

Entries for October 16-31, 2016

BROAD AGENCY ANNOUNCEMENT FOR INNOVATIVE TECHNOLOGIES AND METHODOLOGIES FOR REDUCING VARIOUS ENVIRONMENTAL PROBLEMS

Department of the Air Force, Air Force Civil Engineer Center (AFCEC), AFCA,
Federal Business Opportunities, FBO-5475, Solicitation AFCECBAA-17-001, 2016

The Air Force Civil Engineer Center environmental technology transfer program has issued a BAA for FY 2017. Areas of need include the following:

- **PFOA and PFOS Remediation Technologies for Groundwater and/or Soil:** Proposals must suggest a novel approach employing applicable technologies (e.g., ion exchange resins, thermal, filtration, ultraviolet, and/or sonic remediation applications) and include an on-site demonstration of the proposed technologies.
- **Integrated Characterization and Targeted Remediation of DNAPL at AFPA:** The Air Force seeks proposals that focus on employment of known or novel technologies for high-resolution characterization to assess DNAPL remedial pathways in bedrock (i.e., the Mainland Formation) at AFPA Landfill 1 and the use of a pilot-scale innovative remediation technology to demonstrate and validate the integrated characterization and targeted remediation of DNAPL. Proposals should be targeted for the following:

Offerors for either need should be aware of historical and ongoing studies funded through the AFCEC BAA Program and DoD SERDP/ESTCP to build on earlier results and avoid redundancy. Brief Phase I preproposals are due by 4:00 PM CT on December 16, 2016. <https://www.fbo.gov/notices/63e91a9ef0513d77c374f13fe523c0b8>

FY 2017 CONTINUATION OF SOLICITATION FOR THE OFFICE OF SCIENCE FINANCIAL ASSISTANCE PROGRAM

U. S. Department of Energy, Office of Science, Funding Opportunity DE-FOA-0001664, 2016

Under DOE's Biological and Environmental Research program, the Division seeks to gain a predictive understanding of living systems from microbes and microbial communities to plants and ecosystems to serve as the basis for the confident control of microbial and plants for sustainable containerized, biofuel production, and improved carbon storage. The major Biological and Environmental Research objectives are described at <http://science.energy.gov/ber/research/bescd/>. The major research objectives for DOE's Climate and Environmental Sciences program are described at <http://science.energy.gov/ber/research/cescd/>. This Funding Opportunity Announcement (FOA) will remain open until September 30, 2017, or until replaced by a successor FOA. Applications may be submitted any time during this period. Apply at http://www.grants.gov/web/grants/view_funding_opportunity_detail.asp?fundnum=289281.

HECLA LEASE SITE TECHNICAL & LEGAL ANALYSES

Department of the Interior, Bureau of Indian Affairs.
Federal Business Opportunities. FBO-5475. Solicitation A17PS00076. 2016

This requirement is set aside for Indian Small Business Economic Enterprises. The Bureau of Indian Affairs, Phoenix, Arizona, is requesting technical and legal services for tasks that center around historical disposal of hazardous materials in impoundments on tribal trust land formerly leased for the operation of a mineral processing facility. Technical and legal staff are needed to conduct an analysis of the facility processes, the waste streams produced from 1984 through 1996, the current status of the site, and the regulatory requirements for remediation. The work includes a base period of one year and a one-year option period. Offerors are required to include in their proposals the approach that describes how the tasks will be completed and must include fixed prices per task. Responses are due by 5:00 PM ET on December 17, 2016. Details of the work that has been conducted at this facility over the years are given in the SOW posted on FedConnect at <https://www.fedconnect.com/contract/10724679-0724679-0724679>. [Note: It may be necessary to scroll down past the "Contract Description" section to find the "SOW" link.]

