Technology Innovation News Survey

Entries for July 1-15, 2018

Market/Commercialization Information

RAYMARK REMEDIATION SERVICES IDIQ

U.S. Army Corps of Engineers, USACE District, New England, Concord, Mass.
Federal Business Opportunities, FBO-6003, Solicitation W912WJ18R0003, 2018

This forthcoming procurement will be issued sometime in September 2018 as a small business set-aside under NAICS code 562910, size standard 750 employees. The U.S. Army Corps of Engineers, New England District intends to issue an RFP for a single-award IDIQ remediation services task-order contract for Operable Units (OUs) 3, 4, and 6 of the Raymark Superfund Site in Stratford, Connecticut. Raymark generated waste containing asbestos, lead, copper, PCBs, and a variety of solvents, adhesives, and resins as byproducts of its manufacturing operations. U.S. EPA recently approved one Record of Decision that specified the selected remedies for OUs 3 (Upper Ferry Creek), 4 (Raybestos Memorial Ballfield), and 6 (Additional Properties) of the Raymark Superfund Project. The solicitation will be released on FedBizOpps. https://www.fbo.gov/spg/USA/COE/DACA33/W912WJ18R0003/listing.html

NATIONWIDE DEACTIVATION, DECOMMISSIONING AND REMOVAL (DD&R)

U.S. Department of Energy, EM Consolidated Business Center, Cincinnati, OH.
Federal Business Opportunities, FBO-6005, Solicitation 89303318NEM000003, 2018

DOE's EM Consolidated Business Center is currently in the acquisition planning phase for a potential upcoming procurement to perform DD&R for facilities, waste management, and program support for the National Nuclear Security Administration, Office of Environmental Management, and Office of Science. The services may be performed at different U.S. locations, including but not limited to the Lawrence Livermore and Brookhaven national laboratories. This request for information solicits input via capability statements from interested parties with the specialized capabilities necessary to meet all or part of the major elements of scope for the nationwide DD&R requirements. DOE seeks to determine whether or not the full requirements or part of the requirements can be set aside for any small business types under NAICS code 562910, size standard 750 employees. Interested parties are invited to submit a capability statement (15 pages max). DOE also seeks feedback from interested parties regarding options for the innovative approaches to performance of the major elements of scope as well as insight into potential contracting alternatives. Submit capability statements and questions via nationwideddr@emcbc.doe.gov by 5:00 PM ET on August 30, 2018. DOE has created a procurement website at https://www.emcbc.doe.gov/seb/nationwideddr/. Monitor the EM procurement website and FedConnect at https://www.fedconnect.net/FedConnect/?doc=89303318NEM000003&agency=DOE for updates [Note: It might be necessary to copy and paste the URL into your browser for direct access]. See the "Major Elements of Scope" at FedConnect for additional details.
https://www.fbo.gov/spg/DOE/PAM/HQ/89303318NEM000003/listing.html

CHARACTERIZATION, DEACTIVATION/DEMOLITION, & REMEDIATION SERVICES

U.S. Department of Energy, Office of Environmental Management, Oak Ridge, TN.
Federal Business Opportunities, FBO-6002, Solicitation 89303518REM000003, 2018

U.S. DOE intends to issue a solicitation in electronic format on or about August 20, 2018. The required services include environmental consulting and remediation for planning and conducting characterization, deactivation, demolition, remediation, recycling, and waste disposition. This procurement will be a total small business set-aside under NAICS code 562910, size standard 750 employees. DOE anticipates awarding one or more IDIQ contracts for support services in Oak Ridge, Tennessee, in accordance with the Federal Facilities Agreement. The Y-12 National Security Complex, Oak Ridge National Laboratory, and East Tennessee Technology Park encompass numerous facilities, soils, concrete slabs, containerized and non-containerized debris, and aging legacy waste populations that require investigation and additional characterization to determine appropriate disposal options. The estimated maximum value of the contract is $24.9M for a period of performance of five years from date of award. The full presolicitation synopsis is available on the DOE Environmental Management procurement website at https://www.emcbc.doe.gov/SEB/OREMCDDRS/ and on FedConnect at https://www.fedconnect.net/FedConnect/?doc=89303518REM000003&agency=DOE [Note: It might be necessary to copy and paste the URL into your browser for direct access]. A pre-proposal conference is planned, and the date, time, and location will be posted in the final solicitation.
https://www.fbo.gov/spg/DOE/PAM/HQ/89303518REM000003/listing.html

CHEMISTRY, ECONOMICS AND SUSTAINABLE STRATEGIES DIVISION

U.S. Environmental Protection Agency, Office of Acquisition Management, Washington, DC.
Federal Business Opportunities, FBO-6003, Solicitation 68HE0H18R0008, 2018

