

TREATING DREDGED SEDIMENTS FOR BENEFICIAL USE: PILOT PROJECT INVESTIGATES THE FEASIBILITY OF USING DREDGED MATERIAL AS SOIL PRODUCT

Currents: The Navy's Energy & Environmental Magazine, 18-21, Spring 2013

In a pilot project undertaken to investigate the feasibility of using dredged material as a soil product, ~1,000 yd³ of dredged sediments from Pearl Harbor were excavated, screened for explosive munitions, and transported to a biosolids facility where they were blended with compost, followed by bioremediation and phytoremediation to improve soil quality. TPHs and PAHs were degraded to acceptable levels during the first year. Metals (copper, lead, and zinc) fell by 30-40% during the first 60 days to below cleanup goals, but then gradually rebounded the following year, possibly because degradation of the organics in the compost over time resulted in an effective increase in concentration of residual metals. Though the pilot test continues for experimental purposes, the intent for reuse is to treat the material for a year or less. The resulting soil is of a quality suitable for landscaping to support vigorous plant growth.

http://greenfeed.dodlive.mil/files/2011/01/Spr13_Predged_Sediments.pdf

REMEDICATION OF ARSENIC CONTAMINATED SEDIMENT IN YANGZONGHAI LAKE

Wang, Q. and H. Wang, D.B. Grover, D.B. Magar, and D. Moore
Book of Abstracts: Seventh International Conference on Remediation of Contaminated Sediments, 4-7 February 2013, Dallas, Texas. Battelle Press, Columbus, OH. 2013

High levels of arsenic contamination released into Yangzonghai Lake from three lake-side manufacturing facilities received great attention from the Chinese Government in September 2008. The examination committee chose a combination of impermeable sediment capping using AquaBlok® and in situ chemical reduction using EHC-M® as the most cost-effective remedial solution. In the lake, upwelling flow pressure and turbulence causes continuous release of arsenic from sediments into the water column. AquaBlok® will be used to isolate the contaminated sediment from the water column to prevent resuspension and fluxing of the dissolved arsenic. After EHC-M® injection into the covered sediments, rapid generation of an extremely low redox condition is anticipated to immobilize the arsenic by combined physical, chemical, and biological mechanisms. Pilot-scale implementation of the Yangzonghai Lake project is pending additional information:

http://www.researchgate.net/publication/228085757_Yangzonghai_Lake_Arsenic_Pollution_Addressed_by_AquaBlok_Capping_and_In_Situ_Chemical_Reduction_Technologies/file/29e41dfe132b1b1d4.pdf

EVALUATION OF ACTIVATED CARBON TREATMENT TECHNOLOGIES IN A PCB-CONTAMINATED WETLAND

Bleiler, J.A., K. Gardner, S. Greenwood, R. McCarthy, and N. Ruiz
Book of Abstracts: Seventh International Conference on Remediation of Contaminated Sediments, 4-7 February 2013, Dallas, Texas. Battelle Press, Columbus, OH. 2013

A field demonstration project is underway at a mid-Atlantic site to evaluate the efficacy of different application technologies for delivering activated carbon (AC) to wetlands. The demonstration began in fall 2010, when two different pelletized AC amendments were delivered via a small-scale granular application spreader and a mulch blower, while powdered AC in an AC slurry system was delivered to test plots using a portable high solids sprayer. Performance in these field applications is being gauged through contaminant bioavailability reduction. Six months following AC treatment, reductions in porewater concentrations were observed for both dry-broadcast (85.8%) and slurry-delivered amendments (52.1%). Preliminary data show that no significant variation in macroinvertebrate species composition or plant species richness occurred over the first 6 months. Inert sand caps and "no treatment" controls were included in the study. **Longer abstract**

<http://www.setnet.org/download/2013-posters/Bleiler-John.pdf> -- **16 Slides:** http://www.mntr.fair.edu/media/mntr/career/csm/pdf/conference-media/presentations/John-Follins_Sentrols_A.pdf

DEMONSTRATION OF AN ACTIVATED CARBON SEDIMENT AMENDMENT AT THE PUGET SOUND NAVAL SHIPYARD & INTERMEDIATE MAINTENANCE FACILITY, BREMERTON, WA

Corder, J., V. Kirtzinger, D. Grover, D.B. Magar, and D. Moore
Western Dredging Association, Pacific Chapter 2013 Annual Meeting, October 25, 2013, Long Beach, CA. 42 slides, 2013