FORMERLY UTILIZED SITES REMEDIAL ACTION PROGRAM (FUSRAP)

U.S. Army Corps of Engineers, USACE District, Philadelphia.
Federal Business Opportunities, FBO-5474, Solicitation W912BU17R0002, 2016

The Philadelphia District intends to issue a solicitation set at or \$r small business (NAICS code 562910) for a single-award, IDIQ, 5-year task order contract to provide remediation services at the former DuPont Chambers Works FUSRAP site located in Deepwater, New Jersey. Remediation services for this site include removal of radioactively contaminated soil (including mixed waste) and ancillary groundwater from site areas of concern. Also required is removal of all FUSRAP-related debris and hazardous material that might affect utilities above and below ground, treatment of contaminated groundwater with the Construction Water Treatment Plant (CWTP), transportation and disposal of waste, soil and groundwater sampling, dismantling and demolishing of CWTP, and site restoration. The estimated amount of the contract is \$75M. The solicitation will be issued on or about December 5, 2016, with proposals due by 4:00 PM ET on or about January 6, 2017. For more information, visit www.acquisition.gov.

2016 TOP MARKETS REPORT: ENVIRONMENTAL TECHNOLOGIES — A MARKET ASSESSMENT TOOL FOR U.S. EXPORTERS

U.S. Department of Commerce, International Trade Administration. 148 pp. 2016.

The overarching goal of the U.S. Environmental Export Initiative (EEI) is to deliver, within the context of finite government resources, targeted trade promotion and policy programs that enhance the international competitiveness of the U.S. environmental technology industry.¹ This report supports EEI efforts by identifying and ranking export markets where focusing finite government resources will have the greatest impact in terms of increasing commercial opportunity for U.S. companies. This study distills market forecasts and quantitative assessments into overall market scores that identify and rank export markets relative to three critical traits: (1) markets that are large and growing in absolute terms; (2) those that have a defined and increasing need for imported technology and services; and (3) those where U.S. exports are lower than predicted, based on markets with similar characteristics.

Cleanup News

APPLICATION OF INJECTED ZVI PRB TO CONTROL OFF-SITE MIGRATION OF A VOC PLUME AT A DRYCLEANER SITE IN QUEBEC

Przepiora, A. and S. Smith.
RemTech 2016: Remediation Technologies Symposium, 12-14 October, Banff, 23 slides, 2016

A 100-m-long, L-shaped zero-valent iron (ZVI) permeable reactive barrier (PRB) located along the southern and eastern boundary of a dewatering facility was installed in November 2013 to intersect and treat PCE and TCE originating in site groundwater, which resides in shallow overburden till and underlying intermediate fractured shale water-bearing units from 3 m to a total depth of 8–9 m bgs. PCE and TCE had maximum concentrations of 420 µg/L and 33 µg/L, respectively, in the shallow zone, and 1,100 µg/L and 100 µg/L, respectively, in the intermediate zone. The subsurface was sufficiently permeable to enable hydraulic injection of 53 tonnes of the microbially enhanced ZVI slurry into discrete intervals isolated by inflatable packers. Monitoring results within the injection radius of influence indicated substantial decreases in PCE and TCE concentrations to below the applicable groundwater criteria as a result of direct contact with the emplaced ZVI. Because of the relatively low groundwater velocity at the site, the positive effects of the PRB on groundwater quality were not expected to be observed for several years after installation; however, gradual decreases in downgradient wells have already been observed in the closest shallow well located 5 m downgradient of the PRB, where CVOC concentrations in April 2016 decreased to below detection. Comparison of the results from April 2016 to those from September 2013 (prior to PRB installation) for other monitoring wells located ~15 m downgradient of the PRB indicates that the impact of PRB treatment has reached the shallow wells but has not yet manifested in the intermediate wells. These temporal trends are in agreement with the difference in the groundwater flow rate in the two units. Overall, the ZVI PRB is performing as designed and its effective longevity is expected to be at least 5 years. **Slides:**

CASE STUDY: 20 YEARS OF ACID ROCK DRAINAGE CHEMISTRY IMPROVEMENTS AFTER A BACTERICIDE APPLICATION

Gusek, J.J. and V.G. Plocus.
Journal of the American Society of Mining and Reclamation 5(1):67-85(2016)