U.S. EPA requires technical and program support for its Office of Pollution Prevention and Toxics Chemistry, Economics and Sustainable Strategies Division by preparing screening-level chemistry assessments; Safer Choice (formerly Design for the Environment) chemical substance and product evaluations; updates to Safer Chemical Ingredients List; pollution prevention assistance; and Toxics Release Inventory support of chemical substances, including biotechnology, nanotechnology, and other new initiatives. A draft statement of work is available on FedConnect at https://www.fedconnect.net/FedConnect/?doc=68HE0H18R0008&agency=EPA [Note: It might be necessary to copy and paste the URL into your browser for direct access]. The resultant contract is anticipated to be a labor-hour contract with a 12-month base period and four 12-month options. The requirement will be solicited as a full and open competition under NAICS code 541620, small business size standard $15M. Questions will be neither accepted nor answered until the full solicitation is released. Monitor FedConnect for updates.
https://www.fbo.gov/spg/EPA/OAM/HQ/68HE0H18R0008/listing.html

Cleanup News

FIRST SEMESTER 2016 REMEDIATION PROGRESS AND HORIZONTAL WELL INSTALLATION REPORT: 7-ELEVEN STORE 23020, 1522 E MADISON STREET, SEATTLE, WA

Washington State Department of Ecology, 174 pp, 2017

A leaded gasoline release at 7-Eleven Store No. 23020 was discovered in 2007 during construction activities located on the southwestern adjacent property. Subsequent environmental assessment activities (2008-2009) identified origination of the release from previous gasoline operations (prior to 7-Eleven operation) and found LNAPL extending south of the property, beyond East Madison Street. To mitigate potential environmental and human health risk, a dual-phase extraction (DPE) system was installed and initiated in 2012. This report documents recent remediation activities at the site during the first semester of 2016, including the previously unreported installation, pilot testing, and connection of two new horizontal remediation wells in second and third quarter 2016. The two new horizontal remediation wells were installed under the 7-Eleven building to remediate previously inaccessible source area petroleum hydrocarbons and meet cleanup goals for monitoring well MW-10. The new horizontal remediation wells were tied into the existing DPE system and initiated in August 2016.
https://fortress.wa.gov/ecy/gsp/DocViewer.ashx?did=62055

SITE 73 UPDATE

Porter, B.
Former Pease Air Force Base Restoration Advisory Board, October 24, 2017, Portsmouth, New Hampshire. 8 pp, 2017

Cleaning and degreasing operations at Site 73 (a.k.a. former building 234) prior to 1978 resulted in spills of chlorinated solvents. In 1999 the Air Force installed a permeable reactive barrier (PRB) containing zero-valent iron to react with the chlorinated solvents (mostly TCE in the plume with very little PCE). The PRB is 150 ft long, 2.5 ft wide, and 34 ft deep (where it hits bedrock). Monitoring data showed the PRB worked well in reducing the mass of TCE at Site 73, although residual mass persists in the source area. To complement the PRB, the Air Force in 2012 implemented in situ enhanced bioremediation (ISEB) using emulsified vegetable oil with the SDC-9 anaerobic microbial consortium. The Air Force injected 1,338 gal of this solution per injection point at a total of 106 injection points, ~140,791 gal of solution in total. Data from 2010-2017 show that the ISEB treatment successfully remediated TCE and DCE, with only residual VC remaining at roughly 2.1 to 3 ppb. The area is close to achieving the cleanup goal of 2 ppb. Options to address the slow VC degradation rate are being evaluated. Remedial activities have reduced the length of the contaminant plume from ~2,200 ft to ~150 ft.
http://www.afcec.af.mil/Portals/17/documents/BRAC/Pease/170124_Pease%20RAB/171024_Pease_Summary%20Minutes%20RAB.pdf?ver=2018-03-26-142600-273

UTILIZATION OF EPA METHOD 300 CHROMATOGRAMS TO TRACK LACTATE DISTRIBUTION IN SAPROLITE AND FRACTURED ROCK AQUIFER

Clark, L.
The 26th Annual David S. Snipes/Clemson Hydrogeology Symposium, April 12, 2018: Book of Abstracts, p. 6, 2018