A demonstration project for Pier 7 at the Puget Sound Naval Shipyard and Intermediate Maintenance Facility located in Sinclair Inlet, Puget Sound, Washington, is evaluating and validating the placement, stability, and performance of activated carbon to treat PCB-contaminated sediments in an active harbor setting. The demonstration consists of amending the contaminated area with powdered activated carbon (PAC) using the AquaGate+PAC™ composite aggregate system to improve delivery and physical stability, and decrease the bioavailability of PCBs and other contaminants in the 190 x 115 ft target area, about half of which lies under the pier. Successful placement requires uniformly depositing the amendment in a layer ~2 inches thick over the target area. A broadcast application with conveyor belt-type equipment from a moored barge was selected for rapid, relatively uniform amendment placement. A second barge supplies material to the broadcast conveyor system. <https://www.westerndredging.org/index.php/2013-pacific-western-presentations/download/696/14-demonstration-of-an-activated-carbon-sediment-amendment-at-the-puget-sound-naval-shipyard>

Research

ACTIVATED CARBON IN SEDIMENT REMEDIATION: BENEFITS, RISKS AND PERSPECTIVES

Kuprianchyk, Darya, Ph.D. thesis, Wageningen University, The Netherlands, 264 pp, 2013

This thesis contains a review of the current state of the art in activated carbon (AC) sorbent amendment technology for sediment remediation. Published data indicate that the effectiveness of remediation with AC may be different for powdered AC versus granular AC, and AC effectiveness may be less if black carbon (BC) is already present in the sediment. The effectiveness of AC amendments mainly depends on desorption processes from the native sediment particles and subsequent sorption processes to AC. Aside from sediment geochemical characteristics, the efficiency of AC application depends on factors like particle size, AC concentration applied, and AC pore structure and surface area. Recent ecological studies suggest that effects on the community and ecosystem level are absent or less severe compared to those observed in single-species lab tests. Results from full-scale AC application studies showed stability of AC in the environment and demonstrated its efficiency in binding contaminants in sediments several years after application. <http://ednetp.wur.nl/244236>

1,4-DIOXANE AND THE APPLICATION OF PHYTOREMEDIATION AT NORTH CAROLINA HAZARDOUS WASTE GROUNDWATER CONTAMINATED SITES

Sorensen, Heather, Master's thesis, North Carolina State University, 45 pp, 2013

Twelve 1,4-dioxane-contaminated sites were identified within the state of North Carolina, and six of the sites were assessed in detail for the potential applicability of phytoremediation. Following a review of the sites' characteristics and the strengths and limitations of phytoremediation, results indicated that phytoremediation can be considered as a potentially viable remedial option for 1,4-dioxane at sites that have enough space for plantings of appropriate tree stands and no treatments planned that would interfere with tree uptake of groundwater. http://repository.lib.ncsu.edu/dt/blaststream/1840_d/6273/1/Sorensen-Heather-final.pdf

SUB-PPM QUANTIFICATION OF HG(II) IN AQUEOUS MEDIA USING BOTH THE NAKED EYE AND DIGITAL INFORMATION FROM PICTURES OF A COLORIMETRIC SENSORY POLYMER MEMBRANE TAKEN WITH THE DIGITAL CAMERA OF A CONVENTIONAL MOBILE PHONE

Kaoutit, H.E., P. Estevez, F.C. Garcia, F. Serna, and J.M. Garcia

Analytical Methods, Vol 5 No 1, 54-58, 2013

Colorimetric sensory membranes have been developed for detecting mercury [Hg(II)] in aqueous media. The membranes contain a fluorescent organic compound called rhodamine, which acts as a mercury sensor. The color response of the sensory materials can be tuned for detection with the naked eye, such as the maximum contaminant level of Hg(II) set by U.S. EPA for drinking water. Furthermore, the Hg(II) concentration can be monitored using digital pictures of the membranes taken with conventional cameras. Nanomolar concentration of Hg(II) thus could be detected by the naked eye due to color changes of membranes, and the concentration of Hg(II) could be quantified within the millimolar to nanomolar range by analyzing the digital information of pictures taken of the membranes after dipping them in water containing the Hg cation. *Technical supplement:* <http://www.rsc.org/supdata/bj/c2/c2ay26317f/c2ay26317f.pdf> *Additional description:* <http://pubs.org/pdf/29371308.pdf>

DETECTION AND SPATIAL MAPPING OF MERCURY CONTAMINATION IN WATER SAMPLES USING A SMART-PHONE

Wei, Q., R. Nagi, K. Sadeghi, S. Feng, E. Yan, S.J. Ki, R. Caire, D. Tseung, and A. Ozcan

