov/docs/remediation_hudson_pdf/700014rod.pdf.

Demonstrations / Feasibility Studies

CASE STUDY: USE OF ZERO VALENT IRON (ZVI) TO ENHANCE ABIOTIC/BIOTIC CHLORINATED SOLVENT REMEDIATION AT A FORMER WASTEWATER TREATMENT FACILITY

Kinsella, K. and T. Justham.

2017 New Hampshire Hazardous Waste & Contaminated Sites Conference, May 24, Manchester, NH. 31 slides, 2017

Chlorinated VOCs, mainly TCE and daughter products, were found beneath a former municipal wastewater treatment facility in New England. TCE was detected at concentrations >1,000 mg/L with measurable DNAPL in a groundwater monitoring well. Following a bench-scale study, regulators approved a field-scale abiotic/biotic pilot study within the upper hydrogeologic unit's saturated alluvial deposits. A blend of zero-valent iron (ZVI), guar gum, sugar, inactive yeast, and micronutrients was injected in a 300 ft² area using direct push methods. The abiotic/biotic remedy created multiple degradation pathways, addressing both residual CVOC source mass and dissolved-phase CVOCs by combining ZVI-based chemical dechlorination with microbial dehalorespiration. Site groundwater contained sulfate at background concentrations ranging up to 50 mg/L. Pilot results showed that the combined biotic/abiotic dechlorination remedy was effective on a complex source area and illuminated the pH balance maintained during bioremediation and the potential of sulfate to enhance ZVI effects. http://www.biaofrb.com/uploads/5/9/9/7/59971097/session_a_2.pdf

BAY ROAD HOLDINGS, EAST PALO ALTO (FORMERLY ROMIC)

U.S. EPA Region 9 Website, 2018

Bay Road Holdings LLC (formerly Romic Environmental Technologies Corp.) is a closed hazardous waste management facility located in East Palo Alto, Calif., near the San Francisco Bay. The facility ceased operations in 2007, and all surface structures were demolished in 2009. Historical facility operations from 1964 to 2007 included solvent recycling, fuel blending, wastewater treatment, and hazardous waste storage and treatment, resulting in releases that contaminated the soil and groundwater beneath the site. Biological treatment was the primary remedy selected by EPA to address the solvent-contaminated soil and groundwater. The biological treatment approach introduces a substrate (cheese whey and molasses were used in early testing) through horizontal injection wells (>200 ft long) for distribution via an in situ delivery (ISD™) groundwater recirculation system. The horizontal injection wells and the biological treatment system can operate independently and thus not interfere with the redevelopment ongoing at the surface. See details of this system in the *ISD™ Groundwater Recirculation Pilot System Installation Work Plan* at <https://www.epa.gov/epaoswer/hazwaste/docs/bay-road-holdings-former-romic-facility-final-groundwater-recirculation-pilot-system-installation-workplan-2016-03.pdf>. About 40% of the biological treatment system was constructed and underwent testing in 2017. A full-scale treatment system is expected to be in operation by 2020. For follow-on information, visit Envirostor at http://www.envirostor.dsc.ca.gov/public/profile_report2global_id=80001633.

Research

ESTIMATING THE HIGH-ARSENIC DOMESTIC-WELL POPULATION IN THE CONTERMINOUS UNITED STATES

Ayotte, J.D., L. Medalle, S.L. Qi, L.C. Backer, and B.T. Nolan.
Environmental Science & Technology 51(21):12443-12454(2017)

A logistic regression model of the probability of having arsenic >10 µg/L (high arsenic) in wells at the county, state, and national scales was developed using As concentrations from 20,450 U.S. domestic wells. The population in the conterminous U.S. using water from domestic wells with predicted As concentration >10 µg/L is 2.1 million people (95% CI is 1.5 to 2.9 million). Although some parts of the U.S. were underrepresented with As data, predictive variables available in national data sets were used to estimate high As in unsampled areas. By predicting to all of the conterminous U.S., the investigators were able to identify areas of high and low potential exposure in areas of limited As data, which can be viewed as potential areas to investigate further or to compare to more detailed local information. This paper is **Open Access** at <https://pubs.acs.org/doi/abs/10.1021/acs.est.7b07881>.