Enhanced reductive dechlorination (ERD) was implemented to address PCE/TCE contamination at an NPL site in Cherokee County, S.C. Monitoring activities focused on the distribution of ERD nutrients (sodium lactate and other ingredients) and treatment process performance. During the 2015 ERD injection event, sodium bromide was included in the ERD injection fluids at selected wells to act as a tracer that could be monitored to assess the direction and velocity of lactate/groundwater movement. Bromide tracer results successfully identified preferred groundwater flow pathways, and the bromide analyses yielded an unexpected benefit. In reviewing the chromatograms for the bromide samples, an unidentified peak was noted in samples collected from or near the lactate injection wells. This peak eluted immediately following fluoride and well before chloride. To investigate if the peak might be indicative of lactate, samples of the lactate solution were collected and analyzed by EPA Method 300. The chromatogram displayed a peak at the same retention time as the peak in question, supporting the hypothesis that this peak represented the presence of lactate in the groundwater. Higher peaks were observed in saprolite injection wells with low groundwater flow rates; low to moderate peaks were observed in transition zone injection wells with higher groundwater flow rates. Wells located upgradient of the lactate injection wells or wells distal to the treatment area had no lactate peak on their chromatograms. By monitoring the well locations using Method 300, the presence or absence of a lactate peak and relative size of the lactate peaks over time provided a line of evidence regarding the distribution and longevity of the injected lactate solution within the aquifer.

UPDATE TO THE CASE STUDY OF ENHANCED BIOREMEDIATION OF PCE IN GROUNDWATER USING MILK SOLUTION

Alexander, A. and T. Benton.
The 26th Annual David S. Snipes/Clemson Hydrogeology Symposium, April 12, 2018: Book of Abstracts, 2018

Releases of PCE affected groundwater at a former textile facility located in the Blue Ridge area of North Carolina. Enhanced bioremediation of groundwater utilizing milk solution from a nearby dairy facility was evaluated as a low-cost remedial strategy in a lab-scale test in 2005. In a 2011-2013 pilot test, milk solution was injected into various locations within the contaminant plume. Installation of 4 injection wells and performance of 3 additional injection events accompanied full-scale remediation, which began in 2014 and is currently ongoing. A total of 15 monitoring events have been performed over about 4 years of full-scale remediation. Monitoring parameters include total organic carbon to gauge both infiltration and utilization of milk solution within the injection zones and VOCs to monitor PCE degradation. Findings to date include complete degradation of PCE through the transformational pathway to compliance; areas of hydraulic isolation and recalcitrance; creation and dissipation of metabolic by-products, including acetone, 2-hexaone, and MEK; creation of high concentrations of daughter products; and confirmation of contaminant flow pathways from observed daughter product migration.

IDENTIFICATION AND RECOVERY OF TCE DENSE NON-AQUEOUS PHASE LIQUID (DNAPL) IN SOURCE AREA USING LOW COST METHODS

Foster, J., S. Golaski, and G. Maalouf.
The 26th Annual David S. Snipes/Clemson Hydrogeology Symposium, April 12, 2018: Book of Abstracts, p. 13-14, 2018

At a site affected by TCE DNAPL in bedrock fractures, an electrical substation limited access, and the aquifer lay almost entirely in crystalline bedrock at the source. Early assessments at the site in and around the former source AST location found no direct evidence of DNAPL. Bioremediation was selected as the source remedy based on the success of pilot studies conducted at the site. Although DNAPL was discovered in injection wells during remedy installation, application of HRC products with bioaugmentation cultures remained the preferred remedial option. All recoverable DNAPL was removed using a bottom-intake pump over a 3-month period, and wells were checked for the reappearance of DNAPL at least weekly. When no additional product had been observed for ~2 months, injection activities proceeded. Three months following injection, DNAPL was discovered in a performance monitoring well immediately downgradient of the injection wells that previously contained DNAPL. Recovery began immediately using a bottom-intake pump. Low-cost methods were implemented in sequence to verify results obtained in earlier steps and ensure effective DNAPL recovery. A downhole video camera revealed discoloration at a fracture within the fresh borehole. Subsequently, a FLUTe liner was deployed to evaluate the nature of the discoloration, which confirmed the presence of DNAPL at three depths. The DNAPL stains on the FLUTe liner corresponded to existing fractures in the rock core based on depth measurements and photographs of the rock core. These fractures were isolated using an inflatable packer, and the DNAPL was pumped from the isolated zone. Three months later, using existing appurtenances of a nearby decommissioned SVE system, vacuum was applied to try to induce more DNAPL flow into the well with little effect; the swift removal responses had already recovered more than 10 liters of DNAPL (~33 lb). Work was completed within budget and without interfering with the remedy in place.

