Technology Innovation News Survey

Entries for June 16-30, 2016

Market/Commercialization Information

REMEDIAL ACTIVITIES AT ENVIRONMENTALLY CONTAMINATED SITES, PREDOMINATELY AT NAVY AND MARINE CORPS INSTALLATIONS
Naval Facilities Engineering Command, NAVFAC Southwest, San Diego, CA.
Federal Business Opportunities, FBO-5346, Solicitation N6247316N9999, 2016

This presolicitation notice advises interested parties that a future procurement is planned to obtain services for performing remedial activities (usually post-ROD) at environmentally contaminated sites, mainly at Navy and Marine Corps installations. The work will be performed at locations within the NAVFAC Southwest footprint (Alaska, Arizona, California, Colorado, Nevada, New Mexico, Oregon, Utah, and Washington), although the majority of the work is expected to be performed in California. The resulting contract may be a multiple-award contract with a 12-month base period and four one-year option periods for an aggregate maximum dollar value not to exceed $240M. This procurement is intended to be available for small businesses and may also be available for large businesses under NAICS code 562910, depending on the outcome of market research.
https://www.fbo.gov/spg/DON/NAVFAC/N68711A6A/N6247316N9999/listing.html

FORMER KANSAS ARMY AMMUNITION PLANT (KSAAP), 1200 AREA, PARSONS, KANSAS: BEDROCK REMOVAL
U.S. Army Corps of Engineers, USACE District, Kansas City, Missouri.
Federal Business Opportunities, FBO-5349, Solicitation W912DQ-16-R-3012, 2016

The 1200 Area (formerly the Casing Rework Area) refers to ~49 acres in the south-central portion of the former KSAAP. Casing rework of 105-mm cartridges (1953 and later) involved cleaning the casings with a chromic acid solution. Two earthen-type, unlined lagoons (SSL and NSL) located within the 1200 Area were used for settling and storage of wastewater generated from casing reworking. In the investigation trenches excavated during the SSL Corrective Measures Implementation (ca. 2011 and later), Cr(VI) concentrations down to bedrock exceeded the soil cleanup standard. There are no cleanup criteria for bedrock at the former KSAAP, but a screening standard has been developed to verify removal of the most highly contaminated bedrock. This solicitation will be set aside for eligible small business concerns under NAICS code 562910. The subsequent contract will be awarded as a construction contract, magnitude estimated between $5M and $10M. Release of the solicitation is expected on or about September 23, 2016.
https://www.fbo.gov/spg/USA/COE/DACA41/W912DQ-16-R-3012/listing.html

SBIR E-LEARNING FOR HAZMAT AND EMERGENCY RESPONSE (R43/R44)
DHHS, National Institutes of Health, Funding Opportunity RFA-ES-16-006, 2016

Advanced Technology Training (ATT) products as defined by the NIEHS Worker Training Program (WTP) include but are not limited to online training, virtual reality, serious gaming, and tools that complement all aspects of training from development to evaluation, including advanced technologies that enhance, supplement, improve, and provide health and safety training for hazardous materials workers. The major objective of the NIEHS WTP is to prevent work-related harm by assisting in the training of workers in how best to protect themselves and their communities from exposure to hazardous materials. This funding opportunity encourages Small Business Innovation Research grant applications from small business concerns that propose to further the development of ATT products for the health and safety training of HAZMAT workers; skilled support personnel; emergency responders in biosafety response, infectious disease training and cleanup; and emergency responders in disasters and resiliency training. This includes the training of workers engaged in environmental restoration, waste treatment, and emergency response activities at sites in the U.S. DOE nuclear weapons complex. Also needed are ATT tools to assist in research into the acute and long-term health effects of environmental disaster. The closing date for applications is August 29, 2016. http://www.grants.gov/web/grants/view-opportunity.html?oppId=285519
Additional information: http://grants.nih.gov/grants/guide/rfa-files/RFA-ES-16-006.html

ENVIRONMENTAL REMEDIATION SERVICES AT THE FORMER BELLE MEAD ARMY DEPOT IN BELLE MEAD, NJ
General Services Administration, Public Buildings Service, Acquisition Management Division.
Federal Business Opportunities, FBO-5363, Solicitation TJP-072816-003, 2016

