

# Technology Innovation News Survey

**Entries for March 16-31, 2014**

## Market/Commercialization Information

**BASIC ENVIRONMENTAL SERVICES SUPPORT IN SUPPORT OF U.S. ARMY GARRISON ABERDEEN PROVING GROUND, MD**  
Army Contracting Command, Aberdeen Proving Ground (APG), MD.  
Federal Business Opportunities, FBO-4523, Solicitation W56ZTN-14-R-0005, 2014

The Army Contracting Command intends to establish a contract for performance-based services to support the broad spectrum of the Army's environmental cleanup strategy and APG's environmental services requirements via the award of four indefinite-delivery, indefinite-quantity contracts for installation-wide environmental support. The ACC-APG Garrison Contracting Division anticipates posting the official RFP, which is limited to eligible 8(a) concerns, on or about April 28, 2014, on FBO.gov. The base period of performance will commence around June 30, 2014, for 12 months, with two 1-year option periods. The NAICS Code is 541620, with a size standard of \$14.0M.  
<https://www.fbo.gov/notices/b89801e99dc4bd95b7d648775c49ac4>

**PERFORMANCE-BASED REMEDIATION (PBR) AT JOINT BASE MCGUIRE-DIX-LAKEHURST, NEW JERSEY**  
U.S. Army Corps of Engineers (USACE), USACE District, Tulsa, OK.  
Federal Business Opportunities, FBO-4527, Solicitation W912BV-14-R-0007, 2014

The USACE Tulsa District intends to issue a solicitation for a firm-fixed-price contract for the procurement of performance-based remediation at Joint Base McGuire-Dix-Lakehurst, New Jersey. The solicitation will be issued as an unrestricted procurement, NAICS code 562910, with a small business size standard of 500 employees. The work will consist of a full range of construction and engineering activities necessary for investigation, design, remedial action, remedial construction, and environmental remediation activities to support progress to site closeout at 105 Installation Restoration Program sites. The RFP issue date likely will be on April 30, 2014, with proposals due around June 26, 2014.  
<https://www.fbo.gov/spq/USA/COE/DACA56/W912BV-14-R-0007/listing.html>

## BIG RIVER MINE TAILINGS

U.S. Environmental Protection Agency, Region VII, Lenexa, KS.  
Federal Business Opportunities, FBO-4534, Solicitation SOL-R7-14-00010, 2014

EPA Region 7 intends to procure environmental remediation services for lead-contaminated properties within the Big River Mine Tailing Site in St. Francois County, Missouri. The selected remedy consists of excavation and relocation of lead-contaminated materials in up to 225 residential yards and a school football field, and placement of a 12-inch rock cover on up to 3 acres of the Bonne Terre East Wet Repository. Remediation will be conducted pursuant to CERCLA. This requirement will be a 100% small business set-aside under NAICS 562910. EPA anticipates issuing an indefinite-quantity contract with fixed unit prices consisting of a one-year period of performance and a one-year option period. Estimated dollar value for this procurement is between \$10.5M and \$12.5M. The RFP likely will be posted around mid-May 2014.  
<https://www.fbo.gov/spq/EPA/OAM/ReqVII/SOL-R7-14-00010/listing.html>

## EMERGENCY AND RAPID RESPONSE SERVICES IV (ERRS IV)

U.S. Environmental Protection Agency, Region IV, Atlanta, GA.  
Federal Business Opportunities, FBO-4529, Solicitation SOL-R4-14-00002, 2014

EPA Region 4 has an ERRS requirement for emergency responses, time-critical and non time-critical removals, and remedial actions. The contract will cover the eight states within Region 4 (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee) over a 3-year base period with one 2-year option period. Up to three indefinite-delivery, indefinite-quantity, time-and-materials contracts will be awarded under this total small business set-aside, NAICS code 562910. Proposals are due no later than 4:30 pm ET on June 3, 2014.  
<https://www.fbo.gov/spq/EPA/OAM/ReqIV/SOL-R4-14-00002/listing.html>

## OFFSHORE MARINE DEBRIS SEARCH

U.S. Environmental Protection Agency, Office of Acquisition Management, Washington, DC.  
Federal Business Opportunities, FBO-4529, Solicitation SOL-HQ-14-00011, 2014