DIOXIN DEGRADATION AND METAL BIOVOLATILIZATION AT A FORMER WOOD TREATING SITE

Hardy, L. Dioxin 2017: August 20-25, Vancouver, Canada. 3 pp, 2017

A large-scale contamination assessment of a former wood treating site completed in 2015 was compared to results of field work conducted in the early 1990s. The 2015 results clearly show that while dioxins, chlorophenols, and metals are (as expected) the main contaminants at the site, significant natural attenuation of all contaminants has occurred. These results are attributed to reductive dechlorination of dioxins and chlorophenols and to biovolatilization of metals. The combination of persistent organic pollutant degradation and metals biovolatilization seen at this site is not unprecedented as arsenic biovolatilization in the presence of DDT has been documented, and addition of biochar has promoted organochlorine degradation at a similar site. http://www.dioxin2017.org/uploadfiles/otheres/9537_0504083747.pdf.

A FIELD STUDY OF NUCLEAR MAGNETIC RESONANCE LOGGING TO QUANTIFY PETROLEUM CONTAMINATION IN SUBSURFACE SEDIMENTS

Fay, E.L., R.J. Knight, and E.D. Grunewald.
Geophysics 82(4):EN81-EN92(2017)

In a field study conducted in Pine Ridge, South Dakota, nuclear magnetic resonance (NMR) logging measurements were used to investigate an area of hydrocarbon contamination from leaking underground storage tanks. NMR logging measurements are directly sensitive to hydrogen-bearing fluids in the sediments surrounding a well and can be used to estimate in situ fluid volumes. The relaxation time T₂ and diffusion coefficient D of the fluids were used to differentiate between signal from water and signal from contaminant, enabling the estimation of the hydrocarbon volume. Based on NMR measurements collected in two PVC-cased monitoring wells, D and T₂ measurements were used together to detect a contaminant smear zone at both wells. Although the contrast in D between the fluids was found to be inadequate for fluid typing, the T₂ contrast between the contaminant and water in slit enabled estimation of contaminant volumes. Using this technique, the vertical extent of the smear zone was estimated to be more than 3 m with up to 5 vol% contaminant in the sediments at one well and up to 9.5 vol% at the other well. Under appropriate circumstances, NMR logging can be used to detect and quantify contamination in situ; however, sediment and contaminant properties at many sites might result in insufficient contrast between T₂ and D.

NMR-BASED SENSORS FOR IN SITU MONITORING OF CHANGES IN GROUNDWATER CHEMISTRY

Konzuk, J. SERDP Project ER-2534, 105 pp, 2017

Recent progress in the development of chemical sensors based on nuclear magnetic resonance (NMR) relaxation in the biomedical field may present opportunities for the development of chemical sensors based on similar principles for environmental applications. The objective of this limited scope study was to explore the viability of a NMR relaxation approach to measure variation in key chemical parameters indicative of the attenuation of chlorinated ethenes in groundwater. <https://www.serdp-estscn.org/content/download/4667/1436309/file/ER-2534%20Final%20Report.pdf>.

BIOFILTRATION FIELD STUDY FOR COLD FE(II)- AND MN(II)-RICH GROUNDWATER: ACCELERATED MN(II) REMOVAL KINETICS AND COLD-ADAPTED MN(II)-OXIDIZING MICROBIAL POPULATIONS

Dangetti, S., B. Roshan, B. Rindall, J.M. McBeth, and W. Chang.
Water Quality Research Journal 53(1):10.2166/wqrj.2017.006(2017)

A 2-stage pilot-scale biofilter developed to remove Fe and Mn at on-site temperatures ranging from 8-14.8°C achieved acceleration of Mn(II) removal following acclimation despite generally slow Mn(II) removal kinetics at *Pseudomonas*, *Leptothrix*, *Flavobacterium*, and *Zoogloea* cultured from the field-aged biofilter) rapidly produced biogenic Mn oxides at 8°C, confirmed by electron paramagnetic resonance spectroscopy.

