Technology Innovation News Survey

Entries for June 1-15, 2016

Market/Commercialization Information

MESA SUBSTATION SITE REMEDIATION PROJECT

Department of Energy, Western Area Power Administration, Lakewood, Colorado
Federal Business Opportunities, FBO-5347, Solicitation DE-SOL-00010045, 2016

This requirement will be solicited as a competitive 100% small business set-aside RFQ subject to NAICS code 562910, Remediation Services. A firm-fixed-price contract award is contemplated. The project consists of furnishing all necessary labor, supervision, materials, licenses, permits, insurance, transportation, and equipment necessary to perform site remediation at the Western Area Power Administration's Mesa Substation located in Phoenix, Arizona. Monitoring of the remediation services will be conducted by another contractor. Release of the solicitation is anticipated on or about July 21, 2016https://www.fbo.gov/notices/d0fa2556a8acb0aaf1af5d87b387f6d7

CHEMICAL ANALYSIS OF CIGARETTE BUTTS

Department of Health and Human Services, Food and Drug Administration, Rockville, MD.
Federal Business Opportunities, FBO-5350, Solicitation FDA-RFQ-1169382, 2016

A major existing environmental consequence of cigarette use is the waste disposal of discarded cigarette filters, as an estimated 4.5 trillion cigarette butts are thrown away every year worldwide and 1.69 billion pounds of cigarette butts are disposed of as toxic trash each year. Research has shown cigarette butt leachate to be toxic to fish. It is necessary to characterize the hazard and model the fate and transport of these chemical constituents in the environment. Under the contract, the FDA is interested in conducting a study to support characterization and quantification of leachable constituents, including harmful/potentially harmful constituents from cigarette butts. This solicitation is set aside for small business under NAICS code 541712. The period of performance is four months: 9/1/16 to 1/5/17. Quotes are due by 2:00 PM ET on August 9, 2016https://www.fbo.gov/spg/HHS/FDA/DCASC/FDA-RFQ-1169382/listing.html

FY 2017 BROWNFIELDS AREA-WIDE PLANNING GRANT GUIDELINES

U.S. EPA Funding Opportunity EPA-OLEM-OBLR-16-05, 2016

EPA funding is available to eligible entities who wish to develop an area-wide plan for brownfields assessment, cleanup, and subsequent reuse. The proposal submission deadline is August 10, 2016. The funding is for research and/or technical assistance activities directed to one or more brownfield site(s) located in a specific area (such as a neighborhood, downtown or business district, local commercial corridor, community waterfront or city blocks). Each project funded under this grant must result in an area-wide plan that includes specific plan implementation strategies for assessing, cleaning up, and reusing the brownfields site(s) as well as related brownfields and project area revitalization strategies. EPA anticipates awarding about 20 projects in total, funded up to $200,000 each. Details and the archive of the June 16 outreach webinar are posted at http://www.epa.gov/brownfields/brownfields-current-news-and-events.

Cleanup News

DESIGN AND CONSTRUCTION OF THE ROCK BAY REMEDIATION PROJECT, STAGE 3

Pinto, S. and R.-A. Sharp.
RPIC 2016: Federal Contaminated Sites National Workshop, Real Property Institute of Canada, 2016

Stage 3 of the Rock Bay Remediation Project required the cleanup of ~90,000 tonnes of coal tar-contaminated soils and sediments, much of which were under the seawater within Rock Bay. The design and eventual implementation of this multidisciplinary project included the construction of a cofferdam to prevent tidal water from entering the work area, extensive sheet pile shoring along the property line to excavate 12 m bgs, and a robust outfall bypass piping system to reroute water at maximum rates of 16,800 L/s around the cofferdam. Once the various geostructural and civil structures were in place, the contractor was able to implement the dewatering of Rock Bay, followed by removal and relocation of over 3,000 fish and aquatic animals. During this process, a water treatment plant processed sediment-, metal-, and hydrocarbon-impacted water at a rate of one million L/d. Dewatering allowed excavation and removal of the affected soils and sediments via barge and trucks for thermal desorption treatment and eventual disposal. The project, located within a densely populated urban area (downtown Victoria, British Columbia), also had an extensive management program for air particulates, contaminants, and odors. Once complete, the remediated area could be flooded again and the cofferdam and shoring structures removed.**Slides:** http://www.rpic-ibic.ca/documents/2016_FCS_NW/Presentation/51_Pinto_EN.pdf