Environmental Remediation Services at the former Belle Mead Army Depot include but are not limited to removal of trees and other vegetation in the affected areas, excavation and removal of contaminated soil, transportation of contaminated soil both on and off site, construction of a containment cap, placement of clean fill, and coordination and application for all necessary permits and approvals. All services under this solicitation will need to comply with NJDEP regulations and be completed by December 2018. This procurement will be a competitively negotiated Request for Proposal awarded as a firm-fixed-price contract set aside for small businesses registered under NAICS code 562910. Release of the RFP on FedBizOpps is tentatively anticipated on or about August 12, 2016.
https://www.fbo.gov/notices/c9250279f8d38195ded437ccd0748d5d

BLM-MT: GROUNDWATER MONITORING IN SUPPORT OF ENERGY DEVELOPMENT IN EASTERN MONTANA
Department of the Interior, Bureau of Land Management, Funding Opportunity L16AS00257, 2016

Since 1972 the Bureau of Land Management has assisted and provided funding to collect water levels and water quality data from a network of monitoring wells, mainly on public lands, to assess impacts from energy development. This funding opportunity is designed to provide scientifically sound long-term data and corresponding reports; descriptions of the groundwater systems in coalbed natural gas prospective and producing areas, surface coal mining areas, and oil and gas producing areas of Montana; and models of future conditions in these areas. The monitoring data allow developers, regulators, land-management agencies, and the general public to determine the effects of energy production on the groundwater resource and existing water rights. The data will provide critical, third-party information on baseline conditions and changes that occur during and after development. All data will be incorporated into the publicly available Ground Water Information Center database. A single award is anticipated in the form of one 5-year Cooperative Agreement in the amount of $99,500, with an anticipated start date of September 26, 2016. The closing date for applications is September 16, 2016.
http://www.grants.gov/web/grants/view-opportunity.html?oppId=286309

Cleanup News

PERFORMANCE OF AN OPEN LIMESTONE CHANNEL FOR TREATING A STREAM AFFECTED BY ACID ROCK DRAINAGE (LEON, SPAIN)
Santofimia, E. and E. Lopez-Pamo.
Environmental Science and Pollution Research, Vol 14, 14502-14517, 2016

Generation of acid rock drainage (ARD) affected the La Silva stream after the oxidation dissolution of pyrite-rich black shales excavated during highway construction in Leon (Spain). The ARD was characterized by the presence of high concentrations of sulfate and metals (Al, Fe, Mn, Zn, Cu, Co, Ni, Th, and U). This paper provides a hydrochemical characterization of the La Silva stream after its transit through the different elements—open limestone channel, small ponds, and a wetland—of the passive treatment system constructed to improve the stream's water quality. After exiting the treatment system, the stream is buffered by Al at a pH of 4-4.3, showing high Al concentrations (19-101 mg/L) but with a complete removal of dissolved Fe; however, the outflow shows similar or higher acidity than the inflow into the system. During the design, engineers were unaware of the existence of the inflow from two highly polluting sources

that render the passive treatment system ineffective. Potential improvement measures are discussed.

SA DENA HES MINE CLOSURE: APPLICATION OF XRF TECHNOLOGY TO DELINEATE METALS-CONTAMINATED SOILS

Bruemmer, A.
RPIC 2015 Federal Contaminated Sites Regional Workshop, 3-4 June 2015, Edmonton, Alberta.

The Sa Dena Hes mine is a former lead-zinc mine located in Yukon Territory. In January 2013, the mine entered a Permanent Closure phase in accordance with the requirements of the mine's Water License. A portion of the site assessment work included the use of x-ray fluorescence (XRF) to delineate metals-contaminated soils. The XRF analyzer uses x-ray emissions to provide real-time measurements of metals concentrations within the soil matrix. Field staff and field assistants were trained in the proper use of the XRF prior to using the instrument in the field, and a sampling program was developed to establish the correlation between analytical lab data and XRF results. Accompanying XRF software was used to download readings on a daily basis, screen against applicable criteria, and re-assess delineation objectives. XRF and lab data showed a strong correlation, and XRF technology was used to delineate metals-contaminated soil laterally and vertically at the mine site. In 2014, ~10% of samples were submitted to the lab for analytical testing, while remaining samples were analyzed with XRF only. Despite the remote location of the project, field engineers were able to discuss daily results with the project manager to determine if additional step-out samples were required, which increased the overall efficiency of field work, reduced downtime associated with lab analysis turnaround and costs, and reduced costs associated with mobilization to/from the site.
Slides: http://www.rpic-ibic.ca/documents/2015_FCS_RW/Presentations/2_-_Bruemmer.pdf