ACS Nano, Vol 9 No 2, 1121-1129, 2014

A smart-phone-based hand-held platform allows the quantification of Hg(II) ions in water samples with parts-per-billion (ppb) level of sensitivity. An integrated opto-mechanical attachment to the built-in camera module of a smart phone was devised for digital quantification of mercury concentration using a plasmonic gold nanoparticle and aptamer-based colorimetric transmission assay that is implemented in disposable test tubes. Weighing *Additional description:* <http://pubs.org/pdf/31095514.pdf>

IN SITU APPLICATION OF ACTIVATED CARBON AND BIOCHAR TO PCB-CONTAMINATED SOIL AND THE EFFECTS OF MIXING REGIME

Denyes, M.J., A. Rutter, and B.A. Zeeb

Environmental Pollution, Vol 182, 201-208, 2013

In the first in situ experiment conducted at a Canadian PCB-contaminated brownfield site, granular activated carbon (GAC) and two types of biochar exhibited similar performance at reducing PCB uptake into plants. With the addition of 2.8% GAC, Burt's biochar, and BlueLeaf biochar, PCB concentrations in *Cucurbita pepo* root tissue declined by 74%, 72%, and 64%, respectively. A complementary greenhouse study, including an evaluation of earthworm bioaccumulation, found that mechanically mixing AC with PCB-contaminated soil (i.e., 24 h at 30 rpm) resulted in shoot, root, and worm PCB concentrations 66%, 59% and 39% lower than in treatments manually mixed with a spade and bucket. Although both biochar and GAC reduced PCB uptake into plants and earthworms, biochar offered additional benefits, including increased plant and earthworm biomass.

General News

BIOCHEMICAL REACTORS FOR MINING-INFLUENCED WATER

Interstate Technology & Regulatory Council (ITRC)

BCR-1, Available as a Web-based document or a 373-page PDF file, Nov 2013

Mining-influenced water (MIW) includes aqueous wastes generated by ore extraction and processing, as well as acid mine drainage (AMD) and tailings runoff. This document explains biochemical reactor (BCR) technologies used to treat MIW on site and to improve the ambient water quality in nearby watersheds. BCRs are engineered treatment systems that use an organic substrate to drive microbial and chemical reactions to reduce concentrations of metals, acidity, and sulfate in water. This guide covers BCR applicability, testing, design, construction, and monitoring. A decision tree presents the basic factors used to evaluate the efficacy and applicability of BCR treatment for a particular MIW, and 15 case studies allow evaluations of diverse site conditions and different MIW chemical mixtures. <http://itrcweb.org/bcr-1>

GROUNDWATER STATISTICS AND MONITORING COMPLIANCE: STATISTICAL TOOLS FOR THE PROJECT LIFE CYCLE

Interstate Technology & Regulatory Council (ITRC)

GSMC-1, Available as a Web-based document or a 381-page PDF file, Dec 2013

This document was developed to help environmental practitioners understand, interpret, and use statistical techniques to manage groundwater compliance or cleanup projects. The information presented is specifically for environmental project managers who must review or use statistical calculations for reports, make recommendations or decisions based on statistics, or demonstrate compliance for groundwater projects. These individuals typically have a technical background and experience in one or more disciplines related to site compliance or cleanup, but do not have specific expertise in statistics or access to in-house statistical expertise. <http://www.itrcweb.org/gsmc-1>

IN SITU TREATMENT AT PCB CONTAMINATED SEDIMENT SITES

Blackman, T., M. Martin, G. Braun, S. Ozkan, and E. Ashley

Lockheed Martin Middle River Complex Feasibility Study Team, Project Note 2, 92 pp, 2013

Recent research and pilot studies regarding in situ treatment of contaminated sediments by activated carbon (AC) application and its effectiveness for PCBs, PAHs, and metals stabilization indicate that in situ AC treatment is 75-95% effective for reducing PCBs and PAHs bioavailability. To provide background for future sediment remediation at the Middle River Complex site, located in Maryland, this project note presents a general description of in situ treatments, a brief review of ongoing research, and descriptions of projects and pilot studies where in situ treatments have been applied. More than 10 field-scale demonstration projects spanning a range of environmental conditions have been documented in the United States and Norway. <http://www.lockheedmartin.com/content/dam/lockheed/data/corporate/documents/remediation/middle-river/NeteonoInSituTreatment03-13-13.pdf>

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

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