EPA intends to issue a solicitation for environmental consulting services to provide nationally consistent technical support services to EPA On-Scene Coordinators and other federal officials in implementing EPA's responsibilities pursuant to the national response system. Under the NCP, EPA and the U.S. Coast Guard co-chair Regional Response Teams in Oceania and the mainland, working together to address the needs of federal, state, and local entities in responding to large-scale environmental problems specifically involving oil and hazardous substances. The requirements under this procurement include the gathering and analysis of technical information and related data. This requirement is a service-disabled, veteran-owned small-business set-aside, NAICS code is 541620, with a small business size standard of \$14.00M. The procurement is expected to include the award of one fixed-rate, indefinite-delivery, indefinite-quantity award-term contract with a 2-year base period and one 2-year option period. The anticipated RFP release date is on or about May 5, 2014.  
<https://www.fbo.gov/spq/EPA/OAM/HO/SOL-HQ-14-00011/listing.html>

## Cleanup News

**PHYTOREMEDIATION OF WEATHERED PETROLEUM HYDROCARBONS (PHC) AND METALS IN SOIL AND GROUNDWATER AT A FORMER OIL REFINERY IN ONTARIO**  
Gurska, J., T. Dan, and G. Stephenson.

REMTECH 2013: The Remediation Technologies Symposium, Banff, AB, Canada, 20-22 Oct 2013. Environmental Services Association of Alberta, Edmonton, AB (Canada), 29 slides, 2013

Phytoremediation is being implemented at a former refinery landfarm used to treat waste sludges generated as part of a crude oil refining process. Beginning in spring 2012, a site-specific, two-pronged phytoremediation approach was implemented to address varying F1-F4 PHCs, BTEX, and metals in soil and groundwater. The site contractor designed and installed an innovative multiphase phytoremediation system as a new approach for a closure plan for four former landfarms. Soil contamination in all four parcels is being addressed with grasses enhanced with rhizobacteria (plant growth-promoting rhizobacteria, or PGPR), which helps the plants overcome stressors such as high contaminant levels and poor soil quality. For the second phytoremediation component, hybrid willows will address PHC- and metal-contaminated groundwater and provide hydraulic control of the groundwater to prevent further migration of contaminants off site. The willows were installed in 2012 and replaced as needed in 2013.

**Slides:** <http://www.esaa-events.com/proceedings/remtech/2013/pdf/13-Gurska.pdf>

**Longer abstract:** <http://www.esaa-events.com/remtech2013/2013abstracts/Abstracts%2046.pdf>

#### **SUPERFUND PROPOSED PLAN: MATTIACE PETROCHEMICAL CO., INC., SUPERFUND SITE**

Glen Cove, Nassau County, New York  
U.S. EPA Region 2, 29 pp, 2014

As a result of previous operations at the site by a chemical distribution and drum cleaning business, the soil and groundwater are contaminated with TCE, cis-1,2-DCE, PCE, toluene, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,1-DCA, 1,2-DCA, 2-butanone, benzene, chloroform, dichloromethane, ethylbenzene, VC, naphthalene, bis(2-ethylhexyl)phthalate, 4,4'-DDD, arsenic (inorganic), cadmium, cobalt, iron, manganese, and nickel. The site was added to the NPL in 1989. While soil vapor extraction and groundwater pump and treat have reduced contamination levels, the levels are no longer decreasing, and EPA has concluded that additional measures are needed to complete the cleanup. The proposed plan calls for bioremediation of LNAPL through bioventing and enhanced bioremediation of groundwater, in situ thermal treatment of soil and groundwater hot spots, and partial vertical containment and hydraulic control via phytoremediation. The estimated cost of this proposed final phase of the cleanup is ~\$11.2 million. The proposed plan requires restrictions (institutional controls) on how the site can be used in the future to ensure that activities at the site do not interfere with the cleanup. EPA will prohibit the future use of the groundwater as a source of drinking water.

<http://epa.gov/region02/superfund/npl/mattiace/Final%20Mattiace%20Proposed%20Plan.pdf>

#### **FROM PILOT TO FULL SCALE: HIGH PRESSURE INJECTION OF CALCIUM PEROXIDE INTO LIMESTONE BEDROCK**

Rudd, B. and F. Portofe.