CHEMICAL REDUCTION AND STABILIZATION VIA SHALLOW SOIL MIXING TO TREAT CR(VI) AND LEAD IN SOIL IN BARRANQUILLA, COLOMBIA

Morris, K., J. Henderson, C. Hernandez, D. Sanchez, and P. Barreto.
The 26th Annual David S. Snipes/Clemson Hydrogeology Symposium, April 12, 2018: Book of Abstracts, p. 34, 2018

Metal-impacted soil required remediation on the site of a former bronze smelting plant that operated from the early 1960s to 2000. Elevated concentrations of Cr(VI) and Pb in soil above screening levels were found to a depth of ~1 m bgs. Maximum concentrations detected were 229 and 9,220 mg/kg, respectively. The site is bordered by residential housing to the east and an elementary school immediately adjacent to the western edge of the property. The Magdalena River lies ~700 m to the northeast. Based on results of a bench study completed in May 2016, a full-scale shallow soil treatment was designed to chemically reduce the Cr(VI) to Cr(III) and stabilize Pb in the affected area. The chemical reduction and stabilization soil treatment included a mixture of 3% Portland cement and a stoichiometric ratio of 6:1 calcium polysulfide (CPS) to Cr(VI) in soil. Soil mixing was conducted using a CAT 750 excavator. Soil surrounding the perimeter of the treatment area was mixed in cells sized 1 m x 1 m to preserve the integrity of a surrounding boundary wall. About 3,800 m³ of soil were mixed and treated in January-February 2017. After 26 d the reduced and stabilized soil was compacted, graded, and capped with 15 cm of subbase and a 15-cm asphalt cap. Complete mixing of soil and cement was achieved as the average pH of collected samples was >11. The elevated pH catalyzed the reduction reaction of Cr(VI) and allowed the reaction to continue for at least 90 d. After treatment, the average detected concentration of Cr(VI) was 4 mg/kg, a reduction of 96%. The average detected Pb concentration was 1,245 mg/kg. The sustainable remedial strategy allowed for beneficial reuse of the property with no impact to the surrounding community.

Demonstrations / Feasibility Studies

UTILIZING BIOAVAILABLE ABSORBENT MEDIA (BAM) TO REMEDIATE GRO, DRO, CRUDE OIL, AND PVOC IN GROUNDWATER

Kinsman, L.
The 26th Annual David S. Snipes/Clemson Hydrogeology Symposium, April 12, 2018: Book of Abstracts, p. 25, 2018

Bioavailable Absorbent Media (BAM) is a sustainable, pyrolyzed, cellulosic biomass product (>80% fixed carbon) derived from a proprietary blend of recycled organic materials with a high cation exchange and an estimated half-life of 500 years. BAM has diverse pore sizes with a minimum total surface area of up to 1,133 m²/g or 127 acres/lb. BAM's affinity for organic and inorganic compounds supports maximum contact with microbes for contaminant biodegradation. A pilot test conducted near Jackson, Miss., treated groundwater contaminated with GRO, DRO, crude oil, and petroleum VOCs using BAM and a nutrient blend. Three separate pilot areas were conducted with different treatment chemistries: BAM alone, BAM mixed with nutrients, and nutrients alone were advanced via direct push around a targeted well in each area. During injection activities, a vacuum truck extracted groundwater from wells within and adjacent to the injection areas to remove contaminated groundwater and control the hydraulic gradient during injection. Within two weeks following injection activities, groundwater sampling showed nondetect contaminant levels in the BAM-with-nutrients and BAM-alone areas. The petroleum hydrocarbons remained at nondetect levels for the duration of the 12-week pilot test for the BAM-alone area, whereas benzene showed a slight rebound in groundwater at the BAM-with-nutrients area. Microbial analysis also showed a significant increase of biological growth in both the BAM-alone and BAM-with-nutrients compared to nutrients only. The nutrient-only area had limited reductions of DRO, GRO, and crude oil.

VOLUNTARY REMEDIATION PROGRAM FOURTH PROGRESS REPORT: ROPER PUMP COMPANY, HSI NO. 10901, COMMERCE, GEORGIA

Georgia Department of Natural Resources, Environmental Protection Division, 127 pp, 2017