The Fisher site is a backfilled and reclaimed (in 1984) surface coal mine in western Pennsylvania. A post-closure toxic seep at the site discharged acid rock drainage generated in pyritic rock zones. In 1995, sodium hydroxide and bactericide solutions were injected sequentially through cased boreholes into the pyritic zones. The toxic seepage previously had been treated with the addition of sodium hydroxide, followed by a series of settling ponds and wetland zones. Post-injection, the seepage ceased and re-aquifers, the chemistry, and the sodium hydroxide amendment was discontinued. Although the effects of the injection were expected to be temporary, the beneficial effects of the injection were not expected to be permanent. Two decades later, the chemistry was monitored and the data trends suggest that the steady-state condition of the system was entering the ponds and wetland may be permanent. It is possible that the initial suppression of *Acidithiobacillus ferrooxidans* bacterial community with the sodium hydroxide and bactericide was maintained by the seasonal infusion of anti-bacterial organic acids derived from the robust vegetative cover. (<http://www.asmr.us/Portals/0/Documents/Volume4/Volume5-Issue-1/Gusek-CD.pdf>)

Demonstrations / Feasibility Studies

PASSIVE BIOBARRIER FOR TREATING CO-MINGLED PERCHLORATE AND RDX IN GROUNDWATER AT AN ACTIVE RANGE

Hatzinger, P.B. and M.E. Fuller.
ESTCP Project ER-201028, 225 pp, 2016

A field demonstration was undertaken to investigate the fecundity of using a passive emulsified oil biobarrier to remediate commingled perchlorate, RDX, and HMX in the naturally acidic groundwater at the Naval Surface Warfare Center, Dahlgren (Virginia). Microcosm studies indicated that a specific emulsified oil (EOS 550L5) plus a slow-release buffering agent (CoBuPH) was the most effective substrate for promoting the biodegradation of all three target contaminants. Perchlorate degraded most quickly and HMX most slowly. After the second injection of emulsified oil, concentrations of RDX, HMX, and perchlorate fell by 2-92% in the centerline of monitoring wells extending 40 ft downgradient of the biobarrier. Accumulation of nitroso- degradation products from RDX was minimal. The biobarrier required no O&M other than injection/reinjection of oil substrate and had no impact on range activities.

FIELD DEMONSTRATION OF PROPANE BIOSPARGING FOR IN SITU REMEDIATION OF N-NITROSODIMETHYLAMINE (NDMA) IN GROUNDWATER: ESTCP COST AND PERFORMANCE REPORT

ESTCP Project ER-200828, 74 pp, 2015

Propane gas and oxygen were added to groundwater via sparging to stimulate native microbes to biodegrade NDMA in situ at the Aerojet Superfund site in Rancho Cordova, Calif. Groundwater NDMA concentrations at the test site ranged from 10 to >30,000 ng/L. The sparging system, which consisted of steel bioparging wells connected to an air compressor and propane gas feed, supplied oxygen and propane to the test site in situ test plume area for a period of 374 days. NDMA concentrations declined by ~99.7% in the treatment area. A full-scale propane bioparge system was estimated to be ~40% less expensive to build, install, and operate than a comparable UV system over a 30-yr time frame. <https://www.epscor.com/content/download/40785/390111/file/ER-2008289-207-08X6702Report.pdf>.

BIOAUGMENTATION FOR AEROBIC BIOREMEDIATION OF RDX-CONTAMINATED GROUNDWATER

Michalsen, M., F. Crocker, K. Indest, C. Jung, M. Fuller, P. Hatzinger, and J. Istok
ESTCP Project ER-201207. 264 pp. 2016

RDX is mobile and persistent in aerobic groundwater and typically forms large, dilute plumes that are difficult and costly to remediate using conventional technologies, such as pump and treat or anaerobic biostimulation. This project demonstrated an innovative application of bioaugmentation to enhance RDX biodegradation in contaminated groundwater under aerobic conditions at the Umatilla Chemical Depot (UMCD) in Umatilla, Oregon. The principal demonstration objectives were to (1) select and optimize RDX-degrading microbial cultures for use in aerobic bioaugmentation at the site; (2) compare in situ RDX aerobic biodegradation to other aerobic bioremediation techniques for both biostimulation; and (3) quantify and compare rates of RDX remediation. This report summarizes the demonstration activities and results. <https://www.esd.wh.mil/Content/Download.aspx?ContentID=610583&RSG6File/FB-20110707%20Final%20Report.pdf>

Read more about this research at <https://www.esd.wh.mil/Content/Download.aspx?ContentID=610583&RSG6File/FB-20110707%20Final%20Report.pdf>. See also the ESTCP Cost and Benefit Analysis.

