Technology Innovation News Survey

Entries for October 1-15, 2018

Market/Commercialization Information

SMALL BUSINESS HUBZONE SET-ASIDE INDEFINITE DELIVERY CONTRACTS (IDC) FOR A-E SERVICES, USACE NORTHWEST DIVISION (MEGA PHASE B)
U.S. Army Corps of Engineers, USACE District, Kansas City, MO.
Federal Business Opportunities, Solicitation W912DQ19R3000, 2018

This request for submittal of SF330 packages is open only to HUBZone-certified businesses under NAICS code 541330 (Engineering Services). Firms are required to maintain their self-certified HUBZone status throughout the life of this contract; if not, they automatically become ineligible for task order awards. The Northwestern Division (NWD) of the U.S. Army Corps of Engineers has a requirement to acquire A-E hazardous, toxic, and radioactive waste (HTRW) indefinite-delivery contracts for execution of its environmental mission. To support this effort, the Government intends to award contracts to three HUBZone firms sharing $6M in total contract capacity. The ordering period for each contract will be three years with an option for two additional years. Awards are anticipated no earlier than August 2019. The majority of the work will be located in the NWD (including Kansas City, Omaha, and Seattle Districts), with potential for work on EPA Region 2 projects, and likely will be performed under the CERCLA regulatory framework. Selected firms will work on a variety of hazardous waste and other environmental projects, including but not limited to contaminated soil and groundwater, contaminated sediments, radioactive and mixed waste, underground storage tanks and fueling systems, and habitat restoration and mitigation. SF330 packages must be received by 12:00 noon CT on December 7, 2018.
https://www.fbo.gov/spg/USA/COE/DACA41/W912DQ19R3000/listing.html

MISSISSIPPI PHOSPHATE PHASE 1A COVER SYSTEM
Environmental Protection Agency, Office of Acquisition Management, Region IV, Atlanta, GA.
Federal Business Opportunities, Solicitation 68HE0419R0001, 2018

This forthcoming procurement is anticipated to be set aside for small business concerns under NAICS code 237990 (Other Heavy and Civil Engineering Construction), size standard $36.5M. U.S. EPA has initiated a program to address environmental contamination associated with the Mississippi Phosphates Corporation (MPC) Site, located in Pascagoula, Jackson County, Mississippi, where MPC produced diammonium phosphate fertilizer from 1958 to 2014. Phosphogypsum produced as a by-product of the sulfuric acid dissolution step was slurried to disposal areas, where it was deposited in large piles (stacks). The East Gypsum Stack (EGS) served as the disposal area from 2002 until operations ceased in 2014; it has not been closed. The 350-acre EGS complex includes the phosphogypsum stack, four ponds that hold contaminated water, and the water return ditch, which encloses the stack and collects runoff and leachate. EPA has developed a strategy to close the EGS and North Ponds to reduce ongoing water treatment costs and to eliminate contaminated water sources that pose a threat to the environment through potential uncontrolled releases. EPA has identified ClosureTurf as the only product on the market that meets the requirements to cap and cover the EGS. The solicitation resulting from this notice will be only for the purchase and installation of the cover system. Release of the RFP via an additional notice is anticipated by or before December 7, 2018. Any solution submitted as part of the proposal must meet or exceed ClosureTurf specifications. https://www.fbo.gov/spg/EPA/OAM/RegIV/68HE0419R0001/listing.html

Cleanup News

COMPLEX REMEDIATION OF MERCURY CONTAMINATED SOIL ON A SENSITIVE SITE
Leplat, J., J. Chibleur, and J. Haemers.
Intersol 2018: International Conference-Exhibition on Soils, Sediments and Water, March 27-29, 31 slides, 2018