RAPID, SELECTIVE HEAVY METAL REMOVAL FROM WATER BY A METAL-ORGANIC FRAMEWORK/POLYDOPAMINE COMPOSITE
Sun, D.T., L. Peng, W.S. Reeder, S.M. Moosavi, D. Tiana, D.K. Britt, E. Oveis, & W.L. Queen.
ACS Central Science [Publication online 3-14-18 prior to print]

An inexpensive, water-stable, metal-organic framework/polymer composite (Fe-BTC/PDA exhibits rapid, selective removal of large quantities of heavy metals (e.g., lead and mercury) from real-world water samples. When Fe-BTC is treated with dopamine, it undergoes spontaneous polymerization to polydopamine (PDA) within its pores via the Fe³⁺ open metal sites. Pinned on the internal metal-organic framework surface the PDA gains extrinsic porosity, resulting in a composite that binds up to 1634 mg of Hg²⁺ and 394 mg of Pb²⁺ per gram of composite, removes more than 99.8% of these ions from a 1 ppm solution, and yields drinkable levels in seconds. Even when interferents (e.g., Na⁺) are present at concentrations up to 14,000 times that of Pb²⁺, no significant uptake of competing metal ions is observed. The material also resists fouling when tested in high concentrations of common organic interferents (e.g., humic acid) and is fully regenerable over many cycles. *This paper is **Open Access** at <https://pubs.acs.org/doi/10.1021/acscentsci.7b00605>*

PLANTS AS ALTERNATIVE COVERS AT CONTAMINATED SITES

Grifoni, M., G. Petruzzelli, M. Barberi, I. Rosellini, B. Pezzarossa, and F. Pedron.
International Science Index, Environmental and Ecological Engineering 11(10):723-727(2017)

An evapotranspiration (ET) cover is an alternative type of cover system that utilizes a water balance approach to maximize the ET process and reduce the contaminants leaching through the soil profile. Microcosm tests carried out on two contaminated soils using *Triticum durum* (durum wheat, an annual grass) and *Helianthus annuus* (common sunflower) indicated that transpiration was higher than evaporation, thus supporting the use of the plants as alternative cover at the contaminated study site. <http://www.waset.org/publications/10008059>

PERFLUOROALKYL AND POLYFLUOROALKYL SUBSTANCES REMOVAL IN A FULL-SCALE TROPICAL CONSTRUCTED WETLAND SYSTEM TREATING LANDFILL LEACHATE

Yin, T., H. Chen, M. Reinhard, X. Ye, and K.-Y. Gin.
Water Research 125:418-426(2017)

An investigation of the occurrence and treatment of per- and polyfluoroalkyl substances (PFASs) in the leachate of a capped landfill site in Singapore evaluated the efficacy of PFASs removal during flow through a constructed wetland (CW) treatment system. The system comprised an equalization tank, aeration lagoons, sedimentation tank, reed beds, and polishing ponds. Target compounds included 11 perfluoroalkyl acids (PFAAs) (7 perfluoroalkyl carboxylic acids (PFCAAs) and 4 perfluoroalkane sulfonates (PFASAs)) and 7 PFAA precursors. Total PFAS concentrations in the leachate varied from 1269 to 7661 ng/L over the one-year sampling period, but PFASs composition remained relatively stable with PFCAAs consistently predominant (54.0 ± 3.8%). Perfluorobutane sulfonate (PFBS) concentrations were highly correlated with total PFASs concentrations and could be an indicator for the release of PFASs from this landfill. The release of short-chain PFAAs strongly depended on precipitation, whereas concentrations of the other PFAAs appeared to be controlled by partitioning. Overall, the CW system removed 61% of total PFASs and 50-96% of individual PFASs. PFAAs were removed most efficiently in the reed bed (42-49%), whereas most of the PFAA precursors (i.e., 5:3 fluorotelomer carboxylate, N-substituted perfluorooctane sulfonamides) were biodegraded in the aeration lagoon (>55%). The sedimentation tank and polishing ponds were relatively inefficient at ~7% PFASs removal.