Florida Remediation Conference, 10-11 October 2013, Orlando. Abstract only, 2013

BTEX contamination in groundwater was discovered at a site in Sumpter County, Florida. A pump and treat system was operated for ~4 years to remediate the petroleum constituents, until contaminant concentrations were observed to be below Florida natural attenuation default source concentrations and the system was shut down. A bench-scale study indicated good potential for enhanced aerobic biostimulation of indigenous BTEX-degrading aerobic bacteria to reduce dissolved benzene below the contaminant target level of 1 µg/L. A pilot study performed to evaluate the feasibility of a biostimulation strategy consisted of injections of a PermeOx Plus® slurry mixture into three injection wells installed to a depth of ~70 ft into the limestone bedrock. A 4-in casing was installed from ground surface to the top of the bedrock (~50 ft bgs), and a total of 600 pounds of PermeOx Plus® was injected at high pressure into the aquifer, directly into the limestone bedrock. Subsequent monitoring showed that all petroleum hydrocarbons had declined below detection limits. Full-scale implementation consisted of the installation of 17 additional injection wells and PermeOx Plus® injections that were completed in June 2013.

#### **NEW APPROACH TO FUEL ADDITIVE ETHYLENE DIBROMIDE REMOVAL FROM GROUNDWATER: BIOGEOCHEMICAL REDUCTIVE DEHALOGENATION**

Studer, J. and L. Kennedy.

IPEC 2013: 20th Annual International Petroleum Environmental Conference, 12-14 November 2013, San Antonio, Texas. 24 slides, 2013

The maximum contaminant level (MCL) for ethylene dibromide, or EDB (1,2-dibromoethane), associated with plumes of petroleum hydrocarbons is very low at 0.05 µg/L. EDB's presence in groundwater above the MCL at thousands of sites suggests that natural attenuation processes are ineffective; however, the compound is biodegradable under anaerobic and certain aerobic conditions and can undergo abiotic transformation by iron sulfide. Biogeochemical reductive dehalogenation (BiRD), initially developed and patented with a primary view toward chlorinated solvents like TCE and heavy metals like Cr(VI), is an innovative in situ technology that also enhances natural EDB degradation processes. BiRD involves creation of an in situ iron sulfide reactive zone or permeable reactive barrier using direct injection or trench-based construction techniques. The presence of the halogenated compound within and downgradient of a petroleum hydrocarbon plume requires special engineering considerations compared to the typical BiRD application [http://ipec.utulsa.edu/Conf2013/Manuscripts\\_pdfs/StuderBiRD\\_EDB.pdf](http://ipec.utulsa.edu/Conf2013/Manuscripts_pdfs/StuderBiRD_EDB.pdf)

## **Demonstrations / Feasibility Studies**

#### **RAPID PERCHLORATE DESTRUCTION IN SOIL AND GROUNDWATER THROUGH BIOAUGMENTATION**

Saul, M.

Florida Remediation Conference, 10-11 October 2013, Orlando. Abstract only, 2013

A 6-month pilot study of recirculating water with CL-Out® (a patented consortium of *Pseudomonas* species) for in situ treatment of about 30 yd<sup>3</sup> of soil in the vadose zone achieved 99.96% perchlorate reduction to meet the residential soil standard. Scaling up from the pilot study, CL-Out® injection in wells aligned across the groundwater plume has bifurcated the plume, persistently reducing perchlorate at the injection lines to less than 1 mg/L, while upslope concentrations entering the injection line were measured in the range of 60 to 100 mg/L. Injections of CL-Out® into bedrock wells reduced groundwater concentrations from a range of 2 to 7 mg/L to less than 0.01 mg/L within four months. Adjustment of the aquifer pH to >5.5 standard units is necessary for optimal cell metabolism, and application of a weak base provides effective pH buffering. **Longer abstract:**

[http://www.irwinengineers.com/wp-content/uploads/2013/06/perchlorateremediationforwebsite\\_000.pdf](http://www.irwinengineers.com/wp-content/uploads/2013/06/perchlorateremediationforwebsite_000.pdf)

## **GROUNDWATER RESPONSE ACTION PLAN: LOCKHEED MARTIN MIDDLE RIVER COMPLEX, 2323 EASTERN BOULEVARD, MIDDLE RIVER, MARYLAND**