Demonstrations / Feasibility Studies

PASSIVE TREATMENT OF NEUTRAL MINE DRAINAGE AT A METAL MINE IN NEW ZEALAND USING AN OXIDIZING SYSTEM AND SLAG LEACHING BED

Trumm, D. and J. Pope.
Mine Water and the Environment, Vol 34 No 4, 430-441, 2015

Rehabilitation at a metal mine in New Zealand is complete with the exception of a 22 L/s discharge pumped from underground. The discharge has a pH of ~6, alkalinity of ~150 mg/L, dissolved oxygen (DO) 3. Bicarbonate alkalinity in the mine drainage prevented acidification, and release of dissolved CO_2 caused the pH to increase slightly. Precipitation (of carbonates, oxides or oxy-hydroxides) in the slag leaching bed at elevated pH and high DO removed Mn. Adsorption onto Fe(OH)3 removed Zn and As. The oxygenation system removed 82-96% of the Fe and 10% of the Mn. The slag leaching bed removed 99% of the remaining Mn. *See an earlier version of this paper at* http://www.crl.co.nz/downloads/geology/2009/Trumm%202009%20ICARD%20Metal%20Mine.pdf.

IN SITU FIELD APPLICATION OF ELECTROKINETIC REMEDIATION FOR AN AS-, CU-, AND PB-CONTAMINATED RICE PADDY SITE USING PARALLEL ELECTRODE CONFIGURATION

Jeon, E.K., J.M. Jung, S.R. Ryu, and K. Baek.
Environmental Science and Pollution Research, Vol 22 No 20, 15763-15771, 2015

An in situ electrokinetic process with a parallel electrode configuration was evaluated for its applicability to full-scale treatment of As, Cu, and Pb contamination in a paddy rice field. The feasibility study area was 17 m wide, 12.2 m long, and 1.6 m deep. A constant voltage of 100 V was supplied to electrodes spaced 2 m apart. The electrokinetic system removed 48.7, 48.9, and 54.5% of As, Cu, and Pb, respectively, from the soil during 24 weeks of operation, mainly bound to Fe oxide. The removal of metals in the first layer (0-0.4 m) was higher than in the other three layers because the first layer was not affected by groundwater fluctuation. Energy consumption was 1.2 kWh/m^3. The standard deviation of metal concentration in the soil using a parallel electrode configuration was much higher compared to the hexagonal electrode configuration because of its smaller electrically active area; however, both configurations removed similar amounts of metals.

CALCIUM CARBONATE-BASED PERMEABLE REACTIVE BARRIERS FOR IRON AND MANGANESE GROUNDWATER REMEDIATION AT LANDFILLS

Wang, Y., S. Pleasant, P. Jain, J. Powell, and T. Townsend.
Waste Management, Vol 53, 128-135, 2016 [doi: 10.1016/j.wasman.2016.02.018]

Two in situ permeable reactive barriers (PRBs), one of limestone and the other of crushed concrete, were installed downgradient of a closed, unlined landfill in Florida to remediate groundwater containing high concentrations of Fe and Mn. Influent groundwater to the PRBs contained mean Fe and Mn concentrations of ~30 mg/L and 1.62 mg/L, respectively. PRBs were constructed in the shallow aquifer to a max depth 4.6 m bgs. During the first year after installation, the limestone and crushed concrete PRBs removed Fe from influent water at average rates of 91% and 95%, respectively. PRB performance declined after year three, with Fe removal efficiency falling to 64% and 61% for limestone and concrete, respectively. A comparison of water quality in shallow and deep monitoring wells showed a more dramatic performance reduction in the deeper section of the concrete PRB, which was attributed to an influx of sediment into the barrier and settling of particulates from the upper portions of the PRBs. Although Fe and Mn removal from redox impacts was achieved with the PRBs, construction costs and the short effectiveness time frame relative to the duration of a full-scale remediation effort may limit the applicability of these systems. *See additional information in Y. Wang's dissertation at* http://ufdcimages.uflib.ufl.edu/UF/E0/04/21/43/00001/wang_y.pdf.