PLANT UPTAKE OF PER- AND POLYFLUOROALKYL SUBSTANCES AT A CONTAMINATED FIRE TRAINING FACILITY TO EVALUATE THE PHYTOREMEDIATION POTENTIAL OF VARIOUS PLANT SPECIES

Gobelius, L., J. Lewis, and L. Ahrens.
Environmental Science & Technology 51(21):12602-12610(2017)

Uptake of 26 PFASs by plants from soil and groundwater was investigated at a fire training site at Stockholm Arlanda airport (Sweden) in 2016 where elevated PFAS levels were detected in soil (16-160 ng/g dry weight) and groundwater (1200-34,000 ng/L). Samples taken from silver birch, Norway spruce, bird cherry, mountain ash, ground elder, long beechfern, and wild strawberry tissues of the local plant community showed high variability of PFAS concentrations. The bioconcentration factors were highest in foliage. The total tree burden of PFASs per tree was up to 11 mg for birch and 1.8 mg for spruce. Different plant combinations were considered for phytoremediation of PFAS-contaminated sites. *For more information on this study, see L. Gobelius' Master's thesis at https://stud.epsilon.gu.se/37877/1/gobelius_1_161108.pdf*

INTEGRATION OF FILTRATION AND ADVANCED OXIDATION: DEVELOPMENT OF A MEMBRANE LIQUID-PHASE PLASMA REACTOR

Bellona, C., E. Dickenson, T.M. Holsen, and S. Mededovic-Thagard.
U.S. EPA, National Center for Environmental Research, 2018

Under EPA Grant Number R835332, researchers from Clarkson University and the Southern Nevada Water Authority collaborated to engineer, develop, and demonstrate an integrated process comprising membrane technology and electrical discharge plasma generated via a novel reticulated vitreous carbon electrode material. EPA funded the project team from August 16, 2012, through August 15, 2017, as it worked to develop a scalable, robust technology that requires minimal chemical input, has a small footprint, and achieves finished water of high quality. Plasma was very effective for the degradation of perfluorinated compounds, particularly within the team's optimized reactor configuration. Links to the abstracts of the 19 papers developed during this project are available at: <https://cfpub.epa.gov/nce/abstracts/index.cfm?useaction=displayAbstract&detailAbstract/8729/report/2016>

FACTORS CONTROLLING THE RATE OF PERFLUOROCTANOIC ACID DEGRADATION IN LACCASE-MEDIATOR SYSTEMS: THE IMPACT OF METAL IONS

Luo, Q., Z. Wang, M. Li, H. Chen, C. Woodward, S. Liang, J. Lu, and Q. Huang.
Environmental Pollution 224:649-657(2017)

Researchers investigated the factors that regulated the degradation of PFOA in laccase-catalyzed oxidative humification reactions with 1-hydroxybenzotriazole (HBT) as a mediator. The metal ions contained in the reaction solution appeared to have a strong impact on PFOA degradation. Differential UV-Vis spectrometry revealed that Cu²⁺ can complex with PFOA, which plays an essential role to enable PFOA degradation, likely by bridging the negatively charged PFOA and laccase, so that the free radicals of HBT that are released from laccase can reach and react with PFOA. Similarly, Fe³⁺ also enabled PFOA degradation in the laccase-HBT reaction system. The structures of fluoride and partially fluorinated compounds detected as PFOA degraded via the humification pathways involving free-radical initiated decarboxylation, rearrangement, and cross-coupling. *See additional information on this work in Chapter 4 of Q. Luo's dissertation at https://etd.lib.unc.edu/pdfs/luo_q_201512_phd.pdf*

ADVANCED OXIDATION/REDUCTION PROCESSES TREATMENT FOR AQUEOUS PERFLUOROCTANOATE (PFOA) AND PERFLUOROCTANESULFONATE (PFOS): A REVIEW OF RECENT ADVANCES

Trojanowicz, M., A. Bojanowska-Czajka, I. Bartosiewicz, and K. Kulisa.
Chemical Engineering Journal 336:170-199(2018)

Recent advances in methods for decomposition of PFOA and PFOS are reviewed, with particular attention to methods based on oxidation and reduction of target pollutants. The review considers photolytic and photocatalytic methods; electrochemical processes as well as sonolytic and radiolytic methods with the use of ionizing radiation; wet chemical oxidation methods; ozonation; and Fenton processes. Where possible, comparisons of mechanisms of occurring transformations and efficiency in terms of time required for decomposition and energy consumption are provided.