SPILL RESPONSE, SITE ASSESSMENT AND REMEDIATION OF A SIGNIFICANT GASOLINE RELEASE TO LAND, RESOLUTE BAY, NUNAVUT

McCullough, R.
RPIC 2016: Federal Contaminated Sites National Workshop, Real Property Institute of Canada, 2016

The unique elements in this cleanup included conducting a forensic assessment and locating a free-phase product plume in permafrost fractures, use of hydrocarbon fingerprinting to determine the age/type of impacts, adapting southern technologies for water and on-site treatment to extreme northern conditions, and constructing/operating effective remedial systems to meet remediation targets. An estimated 87,000 liters of gasoline were released from a community tank farm in October 2011. Once the extent of the release impacts were determined, ~5,000 m^3 of impacted soil was excavated and placed in two treatment cells constructed within the footprint of the tank farm facilities. About 423,000 L of contaminated water was collected and treated to applicable guidelines and discharged. The project overcame the challenges of severe weather, limited heavy equipment, fluctuating availability of contractors, remote location, and inability to procure much of the normal equipment and supplies.**Slides:** http://www.rpic-ibic.ca/documents/2015_FCS_NW/Presentations/4_-_McCullough_FINAL.pdf

PERMEABLE REACTIVE BARRIER SYSTEM TO PROTECT A WATER STREAM FROM POTENTIAL IMPACT BY LNAPL INTRUSION

Cruz, J., J. Marcellino, O. Maurer, and C. Nogueira.
RPIC 2016: Federal Contaminated Sites National Workshop, Real Property Institute of Canada, 2016

A large LNAPL source area at the at the Petrom site (Mogi das Cruzes, SP State, Brazil) had been under remediation >7 yr using multi-phase extraction, which was found to be insufficient for LNAPL containing significant concentrations of di(2-ethylhexyl)phthalate (DEHP) and di-n-butyl phthalate (DBP). A companion adsorptive barrier system containing organoclay (PTM-199, CETCO) and granulated activated carbon (DSR-C 8X30, Calgon) was designed, consisting primarily of an LNAPL interceptor, a recovery trench situated immediately upgradient of the barrier, and cement-bentonite slurry wall sections. Several sumps were installed to recover LNAPL and prevent NAPL accumulation at the upgradient faces of both wall sections. The technical team proposed a dual-system modification of the original remedial approach to the regulatory agency. The regulators accepted this combined approach in 2013, the new system was installed in 2014, and by August 2015 the system had collected more than 10,000 L of product (dissolved and free phase) via the sumps and skimmer system.**Slides:** http://www.rpic-ibic.ca/documents/2016_FCS_NW/Presentation/26S_-_Cruz_EN.pdf

HARNESSING WIND POWER FOR REMEDIATION VIA SOIL VAPOUR EXTRACTION IN REMOTE AREAS

Knafla, A.
RPIC 2016: Federal Contaminated Sites National Workshop, Real Property Institute of Canada, 2016

At a contaminated site in Alberta with gasoline-range hydrocarbons and solvents to a significant depth (>10 m) in the vadose zone, the remediation program used wind power to extract subsoil vapors for storage and treatment aboveground. Five low-maintenance windmills were installed with modifications that allowed for the creation of a mechanically induced vacuum to depressurize subsoil and subsequently extract soil vapors. The windmills installed at the site enable annual removal of >200 L of product. While this technique provides no unique advantages in terms of radius of influence for extraction, magnitude of chemical mass reduction, or cleanup time frame compared to other SVE methods, advantages are seen in terms of renewable power, ease of maintenance, and low carbon emission footprint. Additionally, the number of windmills used in a remediation program can be readily scaled up or down, depending on intended rate of progress and timeline.
Slides 1: http://www.rpic-ibic.ca/documents/2016_FCS_NW/Presentation/95_Knafla_EN-1.pdf
Slides 2: http://www.rpic-ibic.ca/documents/2016_FCS_NW/Presentation/95_Knafla_EN-2.pdf