REMEDIATION OF ACID MINE DRAINAGE BASED ON A NOVEL COUPLED MEMBRANE-FREE MICROBIAL FUEL CELL WITH PERMEABLE REACTIVE BARRIER SYSTEM

Hai, T., P. Wen-Cheng, C. Chang-Feng, X. Jian-Ping, H. Wen-Jun.
Polish Journal of Environmental Studies, Vol 25 No 1, 107-112, 2016

A pilot-scale continuous-flow membrane-free microbial fuel cell with permeable reactive barrier (MFC-PRB) was operated for five periods at a hydraulic retention time of 48 h to demonstrate the MFC-PRB potential for acid mine drainage remediation. The MFC-PRB was able to generate electricity from AMD continuously. Average sulfate removal rates of 51.2%, 39.8%, and 33.1% were obtained in effluents of 1,000, 2,000, and 3,000 mg/L, respectively. The system removed >99.5% of the initial concentrations of Cu^{2+}, Zn^{2+}, and Pb^{2+}, with concentrations of 0.01-0.05 mg/L of those elements remaining in the effluent. *This paper is* ***Open Access*** *at* http://www.pjoes.com/abstracts/2016/Vol25/No01/11.html.

PERFORMANCE OF WIND-POWERED SOIL ELECTROREMEDIATION PROCESS FOR THE REMOVAL OF 2,4-D FROM SOIL

Souza, F.L., J. Llanos, C. Saez, M.R.V. Lanza, M.A. Rodrigo, and P. Canizares.
Journal of Environmental Management, Vol 171, 128-132, 2016

A wind-powered electrokinetic soil flushing process for the removal of pesticides from soil was conceived as an eco-friendly electrochemical soil technique for in situ treatment of contaminated soils at remote locations. The herbicide 2,4-dichlorophenoxyacetic acid (2,4-D) was selected as a model pollutant for soil treatment. A cell for the electrokinetic soil flushing device was connected directly to a wind turbine, without intermediate batteries, to carry out a 15-day soil flushing test. The wind-powered test covered many different wind conditions (from calm to near gale), being performed 20.7% under calm conditions and 17% under moderate or gentle breeze and obtaining a 53.9% removal of 2,4-D overall. Remediation was more efficient, however, under a constant electric input (conventional DC power supply), which achieved 90.2% removal of 2,4-D with a much lower charge supplied within the same time frame.
https://ruidera.uclm.es/xmlui/bitstream/handle/10578/9551/performance.pdf?sequence=1

Research

TESTING OF THE KRIA IONIZING WATER TREATMENT SYSTEM FOR WATERS CONTAMINATED WITH DIESEL, PCBS, AND NUTRIENTS (NITROGEN FORMS)

Medina, V.F., A. Morrow, C.C. Thomas, and R. Wade.
ERDC/EL TR-16-3, 33 pp, 2016

The KRIA water treatment system (trade name ECOSOAR) works by charging water with the superoxide radical (O_2^-), which is electrochemically generated from oxygen in the atmosphere and can work both oxidatively and reductively. Background studies were conducted to evaluate the KRIA's effect on water. The KRIA charged water for 135 minutes and was compared to a control in which the superoxide valve was turned off. Superoxide charging resulted in elevated (ca. threefold) levels of oxygen, which led to the water being supersaturated by ~300%. Conductivity also increased, presumably due to the addition of charged oxygen species into the water. These elevated levels persisted for at least 24 hours after the charging, suggesting that the effect was persistent. Elevated concentrations of superoxide ion were documented after charging. Treatment of diesel resulted in a 58% increase in removal compared to the control reactor. Treatment of PCBs had a 20% increase in removal as compared to the control. The KRIA system is designed to be deployed into rivers, streams, lakes, and ponds. http://www.dtic.mil/cgi-bin/GetTRDoc?AD=AD1002925

IMPACT OF INCREMENTAL SAMPLING METHODOLOGY (ISM) ON METALS BIOAVAILABILITY

Clausen, J.L., B. Swope, A. Bednar, L. Levitt, T. Cary, T. Georgian, M. Colvin, et al.
ERDC TR-16-4, 81 pp, 2016

This study assessed the impact of the incremental sampling methodology on metals bioavailability through a series of digestion and in vivo experiments, using *Eisenia fetida* and *Lolium rigidum* in both milled and unmilled loam and sand soil containing Sb, Cu, Pb, and Zn obtained from Donnelly Training Area, Alaska. No significant differences in metal levels were evident between milled and unmilled soil for *E. fetida*, and uptake of Pb by *L. rigidum* in sand yielded Pb recoveries comparable with Method 3050 analysis of soil. In contrast, *L. rigidum* grown in loam had much lower recoverable Pb. Milling of the soil had no significant impact on Pb species distribution. In comparison with Method 3050, the alternative digestion tests involving the use of glycine, oxalate, EDTA, or alternative digestion procedures, such as the synthetic precipitation leaching procedure and the TCLP, yielded lower recoveries of Pb for all soil particle sizes and soil types. Diffusive gradient in thin films experiments yielded metal concentrations correlated positively with *E. fetida* concentrations. The physiologically based extraction technique correlated positively with bulk soil concentrations and *E. fetida* tissue concentrations for all soils evaluated. http://acwc.sdp.sirsi.net/client/en_US/search/asset/1049686