EVAPORATIVE DESORPTION TECHNOLOGY AS REMEDIAL MEASURE FOR ON-SITE SOIL TREATMENT DURING RCRA-FACILITY CLOSURE PROCESS

RemTech 2016: Remediation Technologies Symposium, 12-14 October, Banff, 38 slides, 2016

A RCRA facility investigation identified PCE, TCE, and degradation products in soil and groundwater at a former instrument manufacturing facility located in Fullerton, Calif. A relatively new evaporative desorption technology (EDT) offered the fastest and most cost-effective remedial alternative while meeting stringent cleanup standards for the protection of human health and groundwater. EDT is a static ex situ process that uses electrically heated air to evaporate contaminants from soil. Evaporated contaminants were captured on granular activated carbon. Initial EDT pilot testing successfully treated 1,100 tons of soil to five times below U.S. EPA RSLs (4.4 mg/kg PCE and 0.182 mg/kg TCE), and the California DTSC approved an extended EDT pilot test for 6,800 tons of soil matrix cleanup goal three orders of magnitude lower than the original RSLs (0.023 mg/kg PCE and 0.003 mg/kg TCE). The extended pilot test was successful, and DTSC approved EDT as the remedial option for the remaining 10,000 tons of contaminated soil. The demonstrated effectiveness of EDT on VOC-impacted soil facilitated expedited DTSC closure for site soil two years from the start of the pilot test.

Slides: <http://www.espa.gov/rew-content/uploads/2016/10/116-Muzzio.pdf>

SURFACTANT ENHANCED AQUIFER REMEDIATION OF A LOW PERMEABILITY UNIT CONTAINING LIGHT NON-AQUEOUS PHASE LIQUID

RemTech 2016: Remediation Technologies Symposium, 12-14 October, Banff, 24 slides, 2016

In 2012, LNAFL was found beneath the dispenser islands of a gas station in Richmond Hill, Georgia, at thicknesses up to 1.35 ft. Total BTEX concentrations within the source area exceeded 100,000 µg/L. High vapor recovery (HVR) events conducted over several years failed to extract appreciable volumes of LNAPL and contaminated groundwater due to the low permeability of the surficial aquifer. The presence of LNAPL and vapor intrusion concerns warranted the implementation of enhanced remedial actions. A combination of Enhanced Groundwater Extraction (EGE), Surfactant Enhanced Aquifer Remediation (SEAR), and Surfactant Enhanced Aquifer Remediation (SEAR) was selected as the most appropriate technology to achieve the remedial action objectives in a short time frame. Pilot testing results indicated a radius of influence of 10 ft for the 10 ft thick treatment area, which consisted of 8 existing monitoring wells and 13 injection/extraction wells divided into two separate cells. SEAR events were conducted within each cell over a 2-week period. Within each cell, a 16-hour HVR event induced localized drawdown to expose the vadose zone and saturated zone interface, which contained the majority of the residual LNAPL mass. In total, 4,864 gal of surfactant solution was injected into the surface and 10,108 gal of petroleum product water and injectant was recovered. The SEAR events increased petroleum recovery by 80% over the most recent HVR-only event. Slides:

[http://www.epa.gov/rm/pubs/2016-01-16-BR-016.pdf](#)

Research

NANOFIBER-ENABLED, MULTI-TARGET PASSIVE SAMPLING DEVICE FOR DETERMINATION OF THE FREELY-DISSOLVED SEDIMENT PORE WATER CONCENTRATIONS OF ORGANIC CONTAMINANTS

Martinez, A. and D.M. Cwiertny.
SERDP Project FB-2543. 63 pp. 2016

A suite of electrospun nanofiber mats (ENMs) was fabricated as next-generation multi-target passive samplers to test their sorption capacities for a set of hydrophilic (aniline and nitrobenzene) and hydrophobic compounds (PCBs and dioxin). The average diameter of the ENMs ranged from 70 (PET) to 1,000 (EVA) nm, with a relative standard deviation of less than 50% for each material. In water the ENMs yielded a fast equilibration time (<https://www.estcp.com/content/download/40977/391652/file/ER-25-43%20Final%20Report.pdf>)