Lockheed Martin Middle River Complex, 1149 pp, 2013

This report provides background information for an evaluation of response action alternatives for site groundwater as well as details on implementation of the selected alternative. Groundwater at several areas beneath the site contains VOCs (including TCE), 1,4-dioxane, and metals above the Maryland Department of Environment's Generic Numeric Cleanup Standards for Groundwater. This report provides summaries and the full text of two reports of pilot studies conducted at the site: in situ chemical oxidation using sodium persulfate (2012, Appendix E) and enhanced anaerobic reductive dechlorination using injection of EOS® 598B42 in conjunction with hydraulic fracturing to promote amendment distribution (2009, Appendix F).

<http://lockheedmartin.com/content/dam/lockheed/data/corporate/documents/remediation/middle-river/gw-rap-07-2013.pdf>

## **COMBINING SHALLOW GEOTHERMAL ENERGY AND GROUNDWATER REMEDIATION**

Sommer, W., B. Drijver, R. Verburg, H. Slenders, E. de Vries, I. Dinkla, I. Leusbrock, and T. Grotenhuis. European Geothermal Congress 2013, Pisa, Italy, 3-7 June 2013. 9 pp, 2013

Aquifer thermal energy storage (ATES) is a recognized approach to providing sustainable heating and cooling to buildings. The mixing effect of an operating ATES system on the biodegradation and containment of groundwater affected by chlorinated hydrocarbons is being evaluated at an urban demonstration site in Flanders, the Netherlands.

<http://edepot.wur.nl/264023> Additional information:

[http://rwsenvironment.eu/publish/pages/97224/citychlor\\_ates\\_with\\_remediation\\_20april2012.pdf](http://rwsenvironment.eu/publish/pages/97224/citychlor_ates_with_remediation_20april2012.pdf)

## **Research**

### **MASTER WORK PLAN: SOIL TREATABILITY STUDIES, AREA IV SANTA SUSANA FIELD LABORATORY, VENTURA COUNTY, CALIFORNIA**

U.S. Department of Energy, Office of Environmental Management, 161 pp, 2013

To see which soil treatment technologies, if any, can address soil contamination in Area IV effectively, DOE is supporting five treatability studies to identify on-site soil remediation technologies that can reduce Area IV soil contaminant levels to the cleanup goals, thereby reducing the volume of Area IV soil requiring excavation and removal. The treatability studies will focus on the following contaminants: PAHs, total petroleum hydrocarbons, PCBs, perchlorate, dioxins and furans, and metals, with an individual treatability study specifically targeting mercury alongside the studies on bioremediation, phytoremediation, natural attenuation, and partitioning of soil contaminants. Each of the interrelated treatability studies will be carried out by a local university. The five highly detailed work plans are posted with other site information at [http://www.etec.energy.gov/char\\_cleanup/Soil\\_Treatability.html](http://www.etec.energy.gov/char_cleanup/Soil_Treatability.html).

### **PROXIMAL SPECTRAL SENSING TO MONITOR PHYTOREMEDIATION OF METAL-CONTAMINATED SOILS**

Rathod, P.H., D.G. Rossiter, M.F. Noomen, and F.D. van der Meer.  
International Journal of Phytoremediation, Vol 15 No 5, 405-426, 2013

This paper reviews the theoretical basis whereby proximal spectral sensing of soil and vegetation could be used to monitor phytoremediation of metal-contaminated soils. Both lab and field spectroscopy have been applied to sense heavy metals in soils indirectly via their intercorrelations with soil constituents and through metal-induced vegetation stress. In soil, most predictions are based on intercorrelations of metals with spectrally active soil constituents, such as iron oxides, organic carbon, and clays. Spectral variations in metal-stressed plants are particularly associated with changes in chlorophyll, other pigments, and cell structure, all of which can be investigated by vegetation indices and red-edge position shifts.