JET A FUEL RECOVERY USING MICELLAR FLOODING: DESIGN AND IMPLEMENTATION

Kostarelos, K., S.R. Lenschow, M.A. Stylianou, P.C. de Blanc, M.M. Mygind, and A.G. Christensen.
Science of the Total Environment, Vol 563-564, 890-898, 2016

Surfactants offer two mechanisms for recovering NAPLs: mobilizing NAPL by reducing NAPL/water interfacial tension, and increasing the NAPL's aqueous solubility as an enhancement to pump and treat. Few attempts, however, have been made at recovering NAPLs using the mobilization approach presented in this paper. A full-scale field implementation of the mobilization approach is planned to recover LNAPL (Jet A fuel) from a surficial sand aquifer located in Denmark using a smaller amount of surfactant solution and fewer pore volumes of throughput compared with the surfactant-enhanced aquifer remediation approach. The approach will rely on mobilizing the LNAPL so that it is recovered ahead of the micellar flood. This paper reviews the lab work performed as part of the design for full-scale implementation, including screening of surfactants, phase behavior, and detailed salinity scans of the most promising formulations, and generation of a ternary diagram to be used for numerical simulations of the field applicatio**Additional information:**
https://www.egr.uh.edu/news/201604/uh-petroleum-engineer-applies-oil-recovery-technology-clean-leaked-jet-fuel-site-denmark

Demonstrations / Feasibility Studies

STATUS UPDATES FOR THE FORMER ZEPHYR REFINERY, MUSKEGON, MICHIGAN

Michigan Department of Environmental Quality, Remediation and Development Division, 2016

Several innovative in situ remediation alternatives have been tested at the former Zephyr Refinery site, including in situ chemical oxidation (ISCO) and Self-sustaining Treatment for Active Remediation (STAR)—a technology based on the principles of in situ smoldering combustion. The ISCO pilot was completed in March 2016, and a full-scale evaluation of ISCO is planned for late summer 2016. In the STAR pilot study, areas contaminated with diesel-range and gasoline-range petroleum compounds were treated for ~10 days. The STAR pilot was completed in May 2016 and a report is being drafted.**Zephyr Refinery website:** http://www.greatlakesmud.org/muskegon-lakes-zephyr-site.html
http://www.greatlakesmud.org/uploads/4/0/0/1/40013937/july_2016_zephyr_monthly_status_update.pdf

HELENA CHEMICAL COMPANY, TAMPA PLANT, FLORIDA

Florida Department of Environmental Protection, 5 pp, 2016

The primary site contaminants of concern in both soil and groundwater are pesticides, mainly DDT, chlordane, toxaphene, and BHC isomers. The presence of ethylbenzene and xylene in the soil and groundwater enhances the ability of pesticides to leach from soil and increases their mobility once in groundwater. The ROD signed by EPA in 1996 called for institutional controls; excavation of contaminated surface soils and sediments; biological treatment of contaminated soils; and extraction and treatment of contaminated groundwater. In September 2009, injections of zero-valent iron (ZVI) and hydrogen release compound (HRC®) were completed as a pilot study. In 2012, EPA recommended performing additional studies at the site to determine a more effective form of treatment to address sulfur- and BHC-contaminated areas. A supplemental geochemical data report (2014) recommended the evaluation of in situ groundwater treatment methods to raise the pH and create a more reducing environment, including use of a permeable reactive barrier. Initial assessment conducted in preparation for a new pilot study identified an onsite area of concentrated sulfur in soils in one of the pilot test areas. Additional delineation and removal of a sulfur-contaminated source area will be conducted in 2016 prior to pilot test injections of buffering amendments to adjust the groundwater pH. Results will be used to support selection and design of an in situ groundwater treatment remedy to address the pesticides.
http://www.dep.state.fl.us/waste/quick_topics/publications/wc/sites/summary/093.pdf

PHYTOREMEDIATION OF SALT AND HYDROCARBON IMPACTED SOILS USING BIOCHAR AUGMENTATION: THE IMPLICATIONS OF SALT TOLERANCE MECHANISMS

Zeeb, B.
RPIC 2016: Federal Contaminated Sites National Workshop, Real Property Institute of Canada, 2016