The Roper Pump Company manufactures gear pumps, progressive cavity pumps, flow dividers, and power sections for clients in the energy, transportation, and food and beverage industries. In May 2009, soil and groundwater adjacent to an abandoned storm sewer line were found to have elevated concentrations of VOCs, primarily PCE and TCE. The facility was listed on the Georgia Hazardous Site Inventory (HSI) on November 23, 2009, as HSI No. 10901 for releases of 1,1,2-TCA to soil and groundwater above a reportable quantity. A variety of other chlorinated VOCs were documented in the site groundwater. Corrective action conducted at the site to date includes excavation of contaminated soil; installation and operation of an SVE system; and installation of a 60 mil HDPE vapor barrier beneath the office portion of the building expansion. A pilot test is planned to inject a combination of Bioavailable Absorbent Media (BAM), ELS™ Microemulsion, and ferrous sulfate into 12 boring locations. BAM is a sustainable, pyrolized, recycled cellulosic biomass product (>80% fixed carbon) derived from a proprietary blend of recycled organic materials with a high cation exchange and an estimated half-life of 500 years. ELS Microemulsion is a lecithin-based substrate of food-grade carbon used to enhance anaerobic bioremediation. Ferrous sulfate is capable of treating chlorinated solvents abiotically and reducing the production of daughter products.
https://epd.georgia.gov/sites/epd.georgia.gov/files/RoperPumpProgressReport4.pdf

DESIGN AND IMPLEMENTATION OF AN ARSENIC PHYTOREMEDIATION PILOT STUDY AT A WOOD TREATMENT/CHROMATED COPPER ARSENATE SITE

Moore, A., D. Huff, C. Krouse, B. Harding, S. Aufdenkampe, and S. Pittenger.
The 26th Annual David S. Snipes/Clemson Hydrogeology Symposium, April 12, 2018: Book of Abstracts, p. 32-33, 2018

The former Columbia Wood Preserving site, located in Columbia, S.C., previously occupied ~9 acres of wood treatment operations on land now owned by Norfolk Southern Railway Company. Arsenic concentrations in the site soils range between 100 to 1,000 mg/kg. The railway company elected to conduct a phytoremediation pilot study as a potentially cost-effective and sustainable means to supplement soil excavation and disposal. The field pilot began in May 2017 in an area of the site historically used for staging and drying treated wood products. A randomized block design was used to test four plant species-*Pteris vittata* Edenfern™ (ladder brake fern), *Equisetum hyemale* (rough horsetail), *Amaranthus gangeticus* (carnival amaranth), and a native grass/forb control mix—distributed randomly in individual plots, within six replicate rows or blocks. Study area soils were manually tilled and homogenized so As concentrations, along with other soil variables, were as similar as possible across all 24 of the 3 x 3 ft plots. Baseline As concentrations in the upper 12 in of soil ranged 76.4-104.7 mg/kg, with a mean of 86.6 mg/kg across all plots. A non-destructive mid-season harvest conducted in August 2017 took one third of the plants in each plot to assess As concentrations in early-growth plant tissues and mid-season soil and also evaluate biomass production. A final harvest in October 2017 assessed overall plant tissue As concentrations, soil As concentrations, overall biomass production, and regeneration efficiency of previously harvested plot areas. Arsenic concentrations in Edenfern aboveground plant tissue were significantly higher than all other treatments by many orders of magnitude. The overall average Edenfern bioconcentration factor (BCF) achieved in this single-season study was 32. Arsenic uptake by the horsetails and amaranth was not significantly different than the native grass and forb mix, with average BCFs between 0.07 and 0.2.

PILOT TEST OF ELECTROKINETICALLY DELIVERED THERMALLY ACTIVATED PERSULFATE — EK-TAP™ — FINAL REPORT, BALLERUP DENMARK

Henk, D.R. and D. Gent.
The Capital Region of Denmark, 69 pp, 2017

Electrokinetic migration can help to establish the necessary contact between reactants and contaminants in low-permeability soils. The performance of electrokinetically delivered thermally activated persulfate (EK-TAP) technology, which combines electrokinetic delivery of persulfate with heat activation through electrical resistance heating, was demonstrated in a pilot test in Ballerup, Denmark, at a site contaminated mainly with PCE and TCE. The geology consists of partly saturated glacial clay tills overlying a Danien limestone formation. The pilot was a single dipole test consisting of two electrode wells (anode and cathode) situated 3 m apart. Two monitoring wells and four thermistor wells were installed in the test plot. The dipole test operational stages were pre-heating, EK persulfate migration, and post-migration soil heating. For EK persulfate migration, current was applied to the electrodes using a DC power supply, and persulfate was amended to the cathode electrode well. After distribution of the persulfate throughout the test area, post-migration soil heating was applied via AC power to the electrodes, providing electrical resistance heating of the soil to a minimum 35°C to activate the persulfate. Following the heating stage, soil cores were sampled from the test area and analyzed to assess the effectiveness of the combined remedy. Experience with the technology and setup was gained during all three stages of the pilot study, and the design has been optimized.
https://www.danishsoil.org/media/projects/3/documents/170330Final_report_EK-TAP_version_2_March_2017.pdf