REMEDIATION OF ACID MINE DRAINAGE-IMPACTED WATER

RoyChowdhury, A., D. Sarkar, and R. Datta.
Current Pollution Reports, Vol 1 No 3, 131-141, 2015

This review describes some of the widely used acid mine drainage (AMD) remediation technologies in terms of their general working principles, advantages, and shortcomings. AMD treatment technologies can be divided into two major categories: prevention and remediation. Remediation technologies can be further divided into broad categories of active and passive treatment. Given the generally higher costs and labor requirements for maintenance of active treatment systems, passive treatments are implemented more widely. Passive treatment technologies include constructed wetlands, anaerobic sulfate-reducing bioreactors, anoxic limestone drains, open limestone channels, limestone leach beds, slag leach beds, and phytoremediation. Research needs are also discussed. *This paper is* ***Open Access*** *at* http://link.springer.com/article/10.1007/s40726-015-0011-3.

USE OF AMENDMENTS TO RESTORE ECOSYSTEM FUNCTION TO METAL MINING-IMPACTED SITES: TOOLS TO EVALUATE EFFICACY

Brown, S.L. and R.L. Chaney.
Current Pollution Reports, Vol 2 No 2, 91-102, 2016

Combinations of mixtures, typically consisting of a material with high metal binding capacity (cyclonic ashes, municipal biosolids, or other materials rich in Fe, Al, or Mn oxides), material to adjust soil pH (sugar beet lime, cement kiln dust, dolomitic limestone), and an organic residual to provide soil structure and nutrients (composts, animal manures, municipal biosolids) have been tested in multiple lab and field trials on metal-contaminated sites. This review focuses on the results of field tests of this approach with the goal of providing methods to quantify site stabilization (reduction of hazard) and restoration of functional systems. Methods to evaluate amendment success include measurement of changes in metal availability, microbial function and diversity, and phytoavailability of metals as well as earthworm and small mammal assays. In most cases, measures of metal availability and ecosystem function are related. For example, surveys of small mammals on restored sites provide information on metal availability as well as suitability of restored habitat. Additional measures of ecosystem function include soil fertility, physical properties, and diversity of habitat. Measures of the value of amendment approaches for restoring ecosystems are detailed. *This paper is* ***Open Access*** *at* http://link.springer.com/article/10.1007/s40726-016-0029-1.

REMEDIATION OF HIGH-STRENGTH MINE-IMPACTED WATER WITH MIXED ORGANIC SUBSTRATES CONTAINING CRAB SHELL AND SPENT MUSHROOM COMPOST

Grembi, J.A., B.A. Sick, and R.A. Brennan.
Journal of Environmental Engineering, Vol 142 No 2, 2016

Anaerobic passive treatment systems remediating high-strength mine-impacted water (MIW) have not displayed consistent success. For example, the high iron (140 mg/L) and acidity (380 mg/L as calcium carbonate) of the Klondike-1 discharge near Ashville, Penn., caused premature clogging of a vertical flow pond (VFP) filled with a traditional 90% spent mushroom compost (SMC) and 10% limestone substrate. Results from continuous-flow columns designed to simulate VFPs indicated that an optimal substrate ratio of 70% crab shell/30% SMC treated double the volume of MIW, removed more than twice the mass of metals, and sustained the pH above 5.0 for almost twice as long as the traditional substrate. A treatment efficiency of 1.2 g substrate/L MIW was calculated as a design parameter for field-scale systems, compared with 2.3 g/L for the traditional substrate. Although more expensive than traditional substrate (~50% more expensive than for the 70% crab shell mixture), the efficiency of the crab shell amendment enables a 50% reduction in the areal footprint of the VFP and is two times less expensive than active treatment alternatives. *See additional information in J. Grembi's thesis at* https://etda.libraries.psu.edu/files/final_submissions/2493 *and in presentation slides at* http://www.wbsrc.org/uploads/2/5/6/0/25607137/brennan.pdf.