### **ASSESSING CELLULOLOSIS IN PASSIVE TREATMENT SYSTEMS FOR MINE DRAINAGE: A MODIFIED ENZYME ASSAY**

McDonald, C.M., W.D. Gould, M.B.J. Lindsay, D.W. Blowes, C.J. Ptacek, and P.D. Condon.  
Journal of Environmental Quality, Vol 42 No 1, 48-55, 2013

A modified cellulase enzyme assay was developed to monitor organic matter degradation in passive treatment systems for mine drainage. This fluorogenic substrate method facilitates assessment of exo-(1,4)-beta-D-glucanase, endo-(1,4)-beta-D-glucanase, and beta-glucosidase, which compose an important cellulase enzyme system. The modified method was developed and refined using samples of organic carbon-amended mine tailings from field experiments where sulfate reduction was induced as a strategy for managing water quality. Matrix interferences within the metal-rich 3-gram samples were insignificant. *Additional information on this work is available in C.M. McDonald's Master's thesis at* [https://uwspace.uwaterloo.ca/bitstream/handle/10012/5979/McDonald\\_Corina.pdf?sequence=1](https://uwspace.uwaterloo.ca/bitstream/handle/10012/5979/McDonald_Corina.pdf?sequence=1).

### **IMPROVING THE AGRONOMY OF ALYSSUM MURALE FOR EXTENSIVE PHYTOMINING: A FIVE-YEAR FIELD STUDY**

Bani, A., G. Echevarria, S. Sulce, and J.L. Morel.  
International Journal of Phytoremediation, [publication on line prior to printing] 2014

A five-year field experiment on an ultramafic Vertisol aimed at optimizing a low-cost Ni-phytoextraction crop of the hyperaccumulator *Alyssum murale*. The following aspects were studied on 18-m<sup>2</sup> plots in natural conditions: the effect of (i) plant phenology and element distribution, (ii) plant nutrition and fertilization, (iii) plant cover and weed control, and (iv), planting technique (natural cover vs. sown crop). The optimal harvest time was set at the mid-flowering stage when Ni concentration and biomass yield were highest. The application of N, P, and K fertilizers, and especially a split 100-kg/ha N application, increased the density of *A. murale* against all other species, significantly increasing shoot yield without reducing Ni concentration. In the natural stands, weed control required the use of an herbicide that after the optimization of fertilization and harvest time provided little benefit. Cropping sown *A. murale* was more efficient than enhancing native stands and gave higher biomass and phytoextraction yields, improving them from 0.3 to 9.0 t/ha and 1.7 to 105 kg/ha Ni, respectively.

### **BIOSTIMULATION OF THE AUTOCHTHONOUS MICROBIAL COMMUNITY FOR THE DEPLETION OF POLYCHLORINATED BIPHENYLS (PCBS) IN CONTAMINATED SEDIMENTS**

Di Gregorio, S., H. Azaizeh, and R. Lorenzi.  
Environmental Science and Pollution Research, Vol 20 No 6, 3989-3999, June 2013

In a study of the effect of the biostimulation of the autochthonous microbial community on the depletion of PCBs in historically contaminated sediments ( $6.260 \pm 9.3 \cdot 10^{-3}$   $\mu\text{g}$  PCB/g dry weight), biostimulation consisted of (1) amendment with an electron donor (acetate) to favor the dehalogenation of the high-chlorinated PCBs and (2) vegetation of the sediments with *Sparganium* sp. plants to promote the oxidation of the low-chlorinated PCBs by rhizodegradation. The acetate amendment affected the enrichment of anaerobic dechlorinators like *Dehalococcoides* sp. Vegetation with *Sparganium* sp. plants affected the enrichment of either (a) the dechlorinator *Dehalococcoides* and *Chloroflexi* o-17/DF-1 strains or (b) the acidobacteria beta-Proteobacteria, *Actinobacteria*, alpha-Proteobacteria, *Bacteroidetes*, and *Firmicutes*. The combination of the two biostimulation strategies achieved 91.5% abatement of the initial PCB sediment content.