Mercury was a major contaminant of concern at a former industrial site in a highly urbanized area in the south Paris region where redevelopment aimed to accommodate future public use. Lab studies showed it was possible to differentiate several forms of Hg (mainly HgCl and Hg^0) and validated the possibility of desorbing Hg in these forms at ~260°C. That temperature mitigated the residual risk of subsequent Hg vapors, as only stable HgS remained in the soil. Soil excavations carried out in 2016-2017 included work in the vicinity of sensitive structures, particularly a buried high-voltage line. Nearly 12,000 m^3 were excavated and disposed of off site: 80% as non-hazardous waste, 10% as hazardous waste (ISDD), and 10% as ISDD with stabilization. To address areas inaccessible to excavation, in situ thermal desorption was implemented. The groundwater had to be lowered 1 m in a large portion of the thermally treated area at a continuous flowrate of 265 m^3/h using 12 specific vessels (successions of activated carbon treated with sulfur and ion exchange resins) to allow temperatures to rise to the 250-350°C needed for adequate volatile Hg removal. Treatment began in November 2017, aiming for completion in summer 2018. Soil vapors were collected and treated in a unit that first cooled the vapors to 12°C to allow the liquids to condense for recovery, including liquid Hg. The non-condensables (including Hg) were then polished through sulfur-coated activated carbon vessels before release to the atmosphere. Results show high efficiency of Hg removal from the soil with efficient collection in the vapor treatment system. The site is permanently monitored for Hg vapors to ensure public safety.
Longer abstract: https://haemers-technologies.com/wp-content/uploads/2018/03/Intersol2018_TechnicalResume_sensitivesite_mercury.pdf
Slides: https://www.intersol.fr/download/27032018/download.php?f=Intersol_2018_3-Jeremie_Leplat_Biogenie_Europe.pdf

2017 REMEDIATION EFFECTIVENESS REPORT FOR THE U.S. DEPARTMENT OF ENERGY OAK RIDGE RESERVATION, OAK RIDGE, TENNESSEE: DATA AND EVALUATIONS
U.S. DOE, Office of Environmental Management, DOE/OR/01-2731&D2, 689 pp, 2017

This report contains evaluations of the performance of completed CERCLA actions on and around the DOE Oak Ridge Reservation and the effectiveness of long-term stewardship for each of the completed actions. Watershed monitoring results and trends are summarized. https://doeic.science.energy.gov/uploads/A-0100-064-2546.pdf

LOCAL CONTAMINATION IN SVALBARD: OVERVIEW AND SUGGESTIONS FOR REMEDIATION ACTIONS
Granberg, M.E., A. Ask, and G.W. Gabrielsen.
Norwegian Polar Institute (NPI), Kortrapport/Brief Report no. 044, 51 pp, 2017

Norway has a well-developed system for classification and risk assessment of contaminated soil sites within the temperate mainland, but a corresponding system is not fully developed for the Norwegian Arctic. Unremediated sites harboring local pollution from historical human activities, such as abandoned settlements, mining areas, and military installations, may become important contributors to Arctic pollution. Human and industrial activities often are situated along the coasts in Arctic areas for logistic reasons. NPI was assigned to compile experiences from remedial actions performed in contaminated soil sites of the Svalbard area and also to evaluate current remediation methods relevant to areas with an Arctic climate and limited possibilities for disposal of contaminated soil. This report (1) provides a brief review of polluted sites and their sources in Svalbard, (2) describes currently available and appropriate remediation techniques, and (3) offers brief guidance on future actions regarding contaminated sites in Svalbard. The review is informed by example remediation projects carried out in the Arctic and Antarctic regions.
https://brage.bibsys.no/xmlui/bitstream/handle/11250/2456307/Kortrapport44.pdf

LONG-TERM IMPACTS ON GROUNDWATER AND REDUCTIVE DECHLORINATION FOLLOWING BIOREMEDIATION IN A HIGHLY CHARACTERIZED TRICHLOROETHENE DNAPL SOURCE AREA
Schaefer, C.E., G.M. Lavorgna, A.A. Haluska, and M.D. Annable.
Groundwater Monitoring & Remediation 38(3):65-74(2018)

High-resolution soil and groundwater monitoring was performed to assess the long-term impacts of bioremediation using bioaugmentation with a dechlorinating microbial consortium and sodium lactate as the electron donor in a well-characterized TCE DNAPL source area. Monitoring was performed up to 3.7 yrs following active bioremediation using a high-density monitoring network that included several discrete-interval multi-level sampling wells. Results showed that despite the absence of lactate, lactate fermentation transformation products, or hydrogen, biogeochemical conditions remained favorable for the reductive dechlorination of chlorinated ethenes. While ethene levels measured 3.7 yrs after active treatment suggested relatively low (2-30%) dechlorination of the parent TCE and daughter products, carbon stable isotope analysis showed that the extent of complete dechlorination was much greater than indicated by ethene generation and that the estimated first-order rate constant describing the complete dechlorination of TCE at 3.7 yrs following active bioremediation was ~3.6/yrs. Overall results suggest that biological processes may persist to treat TCE for long periods of time after cessation of active bioremediation. *For more information, see the reports completed under ESTCP Project ER-201428 at* https://www.serdp-estcp.org/Program-Areas/Environmental-Restoration/Contaminated-Groundwater/Persistent-Contamination/ER-201428.