Cement kiln dust (CKD) is a by-product generated during the cement production process. When landfilled, CKD can salinize the soil. Two forms of phytotechnologies were explored for their ability to remediate a CKD landfill located in Bath, Ontario. Phytoextraction of chloride with *Phragmites australis* (common reed) was found to extract 65 ± 4 kg/km^2 of chloride per season, sufficient to remediate the highly contaminated surface 10 cm of soil in 3-9 years. Halophytic grass species (*Puccinellia nuttalliana* and *Spartina pectinata*) and the effect of biochar amendments were investigated in greenhouse and field trials. Biochar increased germination rates of *P. nuttalliana* in the field by 67%, decreased uptake of monovalent ions found at toxic levels in the CKD soil, and enhanced microbial activity in the rhizosphere. On the basis of accumulation alone, *P. australis* had the greatest phytoextraction efficiency due to its high biomass, but weekly salt excretion on the leaf surfaces of *S. pectinata* removed significantly more Cl-, surpassing the extraction ability of *P. australis* by nearly 60%.
Slides: http://www.rpic-ibic.ca/documents/2016_ECS_NW/Presentation/ECS_48_Zeeb_EN.pdf

IN-SITU CHEMICAL OXIDATION TEST TO REMEDIATE A DISSOLVED CHLORINATED ALIPHATIC HYDROCARBON PLUME: RESULTS, CONCLUSIONS AND FUTURE DIRECTIONS

Tremblay, L., M. Duquette, Y. Pouliot, S. Foy, and G. Comeau.
RPIC 2016: Federal Contaminated Sites National Workshop, Real Property Institute of Canada, 2016

A pilot test of an in situ chemical oxidation (ISCO) took place on a 1.9 km^2 property where dissolved-phase TCE, DCE, and VC plumes migrate in deltaic and proglacial sediments and in fractured bedrock. Potassium permanganate injections were conducted on two small zones in one of the plumes that had favorable hydrogeological conditions (i.e., sandy aquifer, plume separate from the others, low concentrations [50-300 µg/L TCE], and limited extent). Evaluation of oxidation effectiveness, however, revealed (1) a natural oxygen demand higher than the one measured in laboratory; (2) an injection well radius of influence smaller than the one estimated; (3) a precipitation mechanism in the aquifer resulting from the presence of high iron concentrations; and (4) a larger contaminated zone than the one previously defined. Based on this information, the quantity of oxidizing solution and the number of injection wells required to achieve cleanup goals make ISCO implementation too costly. The information collected during the pilot test will be used to include this aquifer in a global pump-and-treat system constructed for the entire site, and alternate in situ technologies are being explored to reduce CAH groundwater concentrations.**Slides:**
http://www.rpic-ibic.ca/documents/2016_ECS_NW/Presentation/31_Tremblay_EN.pdf

REMEDIAL PROCESS OPTIMIZATION AND OZONE SPARGING FOR PETROLEUM HYDROCARBON-IMPACTED GROUNDWATER

Leu, J., S. O'Connell, and M. Bettahar.
Remediation Journal, Vol 26 No 3, 73-94, 2016

A former natural gas processing station is contaminated with total petroleum hydrocarbons (TPH) and benzene. Remedial process optimization (RPO) was conducted to evaluate the effectiveness of the historical air sparging/soil vapor extraction system and the current groundwater pump-and-treat system. The RPO indicated that both remedial activities offered no further benefit in meeting remediation goals; instead, an in situ chemical oxidation (ISCO) system was recommended. Ozone was selected, and bench test results indicated that the ozone demand was 8 to 12 mg ozone/mg TPH and that secondary by-products would include Cr(VI) and bromate. A capture zone analysis was conducted through groundwater flow modeling (MODFLOW) to ensure containment of the injected oxidant using the existing groundwater extraction system. Pilot test results indicated that the optimum frequency of ozone sparging is 60 min to reach a maximum radius of influence of 20 ft. TPH concentrations within the treatment zone decreased 97% over two months of ozone sparging, while Cr(VI) and bromate concentrations increased from nondetect to 44 and 110 mg/L, respectively, but attenuated to nondetectable concentrations within three months of system shutdown.**Slides:**
http://ipec.utulsa.edu/Conf2012/Papers_Presentations/Leu.pdf