### **ASSESSMENT OF THE EFFICIENCY OF IN SITU BIOREMEDIATION TECHNIQUES IN A CREOSOTE POLLUTED SOIL: CHANGE IN BACTERIAL COMMUNITY**

Simarro, R., N. Gonzalez, L.F. Bautista, and M.C. Molina.  
Journal of Hazardous Materials, Vol 262, 158-167, 2013

Bioaugmentation, biostimulation, bioaugmentation with biostimulation, and natural attenuation were applied to a creosote-contaminated soil to assess the effectiveness of different in situ bioremediation treatments as indicated by soil toxicity, microbial respiration, creosote degradation, and the evolution of bacterial communities. Creosote decreased significantly in all treatments with no significant differences observed between treatments, although specific PAHs were degraded to a greater extent by biostimulation. Despite significant creosote degradation (>60%) at the end of the experiment, toxicity remained constant and high. Biostimulation showed the highest microbial biodiversity, although community composition in all treatments was different from that of the unpolluted control soil by the end of the study. The active uncultured bacteria belonged to the genera *Pseudomonas* (predominating), *Sphingomonas*, *Flexibacter*, *Pantoea*, and *Balneimonas*, the latter two not previously described as PAH degraders. Results confirmed that some bacteria have an intrinsic capacity to degrade creosote without previous exposure.

[http://www.escet.urjc.es/biodiversos/publica/Simarro\\_et\\_al\\_2013\\_J\\_Hazard\\_Mat.pdf](http://www.escet.urjc.es/biodiversos/publica/Simarro_et_al_2013_J_Hazard_Mat.pdf)

### **AIDED PHYTOSTABILISATION OF A CR, MO AND NI-CONTAMINATED TECHNOSOL**

Oustriere, N., M. Mench, L. Marchand, J.L. Bouchardon, and O. Faure.  
COST Action Project FA 0905: Mineral Improved Crop Production for Healthy Food and Feed, Final Conference, 17-19 March 2014, Antalya-Belek, Turkey. 116-117, 2014

PHYSAFIMM, a large-scale aided phytostabilization program, is under way on metal(loid)-contaminated tailings (30 ha) of a steel smelter located at Rive de Gier, France. Aided phytostabilization uses excluder plants, their associated microorganisms, and soil conditioners to minimize pollutant linkages, notably metal(loid) transfer through natural agencies in the environmental compartments and into the food chain. This phytoremediation option has successfully restored the vegetation cover and, using Ni/Cd-tolerant plants in mixture and soil amendments, aims to reduce labile soil Cr, Ni, and Mo concentrations and decrease exposure pathways to herbivores. So far, the shoot Mo concentration of *Festuca pratensis* remains elevated.

**Longer abstract (pages 116-117):** [http://www.umb.no/statisk/costaction/cost\\_905\\_antalya\\_2014\\_proceedings.pdf](http://www.umb.no/statisk/costaction/cost_905_antalya_2014_proceedings.pdf)  
**Poster:** [http://sari.geophyte.akeonet.com/elements/doc\\_pdf/publi\\_pdf/Geophyte\\_Intersol2011.pdf](http://sari.geophyte.akeonet.com/elements/doc_pdf/publi_pdf/Geophyte_Intersol2011.pdf)

### **NUMERICAL MODELING ANALYSIS OF VOC REMOVAL PROCESSES IN DIFFERENT AEROBIC VERTICAL FLOW SYSTEMS FOR GROUNDWATER REMEDIATION**

De Biase, C., A. Carminati, A.E. Oswald, and M. Thullner.  
Journal of Contaminant Hydrology, Vol 154, 53-69, 2013

Vertical flow systems filled with a porous medium have been shown to remove VOCs efficiently from contaminated groundwater. To distinguish between removal due to biodegradation or to VOC losses to the atmosphere, numerical simulation was used to investigate quantitative VOC removal in two pilot-scale water treatment systems—an unplanted and a planted vertical flow filter (i.e., a vertical flow constructed wetland)—for the treatment of groundwater containing benzene and MTBE at the study site in Leuna, Germany. The highly dynamic but permanently unsaturated conditions in the porous medium facilitate aerobic biodegradation but could lead to volatile emissions of the contaminants. For both filters, simulations and experimental data point to high biodegradation rates if the flow filters have had time to build up their removal capacity. In this case, volatile emissions are negligible and total removal can be attributed to biodegradation only. The simulation study thus supports the use of both of these vertical flow systems for the treatment of groundwater contaminated with VOCs. For more on this study, see C. De Biase's Ph.D. thesis at <http://dSPACE.library.uu.nl/handle/1874/253524>.