REMOVAL OF TOXIC METAL IONS FROM SUNGUN ACID ROCK DRAINAGE USING MORDENITE ZEOLITE, GRAPHENE NANOSHEETS, AND A NOVEL METAL-ORGANIC FRAMEWORK

Rahimi, E. and N. Mohaghegh.
Mine Water and the Environment, Vol 35 No 1, 18-28, 2016

Investigators evaluated the sorptive properties of mordenite zeolite (MOR), a copper terephthalate metal-organic framework (MOF), and graphene oxide (GO) and their potential for treatment of acid rock drainage (ARD) containing Fe^{3+}, Cu^{2+}, Mn^{2+}, Zn^{2+}, Pb^{2+}, and Cd^{2+} ions. MOR was prepared via a hydrothermal method, MOF was prepared via a solvothermal method, and few-layered GO nanosheets were synthesized using Hummers' method. The aqueous contaminants were removed by chemico-physical sorption and ion exchange in batch tests. Optimizing the experimental conditions dramatically improved removal efficiency and sorptive capacity. Magnetic MOF crystals removed metals more efficiently than MOR and GO. Sorption tests using ARD from the Sungun copper mine and a multi-component solution containing cationic metal species illuminated the potential of both GO nanosheets and magnetic MOF for ARD treatment.

ULTRASONIC AND MECHANICAL SOIL WASHING PROCESSES FOR THE REMOVAL OF HEAVY METALS FROM SOILS

Park, B. and Y. Son.
Ultrasonics Sonochemistry [Epub ahead of print] 2016 [doi: 10.1016/j.ultsonch.2016.02.002]

To determine the optimal operating conditions of full-scale soil washing processes for the removal of heavy metals, the effect of high-power ultrasound on the conventional mechanical soil washing process was investigated in a lab-scale 28kHz sonoreactor. Soils sampled from an abandoned railway station site in Seoul, Korea, contained Cu (242.7 ± 40.0 mg/kg), Pb (441.3 ± 49.8 mg/kg), and Zn (358.0 ± 35.7 mg/kg). The combined effects of macroscale mixing and microscale sonophysical effects obtained in the ultrasonic/mechanical process achieved performance sufficient to satisfy the regulatory levels. Ultrasound played a more important role in less favorable conditions for the mechanical washing process (less acidic or less washing liquid conditions). Optimal conditions for a reactor with a bottom area of 15 x 15 cm^2 and ultrasound input power of 250 W were determined as 300g soil per operation; soil:liquid ratio of 1:3; and 0.5M HCl concentration of acidic washing liquid.

BIODEGRADATION OF BIOSOLIDS UNDER AEROBIC CONDITIONS: IMPLICATIONS FOR COVER MATERIALS FOR SULFIDE MINE TAILINGS REMEDIATION

Nason, P., Y. Jia, C. Maurice, L. Alakangas, and B. Oehlander.
Mine Water and the Environment [Epub ahead of print] 2016

Sewage sludge residue (biosolids) was investigated for its potential as a long-term tailings cover at lab, pilot, and field scale using analysis of total organic matter (TOM) mass reduction and O_2, CO_2, CH_4 concentrations to quantify the biodegradation rate. Biosolids may prevent oxygen diffusion into underlying sulfide tailings through microbial aerobic biodegradation of organic matter. A 156-day, open microcosm experiment, in which the loss of biosolids mass over time at differing temperatures—ambient (20-22°C), mesophilic (34°C), and thermophilic (50°C) conditions—indicated that TOM biodegradation was best in the mesophilic temperature range, with 14.8, 27.2, and 26.7% mass depletion at ambient, mesophilic, and thermophilic conditions, respectively. The data were correlated to field-scale data to evaluate biodegradation rates via decreasing O_2 and increasing CO_2 concentrations. Field biodegradation rates were less than lab rates because lower mean annual temperatures (0.6-0.7°C) diminished microbial activity. A calibrated model indicates that 20% of a field application of biosolids will degrade within 2 years, although the rate declines with time due to exhaustion of the most readily degradable organic fraction. If biodegradation cannot be maintained, the long-term effectiveness of biosolids as a covering material for mine tailings remains a concern. *For additional information on this research, see P. Nason's Ph.D. thesis at* https://pure.ltu.se/portal/files/63685993/Peter_Nason.pdf.