Research

SUSTAINABLE THERMAL REGENERATION OF SPENT ACTIVATED CARBONS BY SOLAR ENERGY: APPLICATION TO WATER TREATMENT

Miguet, M., V. Goetz, G. Plantard, and Y. Jaeger.
Industrial & Engineering Chemistry Research, Vol 55 No 25, 7003-7011, 2016

The feasibility of using solar energy for thermal regeneration of spent activated carbons (ACs) was investigated for treatment of dissolved-phase PCE in water using Aquacarb as the AC. Groundwater was used in regeneration tests to approximate field conditions. Regeneration was conducted at a working temperature between 130-400°C, and the treatment time was set so as to prevent any kinetic limitation. Solar and classical regenerations gave similar results. This first solar thermal regeneration test is promising for its environmental and economical advantages.

NANO/BIO TREATMENT OF POLYCHLORINATED BIPHENYLS WITH EVALUATION OF COMPARATIVE TOXICITY

Le, T.T., K.-H. Nguyen, J.-R. Jeon, A.J. Francis, and Y.-S. Chang.
Journal of Hazardous Materials, Vol 287, 335-341, 2015

Using an integrated chemical catalysis-biodegradation remediation system for PCBs, researchers achieved initial dechlorination of Aroclor 1248 by treatment with bimetallic nanoparticles Pd/nFe under anoxic conditions. Among the 32 PCB congeners of Aroclor 1248 examined, the process dechlorinated 99%, 92%, 84%, and 28% of tri-, tetra-, penta-, and hexachlorinated biphenyls, respectively. *Burkholderia xenovorans* LB400 rapidly degraded the resulting biphenyl. Benzoic acid was detected as an intermediate during the biodegradation process. The toxicity of the residual PCBs after nano-bio treatment was evaluated in terms of toxic equivalent values, which decreased from 33.8x10^5 µg/g to 9.5x10^{-5} µg/g. The residual PCBs also had low cytotoxicity toward *Escherichia coli* as demonstrated by lower reactive oxygen species levels, lower glutathione peroxidase activity, and a smaller number of dead bacteria.
https://www.bnl.gov/envsci/pubs/pdf/2015/BNL-107601-2015-JA.pdf

POLYCYCLIC AROMATIC HYDROCARBONS IN SOIL: PRACTICAL OPTIONS FOR REMEDIATION

de Boer, J. and M. Wagelmans.
Clean - Soil, Air, Water, Vol 44, 1-6, 2016

This review summarizes recent practical options for remediation of PAH-contaminated soil with their advantages and disadvantages. Given a sufficient time frame, phytoremediation, in combination with supporting techniques emerges as an environment-friendly and cost-effective technique that can also be efficient, depending on the degree and type of PAH pollution.
http://www.bioclear.nl/files/FILES/pah_remediation_review_160304.pdf

BIOREMEDIATION OF PCB-CONTAMINATED SEDIMENTS AND EVALUATION OF THEIR PRE- AND POST-TREATMENT ECOTOXICITY

Dudasova, H., K. Laszlova, L. Lukacova, M. Balascakova, S. Murinova, and K. Dercova.
Chemical Papers, Vol 70 No 8, 1049-1058, 2016

Combined bioaugmentation and biostimulation treatments were evaluated for their potential to biodegrade PCBs in sediments sampled from an industrial waste canal located in the eastern part of Slovakia. Bioaugmentation of sediments was performed in microcosms using two bacterial isolates—*Achromobacter xylosoxidans* and *Stenotrophomonas maltophilia*—obtained from the contaminated sediment. Biostimulation was performed via addition of cut plants (ivy leaves and pine needles) containing terpenes. Ecotoxicity of the contaminated sediments was evaluated pre- and post-treatment. Biostimulation treatment using ivy leaves revealed higher degradation of detected PCB congeners than the addition of pine needles but also moderately higher post-treatment toxicity of the sediment to*Lemna minor*.