### **THE ROLE OF PLANT-ASSOCIATED BACTERIA IN THE MOBILIZATION AND PHYTOEXTRACTION OF TRACE ELEMENTS IN CONTAMINATED SOILS**

Sessitsch, A., M. Kuffner, P. Kidd, J. Vangronsveld, W.W. Wenzel, K. Fallmann, and M. Puschenreiter.  
Soil Biology and Biochemistry, Vol 60 No 100, 182-194, 2013

The authors discuss how bacteria can affect the efficiency and rate of phytoextraction and review the mechanisms employed by bacteria leading to trace element mobilization. An analysis of data from the literature shows that effects of bacterial inoculation on phytoextraction efficiency currently are inconsistent. Details of key processes in plant-bacteria interactions and colonization by inoculated strains remain to be unraveled to allow full-scale application of bacteria-assisted phytoremediation of trace element-contaminated soils.

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3618436/>

### **ARSENIC UPTAKE AND TRANSLOCATION BY PLANTS IN POT AND FIELD EXPERIMENTS**

Ciurli, A., L. Lenzi, A. Alpi, and A. Pardossi.  
International Journal of Phytoremediation, Vol 16 No 7-8, 804-823, 2014

Pot and field experiments were conducted to assess the suitability of poplars and ferns for in situ phytoextraction at a dump site that had high concentrations of As, Al, Fe, Cu, Co, Cr, and Pb owing to the presence of residues from the arseno-pyrite roasting process. Two poplar clones (*Populus deltoides* Dvina and *Populus x canadensis* Orion) and *Pteris vittata* (Chinese brake fern) were planted in the contaminated soil both in situ and ex situ in pots. During a 24-month study period, the researchers evaluated plant survival, As accumulation in plant tissues, leaf pigment content, soluble proteins, activity of catalase, and SH groups in both roots and leaves. Both poplars and ferns exhibited an increase in the activity of catalase and SH group contents when grown in the presence of pyrite ashes. The system planted with both *P. vittata* and *Populus* clones successfully extracted multiple contaminants. Agronomic measures such as irrigation, soil tillage, and amendments supported the successful establishment of poplar trees and ferns in the contaminated soil.

#### **ASSESSING URBAN HABITAT QUALITY USING SPECTRAL CHARACTERISTICS OF *TILIA* LEAVES**

Zadeh, A.R.K., F. Veroustraete, J.A.N. Buytaert, J. Dirckx, and R. Samson.  
Environmental Pollution, Vol 178, 7-14, 2013

A tree leaf reflectance-based biomonitoring method was used to assess the urban habitat quality of two contrasting habitat classes in the city of Gent (Belgium). A customized Matlab code was applied to process the measurements of leaf reflectance for two *Tilia* species (i.e., linden or lime trees), which enabled discrimination between areas with greater and lesser levels of air pollution. Results indicate that leaf reflectance in the PAR range and the NDAI (Normalized Difference Asymmetry Index) are species-dependent, whereas Dorsiventral Leaf Reflectance Correlation (DLRC) seems to be independent of species. The investigators concluded that leaf reflectance provides a feasible means to assess urban habitat quality when taking into account species specificity of tree leaf physiological and structural responses to habitat quality. **Longer abstract:**  
<http://ec.europa.eu/environment/integration/research/newsalert/pdf/342na1.pdf>

#### **LEGUME-GRASS INTERCROPPING PHYTOREMEDIATION OF PHTHALIC ACID ESTERS IN SOIL NEAR AN ELECTRONIC WASTE RECYCLING SITE: A FIELD STUDY**

Ma, T.T., Y. Teng, Y.M. Luo, and P. Christie.  
International Journal of Phytoremediation, Vol 15 No 2, 154-167, 2013

A field experiment was conducted to study the phytoremediation of phthalic acid esters (PAEs) by legume (alfalfa, *Medicago sativa* L.), perennial ryegrass (*Lolium perenne* L.), and tall fescue (*Festuca arundinacea*) intercropping in contaminated agricultural soil at a large e-waste recycling site in China. Two compounds, DEHP and DnBP, were present in the soil and in test plant shoots at much higher concentrations than the other target PAEs studied. By the end of the study, over 80% of total (i.e., all six) PAEs were removed from the soil across all treatments. Alfalfa in monoculture removed over 90% of PAEs, and alfalfa in the intercrop zone contained the highest shoot concentration of total PAEs, ~4.7 mg/kg dry weight. The three-species intercrop and alfalfa monocrop eliminated soil PAEs most effectively (1.78% and 1.41%, respectively). High bioconcentration factors indicated the occurrence of significant extraction of PAEs by plants from soil. <http://www.soilrem.ac.cn/files/project/20130827093024189.pdf>