Research

DYELIF™: A NEW DIRECT-PUSH LASER-INDUCED FLUORESCENCE SENSOR SYSTEM FOR CHLORINATED SOLVENT DNAPL AND OTHER NON-NATURALLY FLUORESCING NAPLS

Einarson, M., A. Fure, R. St. Germain, S. Chapman, and B. Parker.
Groundwater Monitoring & Remediation 38(3):28-42(2018)

DyeLIF™ is a new version of laser-induced fluorescence (LIF) for high-resolution 3D mapping of NAPLs in the subsurface. DyeLIF eliminates the requirement that the NAPL contains native fluorophores (such as those that occur in compounds like PAHs) and therefore can be used to detect chlorinated solvents and other nonfluorescing NAPLs previously undetectable with conventional LIF tools. With DyeLIF, an aqueous solution of water and nontoxic hydrophobic dye is continuously injected ahead of the sapphire detection window while the LIF probe is being advanced in the subsurface. If soil containing NAPL is penetrated, the injected dye solvates into the NAPL within a few milliseconds, creating strong fluorescence that is transmitted via fiber-optic filaments to aboveground optical sensors. This paper describes a detailed field evaluation of the novel DyeLIF technology performed at a contaminated industrial site in Lowell, Mass., where chlorinated solvent DNAPL persists below the water table in sandy sediments. ESTCP funded Project ER-201121 to demonstrate the DyeLIF technology; see additional details at https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Contaminated-Groundwater/Monitoring/ER-201121.

A NOVEL PROPANE MONOOXYGENASE INITIATING DEGRADATION OF 1,4-DIOXANE BY *MYCOBACTERIUM DIOXANOTROPHICUS* PH-06

Deng, D., F. Li, and M. Li.
Environmental Science & Technology Letters 5(2):86-91(2018)

From activated sludge collected at a local wastewater treatment plant, researchers at the New Jersey Institute of Technology have isolated a bacterium that degrades 1,4-dioxane. The team deciphered the essential catalytic role of a novel propane monooxygenase (MO) (encoded by the *prmABCD* gene cluster) in dioxane metabolism by *Mycobacterium dioxanotrophicus* PH-06. This propane MO catalyzes dioxane decomposition via alpha-hydroxylation. This first enzymological identification of the propane MO in PH-06 expands the understanding of dioxane metabolic pathways and enables the development of molecular tools for improving the assessment of natural attenuation and bioremediation at dioxane-contaminated sites. ***Open Access*** *at* https://pubs.acs.org/doi/10.1021/acs.estlett.7b00504.

WASTEWATER TREATMENT USING MICROBIAL FUEL CELLS WITH PEROXIDE PRODUCTION

Torres, C., B.E. Rittmann, K. Tsakalis, and P. Evans.
SERDP Project ER-2239, 236 pp, 2018

The overarching goal of this study was to develop a novel energy-neutral wastewater treatment technology, i.e., a microbial fuel cell capable of generating hydrogen peroxide (H_2O_2) as primary product. This technology takes advantage of the high energy content of blackwater, which the microbial fuel cell consumes and converts into electrical current that is used to generate significant amounts of H_2O_2. The H_2O_2 can have several uses, including direct treatment of graywater toward reuse. Project objectives were to (1) show the feasibility of H_2O_2 production from blackwater, (2) achieve H_2O_2 production at high efficiency, and (3) demonstrate the effective treatment of blackwater at near energy-neutral conditions using a microbial fuel cell.
https://www.serdp-estcp.org/content/download/47246/450749/file/ER-2239%20Final%20Report.pdf

BACTERIAL COMMUNITY DYNAMICS IN DICHLOROMETHANE-CONTAMINATED GROUNDWATER UNDERGOING NATURAL ATTENUATION

Wright, J., V. Kirchner, W. Bernard, N. Ulrich, C. McLimans, M.F. Campa, T. Hazen, et al.
Frontiers in Microbiology 8:2300(2017)

The role of groundwater bacterial communities in the natural attenuation of dichloromethane (DCM, a.k.a. methylene chloride) was studied at a manufacturing site in New Jersey to investigate the biodegradation potential of different autochthonous bacterial communities. Putative DCM degraders such as *Pseudomonas*, *Dehalobacterium*, and *Desulfovibrio* were present within groundwater across all levels of DCM contamination, and each of these taxa respectively dominated specific DCM contamination ranges. Potential DCM-degrading lineages yet to be cited as significant DCM degraders, such as *Desulfosporosinus*, thrived within the most heavily contaminated groundwater samples. Co-occurrence network analysis revealed the presence of aerobic and anaerobic bacterial taxa with DCM-degrading potential. The 16S rRNA gene survey serves as the first in situ bacterial community assessment of contaminated groundwater harboring DCM concentrations ranging over seven orders of magnitude, and study findings indicate the potential for monitored natural attenuation as a remediation strategy for DCM contamination.
https://www.frontiersin.org/articles/10.3389/fmicb.2017.02300/full