THIRD-GENERATION (3G) SITE CHARACTERIZATION: CRYOGENIC CORE COLLECTION AND HIGH-THROUGHPUT CORE ANALYSIS. AN ADDENDUM TO BASIC RESEARCH ADDRESSING CONTAMINANTS IN LOW PERMEABILITY ZONES: A STATE OF THE

SCIENCE REVIEW

Sale, T., S. Kiazhosseini, M. Olson, R. Johnson, and R. Rogers.
SERDP Project ER-1740, 131 pp, 2016

Core samples frozen in situ before recovery can preserve pore fluids, volatile compounds, dissolved gases, redox conditions, mineralogy, microbial ecology, and pore structure. Furthermore, in situ freezing improves the quality of recovered core by preventing materials from dropping out of sample liners during recovery to ground surface. The steps followed for collecting frozen cores are referred to in this text as cryogenic core collection. Processing core in the lab simplifies field work and improves the resources (e.g., anaerobic chambers) that can be used when preparing samples for analysis, while allowing "production line" processing and analysis of large quantities of samples (i.e., high-throughput core analysis). In this project, the combination of cryogenic core collection and high-throughput sampling yielded high quality samples suitable for a wide range of chemical, physical, and biological analyses of chlorinated solvents and other persistent contaminants in groundwater in unconsolidated sediments. The protocols for sample collection and processing are sufficiently robust that they can now be used routinely at field sites. <https://www.esrpn.com/content/download/40835/300494/file/ER-1740%20Final%20Report.pdf>

BIOAUGMENTATION WITH VAULTS: NOVEL IN SITU REMEDIATION STRATEGY FOR TRANSFORMATION OF PERFLUOROALKYL COMPOUNDS

Mahendra, S., I. H. Rome, V.A. Kishorfer, and M. Wang.
SERDP Project ER-2422, 58 pp, 2016

Several studies have shown that wood-rotting fungi and their extracellular enzymes can degrade certain perfluoroalkyl compounds. This research pursued a single-step method for encapsulating active enzymes in naturally synthesized, hollow ribonucleoprotein particles, referred to as *recombinant vaults*. Lignin peroxidase (LiP), manganese peroxidase (MnP), and laccase enzymes are produced by wood-rotting fungi to digest lignin, a complex plant polymer. Biodegradation using fungal whole cells relies on the growth of the culture, which is highly dependent on biogeochemical conditions, such as pH, temperature, nutrient status, and oxygen levels. Neither fungal whole cells of *Phanerochaete chrysosporium*, which produces LiP and MnP, and *Trametes versicolor*, which produces laccase, nor free enzymes of LiP, MnP, and laccase could transform PFDA under the limited experimental conditions used in this study. Free and vault-packaged sMnP-INT enzymes were also tested, but no statistically significant transformation was observed. <https://www.esrpn.com/content/download/40730/389581/file/ER-2422%20Final%20Report.pdf>

APPLICATION OF GENOMIC TOOLS IN BIOREMEDIATION OF ATRAZINE CONTAMINATED SOIL AND GROUNDWATER

Nousiainen, Aura, Ph.D. dissertation, University of Helsinki, Finland. 128 pp, 2015

This study was undertaken to elucidate the potential use of genetic tools—quantitative PCR, radioisotopometry, microautoradiography, clone libraries, and genetic fingerprinting—as applied to evaluate the performance of four different bioremediation methods in atrazine-contaminated soils: natural attenuation, bioaugmentation, biostimulation, and their combination. The most efficient bioremediation treatment was bioaugmentation by atrazine-degrading bacterial strains *Pseudomonas oleovorans* or *Arthrobacter aureus*, or by an atrazine-degrading bacterial consortium; in the agricultural soil, up to 90% of atrazine was degraded in less than a week, whereas in the boreal subsoil, 76% of atrazine was mineralized. In general, the efficiency of atrazine removal in different treatments was bioaugmentation and biostimulation > bioaugmentation > biostimulation > natural attenuation. Previous exposure to atrazine was the most influential factor in atrazine disappearance from soil, as recent exposure always correlated with faster atrazine degradation. Although bioaugmentation removed 90% of atrazine from soil, its effective application at field scale can be challenging, which might make biostimulation with carbon alone the treatment method of choice. <https://helda.helsinki.fi/handle/10138/15780>