MONITORING RE-SUSPENSION AND TRANSPORT OF DIOXIN CONTAMINATED SEDIMENT TO EVALUATE THE RECOVERY OF A SHALLOW URBAN CREEK POST SEDIMENT REMEDIATION

Richman, L., L. Haimovici, T. Kolic, S. Besevic, and E. Reiner.
Journal of Environmental Protection, Vol 7, 453-466, 2016 [http://dx.doi.org/10.4236/jep.2016.73039]

Pringle Creek, identified as the source of dioxin/furan contamination to a Lake Ontario harbor, was remediated in 2008. The focus of this paper is a review of the bottom sediment PCDD/F concentrations collected through time to assess natural recovery post remediation, including a 2014 study to address the transport and contaminant characteristics of suspended sediment downstream of the remediation. Shallow water depth (http://file.scirp.org/pdf/JEP_2016022913570293.pdf

GREEN-DUWAMISH RIVER WATERSHED: PCB CONGENER STUDY, PHASE 1

Washington State Department of Ecology, Bellevue, WA. 228 pp, 2016

The purpose of this report is to provide the Washington State Department of Ecology with a concise and readable summary of available information on PCB congeners and Aroclors that identifies important issues to consider when evaluating historical PCB congener and/or Aroclor data or when collecting new data. Following background information on the Green-Duwamish watershed and the Lower Duwamish Waterway (Section 2), Section 3 defines and describes PCBs, including Aroclors, congeners, and homologs. Additional information includes a summary of laws and regulations that are applicable to PCBs (Section 4); sources and chemistry of PCBs (Section 5); human and environmental health effects (Section 6); chemical analysis of PCBs (Section 7); and previously collected chemical data for PCB congeners in the Green-Duwamish watershed (Section 8).https://fortress.wa.gov/ecy/gsp/DocViewer.ashx?did=54944

A REVIEW OF APPROACHES AND TECHNIQUES USED IN AQUATIC CONTAMINATED SEDIMENTS: METAL REMOVAL AND STABILIZATION BY CHEMICAL AND BIOTECHNOLOGICAL PROCESSES

Akcil, A., C. Erust, S. Ozdemiroglu, V. Fonti, and F. Beolchini.
Journal of Cleaner Approaches, Vol 86, 24-36, 2015

This paper provides an overview of the main treatment strategies potentially available for metal-contaminated sediments, together with a brief discussion of issues associated with sediment management. http://www.jlakes.org/config/hpkx/news_category/2016-03-11/1-s2.0-S0959652614008312-main.pdf

ASSESSING THE EFFECTS OF BIOTURBATION ON METAL BIOAVAILABILITY IN CONTAMINATED SEDIMENTS BY DIFFUSIVE GRADIENTS IN THIN FILMS (DGT)

Amato, E.D., S.L. Simpson, T.M. Remaili, D.A. Spadaro, C.V. Jarolimek, and D.F. Jolley.
Environmental Science & Technology, Vol 50 No 6, 3055-3064, 2016 [DOI: 10.1021/acs.est.5b04995]

The performance of the in situ technique of diffusive gradients in thin films (DGT) was investigated for assessing metal bioavailability in sediments and providing predictions of metal bioavailable to benthic organisms in dynamic sediment environments. The DGT technique for predicting metal bioavailability was tested in clean and contaminated sediments subjected to varying degrees of disturbance. Strong relationships were found between bioaccumulation of Pb and Zn and time-integrated DGT-metal fluxes, whereas poor relationships were obtained using total or dilute acid-extractable metal concentrations.

HEC-RAS MODELING TO ASSESS CONTAMINATED SEDIMENT DEPOSITION BEHIND A RIFFLE REMEDIATION STRUCTURE IN BIG RIVER, BONNE TERRE, MO

Weedman, N., M. Pierson, and R. Pavlowsky.
Partnership for River Restoration and Science in the Upper Midwest, Poster presentation, 2016

Sediment deposition in river channels can be intensified by flooding, channel structures, or dredging. On the Big River, the Army Corps of Engineers and EPA constructed a riffle structure to trap Pb-contaminated sediments for remediation purposes. Developing an understanding of where Pb-contaminated sediment is stored, how it will be affected by flood events, and effective timing of contaminated sediment removal is the overarching project goal. The level of contamination of trapped sediment and an analysis of the hydraulics of this reach of the Big River were

modeled using HEC-RAS. The level of contamination was determined using X-ray fluorescence. The model allows for comparison of observed and predicted sedimentation of the reach.
http://www.prrsum.org/sites/prrsum.org/files/Nichole%20Weedman.pdf