A NEW TEST FOR PLANT BIOACCESSIBILITY IN SULPHIDIC WASTES AND SOILS: A CASE STUDY FROM THE WHEAL MAID HISTORIC TAILINGS REPOSITORY IN CORNWALL, UK

van Veen, E.M., B.G. Lottermoser, A. Parbhakar-Fox, N. Fox, and J. Hunt.
Science of the Total Environment, Vol 563-564, 835-844, 2016

A new test for evaluating plant bioaccessibility in sulfidic mine wastes and soils uses hydrogen peroxide to simulate environmental oxidation. The bioaccessible fraction determined is operationally defined and does not predict actual plant uptake. The test targets the portion of an element that is currently available in pore water for uptake by plant roots as well as the fraction that is temporarily constrained in sulfide minerals but may become available upon oxidation of the substrate. A study was conducted at a historic mine waste repository site in Cornwall, U.K., where near-total As concentrations are extremely elevated and Cd, Cu, Pb, Sb and Zn are also high. The test revealed that bioaccessible concentrations of As, Cd, Cu, and Zn and to a lesser extent Sb and Pb are highest in samples of pyritic grey tailings. This result is attributed to sulfide mineral oxidation and, particularly for Cd and Zn, the dissolution of soluble secondary minerals. High As concentrations in the marbled tailings were not bioaccessible. Results show that the rapid, repeatable, and cost-effective test provides useful information on the future bioaccessibility of contaminants and allows for classification of mineralized sulfidic waste materials otherwise unobtainable using established geochemical and mineralogical techniques.

REMOVAL OF OXYFLUORFEN FROM SPIKED SOILS USING ELECTROKINETIC SOIL FLUSHING WITH THE SURROUNDING ARRANGEMENTS OF ELECTRODES

Risco, C., H. Rubi-Juarez, S. Rodrigo, R. Lopez-Vizcaino, C. Saez, P. Canizares, et al.
Science of the Total Environment, Vol 559, 94-102, 2016

In a study of the use of electrokinetic soil flushing (EKSF) to remediate soil contaminated with the herbicide oxyfluorfen, two different electrode configurations were tested, consisting of several electrodes surrounding an electrode of different polarity (designated 1A6C, one anode surrounded by six cathodes, and 1C6A, one cathode surrounded by six cathodes). The studies were conducted at pilot scale using a soil volume of 175 dm^3. Different parameters were measured daily (flowrates, pH, electrical conductivity, and herbicide concentration in different sampling positions). At the end of the test, a complete post-mortem analysis was carried out to obtain a 3D map of the oxyfluorfen, pH, and electrical conductivity in the soil. Results demonstrate that electrode arrangement is a key factor for effective pollutant removal. The 1A6C configuration had a removal rate of 41.3% versus the 27.0% obtained by the 1C6A configuration after a period of 35 days. *Manuscript version*:
https://ruidera.uclm.es/xmlui/bitstream/handle/10578/9249/removal%20of%20oxyfluorfen.pdf?sequence=1

ACID ROCK DRAINAGE REMEDIATION AND ELEMENT REMOVAL USING A PEAT-HUMIC AGENT WITH SUBSEQUENT THERMAL TREATMENT OF THE METAL-ORGANIC RESIDUE

Bogush, A.A., V.G. Voronin, V.D. Tikhova, and G.N. Anoshin.
Mine Water and the Environment, doi:10.1007/s10230-015-0380-2, 2015

A novel alternative method for acid rock drainage (ARD) remediation and metal recovery has been developed that uses a peat-humic agent (PHA) created by mechanical, chemical, and thermobaric treatment of peat. The PHA effectively neutralized moderately acidic ARD and removed potential pollutants (e.g., Fe, Al, Zn, Cu, Pb, Cd, Ni, Co, and Hg), forming metal-organic residues. The organic matter can be removed completely from the metal-organic residues by heating them at 450-500°C. After this treatment, the metal concentrate residues generally contained aggregates (20-350 µm in size), mainly composed of metal oxides and sulfates. Thermal decomposition of the organic matter in the PHA and metal-organic residues is an exothermic process with significant calorific value (9-15 kJ/g).