ALGAE AS AN ELECTRON DONOR PROMOTING SULFATE REDUCTION FOR THE BIOREMEDIATION OF ACID ROCK DRAINAGE

Ayala-Parra, P., R. Sierra-Alvarez, and J.A. Field.
Journal of Hazardous Materials 317:335-343(2016) doi:10.1016/j.jhazmat.2016.06.011

This study assessed bioremediation of acid rock drainage in simulated permeable reactive barriers using algae, *Chlorella sorokiniana*, as the sole electron donor for sulfate-reducing bacteria. Lipid-extracted algae (LEA), the residues of biodiesel production, were compared with whole-cell algae (WCA) as an electron donor to promote sulfate-reducing activity. Inoculated columns containing anaerobic granular sludge were fed a synthetic medium containing H_2SO_4 and Cu_2^{+} . Sulfate, sulfide, Cu_2^{+} , and pH were monitored throughout the 123-d experiment. Cu recovered in the column packing at the end of the experiment was evaluated using sequential extraction. Both WCA and LEA promoted 80% of sulfate removal, enabling near complete Cu removal (>99.5%) and alkalinity generation, raising the effluent pH to 6.5, whereas in the endogenous control no noteworthy sulfate reduction, alkalinity formation, or Cu_2^{+} removal were observed. In algae-amended columns, Cu_2^{+} was precipitated with biogenic H_2S produced by sulfate reduction. LEA and WCA provided similar levels of electron donor based on the COD balance. For additional information, see P. Ayala-Parra's dissertation at <http://dspace.cqesrpn.org/actrpn/handle/10150/612476>

HYDRAULIC CONDUCTIVITY ESTIMATES FROM PARTICLE SIZE DISTRIBUTIONS OF SEDIMENTS FROM LOS ALAMOS CHROMIUM PLUME

Harris, R., P. Reimus, and M. Ding.
Proceedings of the 2016 Annual Spring Meeting, April 8, Socorro, NM, 2016

The Cr(VI) plume at Los Alamos National Laboratory is being investigated to identify an effective remediation method. Geologic heterogeneity within the aquifer causes the hydraulic conductivity within the plume to be spatially variable. This variability, particularly with depth, is crucial for predicting plume transport behavior. Though pump tests are useful for obtaining estimates of site-specific hydraulic conductivity, they tend to interrogate hydraulic properties of only the most conductive strata. Variations in particle size distribution as a function of depth can complement pump test data by providing estimates of vertical variations in hydraulic conductivity. Samples were collected from five different sonically drilled core holes within the Cr plume at depths ranging from 732-1125 ft bgs. To obtain particle size distribution data, the samples were sieved into six different fractions, from fine sands to gravel, and the data were used in the Kozeny-Carmen equation to estimate permeability. Pump tests estimated a hydraulic conductivity varying between 1 and 50 ft/d, whereas the Kozeny-Carmen equation narrowed this estimate to an average value of 2.635 ft/d for the samples analyzed, with a range of 0.971 to 6.069 ft/d. The Kozeny-Carmen equation provided quite specific estimates of hydraulic conductivity in the Los Alamos aquifer as well as pertinent information on the expected variations with depth in hydraulic conductivity not obtainable from pump tests.

INTEGRATION OF ORGANOHALIDE-RESPIRING BACTERIA AND NANOSCALE ZERO-VALENT IRON (BIO-NZVI-RD): A PERFECT MARRIAGE FOR THE REMEDIATION OF ORGANOHALIDE POLLUTANTS?

Wang, S., S. Chen, Y. Wang, A. Low, Q. Lu, and R. Qiu.
Biotechnology Advances 34(8):1384-1395(2016)

Both nanoscale zero-valent iron (NZVI) and microbial reductive dehalogenation (Bio-RD) boost reductive dehalogenation efficiency, suggesting that the integration of NZVI with Bio-RD (Bio-NZVI-RD) might constitute an even more promising strategy for in situ remediation of organohalide pollutants. The reviewers first provide an overview of the current literature pertaining to NZVI- and organohalide-respiring bacteria-mediated reductive dehalogenation of organohalide pollutants and compare the pros and cons of individual treatment methods. Recent studies investigating the implementation of Bio-NZVI-RD to achieve rapid and complete dehalogenation are highlighted, followed by a discussion of the halogen removal mechanism of Bio-NZVI-RD and its prospects for future remediation applications.