ASSESSING THE POTENTIAL CONTRIBUTIONS OF ADDITIONAL RETENTION PROCESSES TO PFAS RETARDATION IN THE SUBSURFACE

Brusseau, M.L. Science of the Total Environment 613-614:176-185(2018)

A multi-process retention model is proposed to account for potential additional sources of retardation for PFAS transport in source zones, such as partitioning to the soil atmosphere, adsorption at air-water interfaces, partitioning to trapped organic liquids (NAPL), and adsorption at NAPL-water interfaces. An initial assessment of the relative magnitudes and significance of the retention processes was conducted for PFOS, PFOA, and an example precursor (fluorotelomer alcohol, FTOH). Study results indicate that NAPL adsorption at the air-water interface was a primary source of retention for both PFOA and PFOS, contributing ~50% of total retention for the conditions employed. Adsorption to NAPL-water interfaces and partitioning to bulk NAPL were also shown to be significant sources of retention. This work has import for accurate determination of the migration potential and magnitude of mass flux to groundwater as well as for calculations of contaminant mass in source zones.

SORPTION OF POLY- AND PERFLUOROALKYL SUBSTANCES (PFASS) RELEVANT TO AQUEOUS FILM-FORMING FOAM (AFFF)-IMPACTED GROUNDWATER BY BIOCHARS AND ACTIVATED CARBON

Xiao, X., B.A. Ulrich, B. Chen, and C.P. Higgins.
Environmental Science & Technology 51(11):6342-6351(2017)

Researchers compared the removal of 30 per- and polyfluoroalkyl substances (PFASs) from AFFF-impacted drinking water using granular activated carbon (GAC). The approach combined lab batch experiments and modeling. The model predicted that nearly all of the recently discovered polyfluorinated chemicals and PFOS-like PFASs detected in the water would break through GAC systems before PFOS or PFOA. The model breakthrough results were used to evaluate a simplified approach to predicting PFAS removal by GAC using compound-specific retention times on a C18 column. Overall results suggest that GAC systems operated to remove PFOA and PFOS from AFFF-impacted water likely achieve poor removal of many unmonitored PFASs of unknown toxicity. *This paper is **Open Access** at <https://pubs.acs.org/doi/abs/10.1021/acs.est.7b00970>*

A SURVEY OF ANALYTICAL METHODS EMPLOYED FOR MONITORING OF ADVANCED OXIDATION/REDUCTION PROCESSES FOR DECOMPOSITION OF SELECTED PERFLUORINATED ENVIRONMENTAL POLLUTANTS

Trojanowicz, M., K. Bobrowski, B. Szostek, A. Bojanowska-Czajka, T. Szreder, I. Bartosiewicz, and K. Kulisa. Talanta 177:122-141(2018)

Advanced oxidation/reduction processes (AO/RPs) include photolytic and photocatalytic processes, Fenton reactions, sonolysis, ozonation, application of ionizing radiation, and several wet oxidation processes. The monitoring of AO/RPs to evaluate the yield and mechanisms of decomposition of perfluorinated compounds such as PFOA or PFOS can be more difficult than their determination in samples with complex matrices, likely due to the formation of hundreds or even thousands of intermediate and final products. This review discusses the use of LC/MS/MS, GC/MS, molecular spectrophotometry (especially electron paramagnetic resonance), UV/Vis spectrophotometry with pulse radiolysis methods, ion chromatography, and potentiometry with ion-selective electrode for the measurement of perfluorinated compounds.

LITERATURE REVIEW AND REPORT ON THE POTENTIAL HEALTH EFFECTS OF PERFLUOROALKYL COMPOUNDS, MAINLY PERFLUOROCTANE SULFONATE (PFOS)

Priestly, B. Australian Centre for Human Health Risk Assessment (ACHHRA), School of Public Health & Preventive Medicine, Monash University. 44 pp, 2017

This report is an extension of reports prepared in 2015 and 2016 to review the literature on the health effects of PFOS and related perfluoroalkyl substances (PFASs). It summarizes new studies published mainly in the period September 2016 to November 2017 and comments on recent Australian regulatory actions, including the February 2017 updating of Tolerable Daily Intake estimates for PFOS, PFOA, and PFHxS developed by the Australian food regulator. About 50 new epidemiological studies are summarized in a table format, with added comments on the extent to which these new reports extend the knowledge base of the health effects of PFAS. The new epidemiology studies have not added any substantially new or concerning information on the potential health effects of PFOS. <https://www7.health.vic.gov.au/Api/downloadmedia/AB00CA15-A407-4B60-A41B-3E0A67A153E3>