URANIUM SEQUESTRATION: FIELD TEST TO REMEDIAL ACTION
Baynes, P.A., V.A. Rohay, F.C. Elloy, S. Mehta, R. Hermann, and G. Ng.
WM2017: Waste Management Conference, March 5-9, 2017, Phoenix, Arizona. Paper 17151, 2017

The 2013 Record of Decision for the 300 Area of the Hanford site requires DOE to use phosphate to sequester uranium over a 1.2-ha area by applying phosphate to the highest uranium concentration areas of the vadose zone and the periodically rewetted zone using a combination of surface infiltration, periodically rewetted zone injection, and shallow aquifer injection. Due to the difficulties inherent in scale-up from a limited field test to a full-scale remedial action, it was determined that uranium sequestration would occur in two sequential stages. Stage A would treat a 0.3-ha area, while Stage B would treat the remaining 0.9-ha area. The purpose of Stage A, which was implemented in November 2015, was to test the phosphate application approach on a smaller area, refine the process based on the results, and then implement it in a larger area. This paper describes the Stage A uranium sequestration process (objectives, observations, and conclusions), the sampling and monitoring approach, the physical sequestration system, and recommended changes for Stage B. http://www.wmsym.org/archives/2017/pdfs/FinalPaper_17151.pdf

Demonstrations / Feasibility Studies

COMBIE RESERVOIR DRY SEDIMENT REMOVAL IS UNDERWAY
WaterWays 39(4):2(2018)

The Nevada Irrigation District (NID) has awarded contracts worth $6.6M to get the Combie Reservoir Sediment and Mercury Removal Project moving ahead during fall 2018. This pilot project will remove and clean about 80,000 yd^3 of sediment from Combie Reservoir using an innovative centrifuge process to reduce elemental Hg in the Bear River watershed. The sediment removal will reduce potential human exposure to methylmercury as well as restore water storage capacity in the reservoir. Work to remove sediment from Combie Reservoir is in the first of two stages—the dry stage—when contractors expect to take 30,000-40,000 yd^3 of sediment from the reservoir basin. Dredging in wet conditions is scheduled to begin in February 2019. Most Sierra watersheds contain elevated concentrations of Hg, a remnant of gold processing practices used more than a century ago. This pilot project is intended to demonstrate that Hg can be removed effectively from river sediments. The process then can be applied at other reservoirs throughout the Sierra Nevada. The total project is estimated to cost $7.5M. NID will contribute $2M and the Department of Water Resources will provide $5.5M in grant funding. Read more about the project at https://nidwater.com/conservation/mercury-removal-project/.

MERCURY ON A LANDSCAPE SCALE: BALANCING REGIONAL EXPORT WITH WILDLIFE HEALTH
Marvin-DiPasquale, M., L. Windham-Myers, J.A. Fleck, J.T. Ackerman, C. Eagles-Smith, et al. U.S. Geological Survey Open-File Report 2018-1092:1-105(2018)

A treatment approach was tested at field scale to reduce MeHg loads to the Sacramento-San Joaquin River Delta by creating open-water deep cells with a small footprint at the downstream end of wetlands to promote net demethylation of MeHg and minimize MeHg and Hg loads exiting the wetlands. The deep cells were located immediately upgradient of the wetland outflow weir and were deep enough (75-91 cm depth) to be vegetation-free. The topographic and hydrologic structure of each treatment wetland was modified to include open-water deep cells so that the removal of aqueous MeHg might be enhanced through particle settling, photo-degradation, and benthic microbial demethylation. This report discusses the results. https://pubs.er.usgs.gov/publication/ofr20181092

CHEMISTRY AND ENGINEERING ASPECTS OF THE APPLICATION OF SOLUBLE PHOSPHATES FOR URANIUM TREATMENT IN GROUNDWATER
Gillow, J., R. Murphy, P. Moran, S. Ulrich, L. Weidemann, M. Hay, and M. Gentile.
WM2017: Waste Management Conference, March 5-9, 2017, Phoenix, Arizona. Paper 17255, 2017

Within the last 10 years, the application of soluble phosphates has been identified as a viable means of treating soluble uranium, while at the same time changing the balance in terms of the availability of sorbed/immobile uranium to remobilize. While uranium reacts with soluble phosphate to form a range of low-solubility uranium minerals, surface passivation can also result, which limits the availability of uranium for dissolution. This paper discusses the application of dissolved phosphate in a pilot test in a tailings impoundment. http://www.wmsym.org/archives/2017/pdfs/FinalPaper_17255_0505042056.pdf