VERMICULITE BIO-BARRIERS FOR CU AND ZN REMEDIATION: AN ECO-FRIENDLY APPROACH FOR FRESHWATER AND SEDIMENTS PROTECTION

Ferronato, C., B. Silva, F. Costa, and T. Tavares.
International Journal of Environmental Science and Technology, Vol 13 No 5, 1219-1228, 2016

Permeable barriers made of vermiculite clay were positioned for heavy metals remediation at the interface between water and sediments, and researchers investigated the potential for increasing barrier efficiency by loading the vermiculite surface with a microbial biofilm of *Pseudomonas putida*, a known accumulator of heavy metals. Results of batch assays showed that the vermiculite biobarrier system had a higher removal capacity than vermiculite alone. Considerations about biofilm attachment in a continuous-flow system are also discussed.*See additional information in C. Ferronato's Ph.D. thesis at* http://amsdottorato.unibo.it/6881/1/Ferronato_PHD.pdf.

OCCURRENCE OF SELECT PERFLUOROALKYL SUBSTANCES AT U.S. AIR FORCE AQUEOUS FILM-FORMING FOAM RELEASE SITES OTHER THAN FIRE-TRAINING AREAS: FIELD-VALIDATION OF CRITICAL FATE AND TRANSPORT PROPERTIES

Anderson, R.H., G.C. Long, R.C. Porter, and J.K. Anderson.
Chemosphere, Vol 150, 678-685, 2016

PFAS-containing aqueous film-forming foam (AFFF) can enter soil and groundwater at sites on military activities other than former fire-training areas (FTAs), such as emergency response locations, AFFF lagoons, and fire station testing and maintenance areas. In 2014 an investigation was conducted on 10 active Air Force installations with historic AFFF use of varying magnitude to evaluate the occurrence of select PFAS compounds in sites with diverse AFFF release history. Concentrations of 15 perfluoroalkyl acids (PFAAs) and perfluorooctane sulfonamide (PFOSA), an important PFOS precursor, were measured from several hundred samples of surface soil, subsurface soil, sediment, surface water, and groundwater. Differences in detection frequencies and observed concentrations due to AFFF release volume are presented with rigorous data analyses that quantitatively demonstrate phase-dependent (i.e., solid-phase versus aqueous-phase) differences in the chemical signature as a function of carbon chain length and in situ PFOS (and to a slightly lesser extent PFHxS) formation, presumably due to precursor biotransformation.

TRANSFORMATION OF POLYFLUORINATED COMPOUNDS IN NATURAL WATERS BY ADVANCED OXIDATION PROCESSES

Anumol, T., S. Dagnino, D.R. Vandervort, and S.A. Snyder.
Chemosphere, Vol 144, 1780-1787, 2016

Per- and polyfluoroalkyl substances (PFASs) such as fluorotelomer alcohols have been identified as precursors for perfluorocarboxylic acids (PFCAs) in biological pathways. Investigations of the fate of 6:2 and 8:2 homologs of the fluorotelomer unsaturated carboxylic acids (FTUCAs) during advanced oxidation process (AOPs) showed 6:2 FTUCA and 8:2 FTUCA transformed into 6-C PFCA (PFHxA) and 8-C PFCA (PFOA), respectively, with very little other PFCA formation for all AOPs. Degradation of 6:2 FTUCA and 8:2 FTUCA was greater in the groundwater compared to surface water for the ozone processes but similar for UV/H_2O_2. The formation of n-C PFCA followed O_3 > O_3/H_2O_2 at same dose and UV/H_2O_2 had much lower formation at the doses tested. Non-targeted analysis with the LC-MS-qTOF indicated the production of other PFCAs that contribute to the total mass balance, although no intermediate product was discovered, indicating a rapid and direct transformation from the FTUCAs to the PFCAs and significant volatilization of intermediates. With the use of AOPs essential to water reuse treatment schemes, this work raises concerns over the risk of potential formation of PFCAs during treatment and their adverse health effects in finished drinking water.*See additional information in T. Anumol's Ph.D. thesis at* http://hdl.handle.net/10150/332685.