EMERGY AND CARBON FOOTPRINT ANALYSIS OF THE CONSTRUCTION OF PASSIVE AND ACTIVE TREATMENT SYSTEMS FOR NET ALKALINE MINE DRAINAGE

Winfrey, B.K., R.W. Nairn, D.R. Tilley, and W.H.J. Strosnider,
Mine Water and the Environment, Vol 34 No 1, 31-41, 2015

Multi-criteria sustainability assessments were completed for the construction of a net-alkaline mine drainage passive treatment system (PTS) in northeastern Oklahoma to compare resource use and greenhouse gas emissions with a hypothetical active treatment system (ATS) alternative. Emergy analysis (an environmental accounting method assessing resource use) and carbon footprint analysis were completed for the construction of both systems. Construction of the hypothetical ATS required seven times more emergy purchased from the economy and emitted three times more carbon dioxide equivalents than construction of the PTS. Concrete was the largest factor in both the emergy analysis (ATS and PTS) and carbon footprint (ATS only). Diesel fuel was the largest factor in the carbon footprint of PTS construction. This multi-criteria sustainability assessment shows that a hypothetical ATS alternative to the PTS would have used more resources and emitted more greenhouse gases during construction.

NOVEL BIOTECHNOLOGICAL APPROACHES FOR THE RECOVERY OF METALS FROM PRIMARY AND SECONDARY RESOURCES

Pollmann, K., S. Kutschke, S. Matys, S. Kostudis, S. Hopfe, and J. Raff.

Minerals, Vol 6 No 2, 13 pp, 2016

In biosorption processes, biomass or certain biomolecules are used to bind and concentrate selected ions or other molecules from aqueous solutions. Biosorptive materials can be an environmentally friendly and efficient alternative to conventional materials, such as ion exchange resins. Although processes such as bioaccumulation, bioflotation, bioprecipitation, and biomineralization are well known and have been studied in detail, the recent progress of biotechnologies (e.g., genetic engineering and molecule design) as well as their combination with novel developments in material sciences (e.g., nanotechnologies) facilitates new strategies for biotechnologies application. This paper summarizes recent activities in this field. *This paper is* ***Open Access*** *at* http://www.mdpi.com/2075-163X/6/2/54.

General News

STRATEGIC CONSIDERATIONS FOR THE SUSTAINABLE REMEDIATION OF NUCLEAR INSTALLATIONS

NEA Task Group on Nuclear Site Restoration.
Organisation for Economic Cooperation and Development (OECD), Nuclear Energy Agency (NEA), NEA No. 7290, 113 pp, 2016

Recent experience of NEA member countries in nuclear site remediation during decommissioning was captured in this document to identify strategic considerations for the sustainable remediation of subsurface contamination (mainly contaminated soil and groundwater), describe good practice, and make recommendations for further research and development. The report provides insights for decision-makers, regulators, implementers, and stakeholders involved in nuclear site decommissioning with the goal of furthering the sustainable remediation of nuclear sites now and in the future.
http://www.oecd-nea.org/rwm/pubs/2016/7290-strategic-considerations.pdf

GUIDANCE ON THE IDENTIFICATION, MANAGEMENT AND REMEDIATION OF MERCURY-CONTAMINATED SITES

Bell, L.
IPEN, 84 pp, 2016

This guide was developed to provide a basis for countries to take real actions on contaminated sites in their efforts to implement the Minamata Convention on Mercury, reduce mercury pollution, and protect human health and the environment from mercury contamination.
http://kodaimercury.org/backdoor/wp-content/uploads/2016/04/IPEN-final_26_-Feb_2016_contaminated_sites_guidance_EN_web_2.pdf
IPEN website: http://www.ipen.org/

SPILLS OF DILUTED BITUMEN FROM PIPELINES: A COMPARATIVE STUDY OF ENVIRONMENTAL FATE, EFFECTS, AND RESPONSE

National Academies of Sciences, Engineering, and Medicine.
National Academies Press, Washington, DC. ISBN: 978-0-309-38010-2, 167 pp, 2016

Beginning immediately after a spill, exposure to the environment begins to change spilled diluted bitumen through various weathering processes. The net effect is a reversion toward properties of the initial bitumen. An important factor is the amount of time necessary for the oil to weather into an adhesive, dense, viscous material. For any crude oil spill, lighter volatile compounds begin to evaporate promptly; in the case of diluted bitumen, a dense viscous material with a strong tendency to adhere to surfaces begins to form as a residue. For this reason, spills of diluted bitumen pose particular challenges when they reach water bodies. In some cases, the residues can submerge or sink to the bottom of the water body, and the density of the residual oil does not necessarily need to reach or exceed the density of the surrounding water for this to occur. The crude oil may combine with particles present in the water column to submerge and then remain in suspension or sink. These factors are important to consider for spill response planning and implementation. *Free download of this report is available at* http://www.nap.edu/catalog/21834/spills-of-diluted-bitumen-from-pipelines-a-comparative-study-of.

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.