#### **FIELD NOTE: COMPARATIVE EFFICACY OF A WOODY EVAPOTRANSPIRATION LANDFILL COVER FOLLOWING THE REMOVAL OF ABOVEGROUND BIOMASS**

Schnabel, W., J. Munk, and A. Byrd.  
International Journal of Phytoremediation, [publication online prior to print] 2014

This study investigated the drainage through an evapotranspiration (ET) landfill test cover comprising primarily 6-year-old poplars and cottonwoods for a period of one year following the harvest of all woody biomass >30 cm height above ground surface. Results were compared to previously reported drainage leading up to the coppice event. In the first year following coppice, the ET cover was found to be 93% effective at redirecting moisture during the spring/summer and 95% effective during the subsequent fall/winter, which was slightly lower than the 95% and 100% efficacy observed in the spring/summer and fall/winter, respectively, during the final year measured prior to coppice. Post-coppice efficacy was higher than that observed during the first three years following cover establishment. Results show that woody ET covers potentially could produce harvestable biomass while still managing aerial moisture.

## **General News**

#### **DRAFT SEDIMENT CLEANUP USERS MANUAL II**

Washington Dept. of Ecology, Publication 12-09-057, 468 pp + Appendix B (356 pp), Dec 2013

This update to the 1991 document is designed to provide guidance to Washington Department of Ecology staff for Part V: Sediment Cleanup Standards, Sediment Management Standards, Chapter 173-204 WAC, in implementing the sediment cleanup decision process for contaminated sediments in Washington state. The sediment cleanup decision process governs how sites are identified, investigated, remediated, and monitored. See also Appendix B, a separate document that contains selected papers on sediment sampling and testing from several decades of Sediment Management Annual Review meetings. <https://fortress.wa.gov/ecy/publications/summarypages/1209057.html>

#### **IN SITU CHEMICAL REDUCTION USING ZERO VALENT IRON INJECTION: A TECHNIQUE FOR THE REMEDIATION OF SOURCE ZONES**

CityChlor, 104 pp, 2013

This document contains a technical summary of the state of the art in the use of injections of zero-valent iron (ZVI) at nano- or micro-scale for treating soil and groundwater contaminated with chlorinated solvents. Given that practical experience within the European market with respect to this technique was rather limited at the time the document was written, the text is based upon an extensive literature review, a survey of soil remediation companies and suppliers, and experiences from the CityChlor pilot test in Herk-de-Stad. This document will enable the reader to evaluate the practicality of this technique and also provide a guideline for its usage. [Note: CityChlor is an INTERREG IVB-NEW project between partners from Flanders, Germany, France, and the Netherlands who work on innovative solutions for

cleanup of contaminated sites.]

[http://www.citychlor.eu/sites/default/files/in\\_situ\\_chemical\\_reduction\\_using\\_zero\\_valent\\_iron\\_injection.pdf](http://www.citychlor.eu/sites/default/files/in_situ_chemical_reduction_using_zero_valent_iron_injection.pdf) OR  
[http://rwsenvironment.eu/publish/pages/97224/in\\_situ\\_chemical\\_reduction\\_using\\_zero\\_valent\\_iron\\_injection.pdf](http://rwsenvironment.eu/publish/pages/97224/in_situ_chemical_reduction_using_zero_valent_iron_injection.pdf)

#### **MITIGATION OF LANDFILL GAS EMISSIONS**

Pawlowska, M.  
CRC Press, Boca Raton, FL. ISBN: 9780415630771, 100 pp, 2014

This text describes some of the many ways of preventing the spread of bioaerosols and odors from landfills or protecting the environment against such impacts. The application of anaerobic, aerobic, and semi-aerobic bioreactor landfills for control of landfill gas emissions receives special attention. Different types of biotic systems for the oxidation of methane and trace gases, such as biocovers, biofilters, and biowindows, are also presented. For additional information, see the tab for Table of Contents at <http://www.crcpress.com/product/isbn/9780415630771>.

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