IN SITU REMEDIATION OF HEXAVALENT CHROMIUM CONTAMINATED SOIL BY CMC-STABILIZED NANOSCALE ZERO-VALENT IRON COMPOSITED WITH BIOCHAR

Zhang, R., N. Zhang, and Z. Fang.
Water Science and Technology 77(6):1622-1631(2018)

In remediation experiments performed outdoors in natural conditions, carboxymethyl cellulose (CMC)-stabilized nanoscale zero-valent iron (CMC-NZVI), biochar (BC), and CMC-NZVI composited with biochar (CMC-NZVI/BC) were synthesized and investigated for their effect on the in situ remediation of Cr(VI)-contaminated soil. The concentration of available iron was tested after remediation and compared with untreated control soil. TCLP tests showed that CMC-NZVI and CMC-NZVI/BC improved the remediation rate of Cr-contaminated soil. When the ratio of CMC-NZVI to Fe^0 was 2.5 g/Kg, the leachability of Cr(VI) declined by 100% and of Cr_{total} by 95.8% simultaneously. Moreover, sequential extraction procedure showed that most exchangeable Cr converted to carbonate-bound and Fe-Mn oxides-bound, reducing Cr availability and leachability in the soil.

EFFECTIVE TREATMENT OF GROUNDWATER POLLUTION USING A SYSTEM UTILIZING CONTROLLED RELEASE POLYMER MATERIALS: SBIR PHASE II

National Science Foundation, Contract 1758621 with AxNano, LLC (a HUBZone firm), Awarded 2018

Controlled-release polymers (CRPs) offer a novel, highly tunable remediation amendment for in situ chemical oxidation of contaminated groundwater. The technical objectives in this Phase II project will be to field-test the patented CRPs technology. To support field testing, a pilot-scale manufacturing process for the initial minimum viable product established in Phase I will be developed. Manufacturability will be tested in terms of product quality and stability, throughput, and cost. CRPs formulations based on multiple oxidants will be manufactured to address a broad range of environmental contaminants, including chlorinated solvents, PAHs, BTEX, MTBE, and petroleum hydrocarbons. CRPs will be pilot tested at two field sites with contaminated soil and groundwater. In particular, the field pilots will assess the ability of CRPs to eliminate rebounding by sustained release of oxidative agents over extended treatment periods (months to years) after a single application. Field data and computation modeling will be used to create a remediation design tool to prescribe future CRP dosing deployment strategies. This Phase II program aims to result in a clear understanding of in-field performance of the CRPs technology to guide full-scale deployment and market uptake. https://www.sbir.gov/sbirsearch/detail/1500129
Additional information on CRPs: https://briefs.techconnect.org/wp-content/volumes/TCB2016v2/pdf/739.pdf.

GEOCHEMISTRY AND MICROBIOLOGY OF GROUNDWATER AND SOLIDS FROM EXTRACTION AND MONITORING WELLS AND THEIR RELATION TO WELL EFFICIENCY AT A FEDERALLY OPERATED CONFINED DISPOSAL FACILITY, EAST CHICAGO, INDIANA

Bayless, E.R., T.R. Cole, D.C. Lampe, R.E. Travis, M.S. Schulz, and P.M. Buszka.
U.S. Geological Survey Scientific Investigations Report 2018-5073, 150 pp, 2018

The 140-acre confined disposal facility, formerly the site of an oil refinery, now is used for the long-term disposal of dredge material. A groundwater cutoff wall installed to contain residual petroleum hydrocarbons and leachate within the facility consists of soil-bentonite slurry, and a gradient control system comprising an automated network of 96 extraction wells, 42 monitoring wells, and 2 ultrasonic sensors maintains an inward hydraulic gradient at the site. The pumps in the extraction wells require vigilant maintenance and must be replaced when unable to withdraw water at a rate sufficient to maintain the inward gradient. This study was initiated to identify the cause of decreased pump discharges and to identify potential pump fouling mitigation strategies, such as (1) modifying the chemical or physical environment of the well, (2) modifying the pump exterior to decrease microbiological adherence, (3) changing the pumping regime to control influent water chemistry, (4) modifying the pumps to be less physically and thermally attractive, and (5) removing hydrocarbons from groundwater and the aquifer material around the wells or adding surfactants to make them more mobile. https://pubs.er.usgs.gov/publication/sir20185073