EXTENT AND PERSISTENCE OF SECONDARY WATER QUALITY IMPACTS AFTER ENHANCED REDUCTIVE BIOREMEDIATION

Borden, R.C., J.M. Tillotson, G.-H.C. Ng, B.A. Bekins, D.B. Kent, and G.P. Curtis.
SERDP Project ER-2131, 76 pp, 2015

Although electron donor addition can be very effective in stimulating enhanced reductive bioremediation (ERB) of a wide variety of groundwater contaminants, ERB can result in secondary water quality impacts (SWQI), such as decreased levels of dissolved oxygen, nitrate, and sulfate, and elevated levels of dissolved Mn, dissolved Fe, methane, organic carbon, and naturally occurring hazardous compounds (e.g., As). This report summarizes available information on processes that control the production and natural attenuation of SWQI parameters and can be used as a guide in understanding the magnitude, areal extent, and duration of SWQI in ERB treatment zones, and the natural attenuation of SWQI parameters as the dissolved solutes migrate downgradient with ambient groundwater flow. Information compiled from a variety of sources, including a survey and statistical analysis of SWQI from 47 ERB sites, was integrated to provide a general conceptual model of the major processes controlling SWQI production and attenuation.
https://www.estcp.com/content/download/39498/379977/file/Protocol%20for%20Evaluating%20MNA%20of%20SWQI%20V2%20ER-2131%20--%20September%202015.pdf

General News

A QUANTITATIVE DECISION FRAMEWORK FOR ASSESSING NAVY VAPOR INTRUSION SITES

Venable, P., T. Chaudhry, D. Caldwell, I. Rivera-Duarte, C. Lutes, L. Lund, and K. Hallberg.
Navy Environmental Sustainability Development to Integration (NESDI) Program, NESDI #476, TR-NAVFAC-EXWC-EV-1603, 581 pp, 2015

In developing a quantitative decision framework to improve decision-making and site management practices for Navy industrial vapor intrusion (VI) sites, a multidimensional database was developed and populated with Navy Environmental Restoration Program VI site data from a diverse range of geologic, geographic, building types, and other site conditions. The decision framework then designed was based on statistical and nonstatistical analyses of both analytical and nonanalytical data in the database. The project focused on chlorinated hydrocarbon sources, which represents the largest potential Navy VI sourcehttps://clu-in.org/download/issues/vi/TR-NAVFAC-EXWC-EV-1603.pdf

IMPACTS ON GROUNDWATER QUALITY FOLLOWING THE APPLICATION OF ISCO: UNDERSTANDING THE CAUSE OF AND DESIGNING MITIGATION FOR METALS MOBILIZATION

Gardner, K.H., E. Hadnagy, S. Greenwood, B.A. Smith, R. Fimmen, D.K. Nair, and H.V. Rectanus.
SERDP Project ER-2132, 298 pp, 2015

Project objectives were to (1) develop a fundamental and predictive understanding of metals release as a result of three common ISCO treatments; (2) develop a mechanistic geochemical model to describe release and to design mitigation measures; (3) experimentally evaluate the fate of redox and pH perturbations and elevated metals released; (4) demonstrate efficacy of pre-, co-, or post-treatment metals mitigation measures; and (5) develop guidance for the design community to predict release, understand mechanisms, and design mitigation strategies to maximize the utility of ISCO and minimize life-cycle costs. https://www.estcp.com/content/download/38033/361074/file/ER-2132%20Final%20Report.pdf.
The ISCO Metals Byproduct Reference Guide and Interactive Database *(in Microsoft Access) has been completed and is now available at*
https://www.estcp.com/content/download/39501/379995/file/Interactive%20Database_V1%20ER-2132%20May%202015.accdb.

WORKSHOP REPORT: CONSIDERATIONS FOR DEVELOPING LEACHING TEST METHODS FOR SEMI- AND NON-VOLATILE ORGANIC COMPOUNDS

U.S. EPA, Office of Research and Development.
EPA 600-R-16-057, 90 pp, 2016

U.S. EPA hosted a workshop in September 2015 in Arlington, Virginia, to discuss how to evaluate the potential for release of semi- or non-volatile organic constituents at contaminated sites where subsurface treatment approaches have been applied to control migration. Also considered was how to predict subsurface leaching potential at the outer edge of the treated media, or in disposal or material reuse situations at the unit or use boundary. Workshop discussions focused on identifying technical issues for further consideration to support the development of tools that might be used in making determinations of protectiveness and regulatory compliancehttps://clu-in.org/download/char/Organics-Workshop-Report.pdf

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

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