BIOTURBATION EFFECTS ON HEAVY METALS FLUXES FROM SEDIMENT TREATED WITH ACTIVATED CARBON

Men, B., Y. He, X. Yang, J. Meng, F. Liu, and D. Wang.
Environmental Science and Pollution Research 23(9):9114-9121(2016)

It is not clear whether adding activated carbon in the presence of bioturbators is effective for the treatment of heavy metal-contaminated sediment. Researchers compared the ability of granular activated carbon (GAC) and powdered activated carbon (PAC) to reduce Cu, Zn, and Pb pore water concentrations at environmentally relevant concentrations in the absence and presence of *Chironomid* larvae. Compared to untreated sediment, PAC and GAC addition in the absence of *Chironomid* larvae achieved reductions of free Cu concentrations of 78 and 66% just below the sediment-water interface after 28 days, respectively, whereas for Pb and Zn the concentration reductions were only 40 and 38, 19 and 25%, respectively. The presence of *Chironomid* larvae in untreated and GAC sediment generally increased free heavy metals concentrations in pore water, especially in the deeper layers. In comparison with untreated sediment, the coexistence of AC enhanced heavy metals accumulation, especially for PAC. This bioaccumulation increase may decrease *Chironomid* larvae survival.

EFFECT OF ACTIVATED CARBON AND BIOCHARS ON THE BIOAVAILABILITY OF POLYCYCLIC AROMATIC HYDROCARBONS IN DIFFERENT INDUSTRIALLY CONTAMINATED SOILS

Koltowski, M., I. Hilber, T.D. Bucheli, and P. Oleszczuk.
Environmental Science and Pollution Research 23(11):11058-11068(2016)

Two soils (KOK and KB) from a coking plant area were investigated, and their total PAH concentration was 40 and 17 mg/kg, respectively, for the sum (Σ) of 16 U.S. EPA PAHs. A third soil sampled from a bitumen plant area was characterized by 9 mg/kg Σ 16 U.S. EPA PAHs. To reduce the freely dissolved concentration (C_{free}) of the PAHs in the soil pore water, activated carbon (AC) and two biochars pyrolyzed from wheat straw (biochar-S) and willow (biochar-W) were added to the soils at 0.5-5% (w/w), each. The AC performed best and reduced the C_{free} by 51-98% at the lowest dose. The biochars needed doses up to 2.5% to reduce the C_{free} by 44-86% (biochar-S) and by 37-68% (biochar-W). The high black carbon (BC) content of up to 2.3% in the soils compared with the sorption sites of the carbon amendments, and remediation performance was affected by the contaminants' source and the distribution between the BC and the AC/biochars. In contrast, the carbon amendment could best reduce the C_{free} in the Lublin soil where the BC content was normal (0.05%).

ACID MINE DRAINAGES FROM ABANDONED MINES: HYDROCHEMISTRY, ENVIRONMENTAL IMPACT, RESOURCE RECOVERY, AND PREVENTION OF POLLUTION

Favas, P.J.C., S.K. Sarkar, D. Rakshit, P. Venkatachalam, and M.N.V. Prasad.
Environmental Materials and Waste. Academic Press, ISBN: 978-0-12-803837-6, 413-462, 2016

This paper presents an in-depth study of acid mine drainage (AMD) issues situated in the northern part of Portugal. The first section highlights basic features relevant to (1) the origin of AMD; (2) AMD characteristics; (3) factors controlling its formation; (4) environmental impacts; (5) resource recovery; and (6) AMD prevention, mitigation, and treatment. The second section provides case studies of mine drainage water collected bimonthly over a period of one year from five abandoned mines situated in northern Portugal. <http://sci.fclup.pt/downloadfile/19665>

OPTIMAL GROUNDWATER REMEDIATION DESIGN OF PUMP AND TREAT SYSTEMS VIA A SIMULATION-OPTIMIZATION APPROACH AND FIREFLY ALGORITHM

Kazemzadeh-Parsi, M.J., F. Daneshmand, M.A. Ahmadvard, J. Adamowski, and R. Martel.
Engineering Optimization 47(1):1-17(2015)