AUSTRALIA-WIDE ASSESSMENT OF PERFLUOROALKYL SUBSTANCES (PFASS) IN LANDFILL LEACHATES

Gallen, C., D. Drage, G. Eaglesham, S. Grant, M. Bowman, and J.F. Mueller.
Journal of Hazardous Materials 331:132-141(2017)

In an analysis of leachate from 27 landfills for nine perfluoroalkyl substances (PFASs), five PFASs were detected ubiquitously, with perfluorohexanoate (PFHxA) predominant. Some general trends in PFAS concentrations were observed. Mean concentrations of eight PFASs were higher in operating landfills/landfill cells accepting mainly municipal waste, compared to closed municipal landfills. Landfills accepting primarily construction and demolition wastes produced leachate that had higher mean PFAS concentrations than municipal landfills. Significant relationships were observed between selected PFAS concentrations and landfill age as younger landfills appeared to have a higher burden of waste containing PFASs (or their precursors). Increasing pH and total organic carbon in leachate were associated with increased concentrations of several PFASs.

General News

IN SITU CHEMICAL TREATMENT: A LOVE-HATE RELATIONSHIP

Suthersan, S., J. McDonough, M. Schnobrich, and C. Irvine.
Groundwater Monitoring & Remediation 37(1):17-26(2017)

A large body of experience and many lessons learned on how to implement *situ* chemical treatments (ISCTs, such as chemical oxidation and reduction) successfully has been gained after several decades of mixed success in the field. The best practices for ISCT design highlighted in this paper are closely aligned with current remediation philosophies related to high-resolution investigation, contaminant mass flux mapping, and subsurface transport dynamics. **Open Access** at <http://onlinelibrary.wiley.com/doi/10.1111/gwmr.12203/full>

SUSTAINABLE HEAVY METAL REMEDIATION. VOLUME 1: PRINCIPLES AND PROCESSES

Rene, E.R., E. Sahinkaya, A. Lewis, and P. Lens (eds).
Springer International Pub., New York. eBook ISBN: 978-3-319-58622-9, 283 pp, 2017

The individually authored chapters within this text describe physico-chemical and biological technologies implemented to prevent and control industrial heavy metal emissions; to cover principles, underlying mechanisms, thermodynamic functions, kinetics, and modeling of technologies used to treat heavy metals in effluents; and to provide case studies of heavy metal removal and recovery from mining and metallurgical wastes, construction and demolition wastes, spent catalysts, and electronic wastes. Precipitation, biosorption, permeable reactive barriers, constructed wetlands, and bioelectrochemical systems are among the treatment technologies discussed. *See the table of contents and chapter abstracts at <http://www.springer.com/us/book/9783319586229>*

MICROBIAL BIOTECHNOLOGY IN ENVIRONMENTAL MONITORING AND CLEANUP

Bhatt, P. and A. Sharma (eds).
IGI Global, Hershey, PA. EISBN13: 9781525231272, 427 pp, 2018

The individually authored chapters in this book cover a broad range of topics, including microbes and minerals interaction, green chemistry, phytoremediation, bioremediation, and environmental nanotechnology. The text is geared toward academics, professionals, graduate students, and practitioners interested in emerging techniques for environmental decontamination. *See the table of contents and abstracts at <https://www.igi-global.com/book/microbial-biotechnology-environmental-monitoring-cleanup/129824>*

BEST PRACTICES FOR ENVIRONMENTAL SITE MANAGEMENT: A PRACTICAL GUIDE FOR APPLYING ENVIRONMENTAL SEQUENCE STRATIGRAPHY TO IMPROVE CONCEPTUAL SITE MODELS

EPA 600-R-17-293, 62 pp, 2017

This issue paper offers a practical guide on the application of the geologic principles of sequence stratigraphy and facies models to the characterization of stratigraphic heterogeneity at hazardous waste sites with the aim of improving CSMs and providing a basis for understanding stratigraphic flux and associated contaminant transport. These principles are fundamental to designing monitoring programs as well as selecting and implementing remedies at contaminated groundwater sites. Appendix A presents six case studies of environmental sequence stratigraphy application. <https://semspub.epa.gov/src/document/119/100001008>

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