IDENTIFICATION OF SEDIMENT SOURCES TO CALUMET RIVER THROUGH GEOCHEMICAL FINGERPRINTING

Perkey, D.W., H.M. Wadman, M.A. Chappell, and J.M. Seiter.
ERDC TR-17-1, 66 pp, 2017

To help identify possible sources of contaminated sediment infilling a reach of the Calumet River between the Thomas J. O'Brien lock and Lake Michigan, multiple bottom sediment samples were collected in 2014 from six potential sediment sources. Additionally, geochemical data from historic dredging records spanning a 40-yr period were examined to develop a historic geochemical fingerprint for sediments within this reach of the river. Geochemical measurements and advanced multivariate statistics were used successfully to distinguish between all six potential sediment sources. River samples showed elevated levels of heavy metals and a geochemical signature that was distinct from the potential source sediments, suggesting that heavy metal contamination was occurring locally within the river. Multivariate analysis was able to show historic reductions in heavy metal and organic contaminants in the dredge records that likely correlate with implementation of the Clean Water Act. Geochemical fingerprints were used to track changes in sediments both spatially and temporally within the project area. These fingerprints could be used further to identify any future changes in sediments within this reach of the Calumet River.
https://usace.contentdm.oclc.org/digital/api/collection/p266001coll1/id/6534/download

General News

SMALL SYSTEMS WORKSHOP: SESSION 3B — MONITORING AND TREATMENT I: PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

EPA's Office of Research and Development and Office of Water will host a webinar to discuss challenges and treatment solutions for small drinking water and wastewater systems affected by per- and polyfluoroalkyl substances, such as PFOA and PFOS. The webinar will take place on Tuesday, August 28, 2018, 1:30 to 3:00 PM ET. Register for the webinar at https://register.gotowebinar.com/register/5454547835548545538. For future viewing, a closed-captioned recording of the webinar will be posted on EPA's YouTube site.

PRACTITIONER GUIDE TO RISK-BASED ASSESSMENT, REMEDIATION AND MANAGEMENT OF PFAS SITE CONTAMINATION

CRC for Contamination Assessment and Remediation of the Environment, CRC CARE Technical Report No. 43, 181 pp, 2018

This guide aims to provide a consistent, risk-based approach to the assessment, management, and remediation of PFAS contamination in Australia. It includes ecological and human health screening levels for PFOS and PFOA contamination in soil, groundwater, surface water, and sediment. The guide provides an overarching framework for the application of these screening values and discusses a risk-based approach to the management and remediation of PFOS and PFOA contamination. Complementing the practitioner guide and also available for download is Technical Report No. 42, *A Human Health Review for PFOS and PFOA*, which provides an overview of the international studies used in considering tolerable daily intake values. Report No. 42 also recommends background intake levels for PFOS and PFOA in Australia, which might be useful when assessing multiple exposure pathways.
https://www.crccare.com/publications/technical-reports

REVIEW OF THE ANALYSIS OF SUPPLEMENTAL TREATMENT APPROACHES OF LOW-ACTIVITY WASTE AT THE HANFORD NUCLEAR RESERVATION: REVIEW #1

National Academies of Sciences, Engineering, and Medicine.
The National Academies Press, Washington, DC. ISBN: 978-0-309-47515-0, 54 pp, 2018

In 1943, as part of the Manhattan Project, the Hanford Nuclear Reservation was established with the mission to produce plutonium for nuclear weapons. During 45 years of operation, the Hanford Site produced ~67 metric tonnes of plutonium—about two-thirds of the nation's stockpile. Production processes generated radioactive and other hazardous wastes and released airborne, surface, subsurface, and groundwater contamination. Presently, 177 underground tanks contain collectively about 210 million liters (~56M gal) of waste. The chemically complex and diverse waste is difficult to manage and dispose of safely. Section 3134 of the National Defense Authorization Act for Fiscal Year 2017 calls for a Federally Funded Research and Development Center (FFRDC) to conduct an analysis of approaches for treating the portion of low-activity waste at the Hanford Nuclear Reservation intended for supplemental treatment. The first of four, this report reviews the analysis carried out by the FFRDC. It evaluates the technical quality and completeness of the methods used to conduct the risk, cost benefit, schedule, and regulatory compliance assessments and their implementations; waste conditioning and supplemental treatment approaches considered in the assessments; and other key information and data used in the assessments. https://www.nap.edu/catalog/25093/review-of-the-analysis-of-supplemental-treatment-approaches-of-low-activity-waste-at-the-hanford-nuclear-reservation

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

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