An optimization approach based on the firefly algorithm (FA) was combined with a finite element-simulation method (FEM) to determine the optimum design of pump-and-treat remediation systems. Three multi-objective functions in which pumping rate and cleanup time are design variables were considered, and the proposed FA-FEM model was used to minimize operating costs, total pumping volumes, and total pumping rates in three scenarios while meeting water quality requirements. Groundwater lift and contaminant concentration were also minimized through the optimization process. Results demonstrated the applicability of the FA in conjunction with the FEM for optimal design of groundwater remediation systems. Comparison of FA performance with the genetic algorithm (GA) found the FA to have a better convergence rate than the GA. https://www.mcgill.ca/biengp/files/biengp/optimal_groundwater_remediation_design_of_pump_and_treat_systems_via_a_simulation-optimization_approach_and_firefly_algorithm.pdf

FORENSIC ASSESSMENT OF POLYCYCLIC AROMATIC HYDROCARBONS AT THE FORMER SYDNEY TAR PONDS AND SURROUNDING ENVIRONMENT USING FINGERPRINT TECHNIQUES

MacAskill, N.D., T.R. Walker, A. Oakes, and M. Walsh.
Environmental Pollution 212:166-177(2016)

Concentrations of PAHs were measured in surface soils and in marine and estuary sediments prior to and during remediation of the Sydney Tar Ponds (STPs) site, which was contaminated by nearly a century of coking and steel production. Previous studies identified PAHs in surficial marine sediments within Sydney Harbour that were considered to derive from STP discharges. Numerous PAH fingerprint techniques (diagnostic ratios, principal component analysis, quantitative and qualitative analysis) were applied to soil and sediment samples from the STPs and surrounding area to identify common source apportionment of PAHs. Results indicate coal combustion (from historical residential, commercial, and industrial uses) and coal handling (from historic on-site stockpiling and current coal transfer and shipment facilities) are likely the principal source of PAHs found in urban soils and marine sediments, consistent with current and historical activities near these sites. See additional information in 42 slides at <http://atlasnrc.ca/ww-content/uploads/2015/11/MacAskill-PAH-Fingerprinting-Sydney-Tar-Ponds.pdf> and in D. MacAskill's thesis at <https://dalspace.library.dal.ca/handle/10222/54049>

General News

GREEN AND SUSTAINABLE REMEDIATION BEST MANAGEMENT PRACTICES

Nair, D. and S. Moore.
Naval Facilities Engineering Command (NAVFAC) Technical Memorandum TM-NAVFAC-EXWC-EV-1601, 22 pp, 2016

This technical memorandum summarizes GSR BMPs for the following commonly used remediation technologies: air sparging, biosparging, soil vapor extraction, enhanced reductive dechlorination, in situ chemical oxidation, thermal treatment, groundwater pump and treat, and excavation. A technology screening matrix is provided, and brief case studies offer examples. http://www.navfac.navy.mil/content/dam/navfac/Speciaity%20Centers/Engineering%20and%20E%20ditionary%20Warcfare%20Center/Environmental/Restoration/er_pdfs/g/navfacexwc-ev-TM-GSR-BMP-201609.pdf

SUSTAINABLE LONG TERM MANAGEMENT OF LANDFILLS UNDER THE NAVY'S ENVIRONMENTAL RESTORATION PROGRAM

Naval Facilities Engineering Command (NAVFAC), ESAT N62583-11-D-0515/TO 0082, 8 pp, 2016

The ultimate goal of sustainable long-term management (SLM) of closed landfills is termination of active post-closure care based on demonstration of *functional stability* and transition to passive controls for off-gas and leachate management. A landfill site that demonstrates no unacceptable risk to human health or the environment at the relevant point of exposure in the absence of active care has achieved *functional stability*. Passive controls, optimized landfill cap design and maintenance, optimized long-term monitoring, beneficial site reuse, clean closure considerations, and shoreline erosion protection issues are discussed along with a case study from a Navy installation. http://www.navfac.navy.mil/content/dam/navfac/Speciaity%20Centers/Engineering%20and%20E%20ditionary%20Warcfare%20Center/Environmental/Restoration/er_pdfs/es/navfacexwc-ev-fs-sustain-TMgmtlandfill-201604.pdf

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