Research

ASSESSMENT AND MANAGEMENT OF STORMWATER IMPACTS ON SEDIMENT RECONTAMINATION
Reible, D., B. Rao, M. Rakowska, D. Athanasiou, I. Drygiannaki, M. Bejar, B. Chadwick, et al.
SERDP Project ER-2428, 1840 pp, 2018

To develop, test, and assess the effectiveness of a comprehensive set of lab, field, and modeling approaches in characterizing the role of urban stormwater in contamination of sediments and recontamination of remediated sites, a field study was conducted at Paleta Creek, an urban watershed partially encompassing Naval Base San Diego and draining to San Diego Bay. Stormwater discharges at a secondary site at Puget Sound Naval Shipyard were also studied to identify whether the methods were applicable and whether general characteristics noted at Paleta Creek were reproduced at an additional site. This report is organized by the tools and measurements as related to the understanding gained during their use.
https://www.serdp-estcp.org/content/download/47212/454846/file/ER-2428%20Final%20Report.pdf

LAYING WASTE TO MERCURY: INEXPENSIVE SORBENTS MADE FROM SULFUR AND RECYCLED COOKING OILS
Worthington, M.J.H., R.L. Kucera, I.S. Albuquerque, C.T. Gibson, A. Sibley, A.D. Slattery, et al.
Chemistry: A European Journal 23(64):16219-16230(2017)

Researchers have developed low-cost Hg sorbents made solely from sulfur and unsaturated cooking oils. A porous version of the polymer was prepared by simply synthesizing the polymer in the presence of a sodium chloride porogen. The resulting material is a rubber that captures liquid Hg metal, Hg vapor, inorganic Hg bound to organic matter, and highly toxic alkylmercury compounds. Hg removal from air, water, and soil was demonstrated. Because sulfur is a by-product of petroleum refining and spent cooking oils from the food industry are suitable starting materials, these Hg-capturing polymers can be synthesized entirely from waste and supplied on multi-kilogram scales. *This paper is* ***Open Access*** *at* https://onlinelibrary.wiley.com/doi/full/10.1002/chem.201702871.

MERCURY REMOVAL & STABILIZATION IN THE SUBSURFACE USING VAPOR PHASE SULFUR
Jackson, D.G., M.E. Denham, and C. Eddy-Dilek.
Savannah River National Laboratory, 2017 LDRD: Laboratory Directed Research and Development Program, SRNL-STI-2018-00143:29-34(2018)

Operational strategies related to thermal heating of elemental Hg with gas injection were evaluated in simulations performed with the DOE-developed code TOUGH2/TMVOC. The TOUGH2/TMVOC library of thermophysical parameters was updated with relative properties for elemental Hg. Simulations representative of a practical field problem were performed to determine the effect of moisture and air injection requirements to facilitate elemental Hg removal. This research is developing an SRNL technology (US #8,770,891) designed to stabilize elemental Hg in the subsurface. The technology uses residual heat present following thermal treatment to deliver elemental sulfur vapor as a sequestering agent. Sulfur combines with Hg to form mercury sulfide compounds, which are more stable, less leachable forms of Hg. The goal is to establish an operating paradigm that couples thermal mass removal with this process to stabilize residual contamination in place. https://srnl.doe.gov/LDRD/pdf/FY17_SRNL_LDRD_Report.pdf

EVALUATING THERMAL TREATMENT AS A VIABLE MECHANISM FOR THE REMEDIATION OF ELEMENTAL MERCURY
Spain, T. and R. Falta. The 26th Annual David S. Snipes/Clemson Hydrogeology Symposium, April 12, 2018: Book of Abstracts, p. 47, 2018

DOE's TOUGH2/TMVOC code, developed at Lawrence Berkeley National Laboratory, was used to determine the effectiveness of thermal treatment to remediate elemental Hg. TMVOC is a 3-phase nonisothermal numerical simulator for water, gas, and VOCs in porous media. The code was used to simulate the removal of elemental Hg due to its liquid state at 25°C and relatively high vapor pressure at elevated temperatures. The overlying work was conducted as feasibility research for the maturation of thermal treatment for elemental Hg. Multiphase flow, contaminant phase change, and transport processes were investigated during Hg thermal mass transfer. Temperature, pressure, and mass injection rates were evaluated the better to constrain the thermal Hg treatment process. The study consisted of three key elements: 1) numerical simulation of 1D thermal treatment experiments outlined by Kunkel et al. 2006 for the treatment of elemental Hg; 2) development of ex situ and in situ thermal treatment simulation under varying conditions for Hg removal; and 3) a feasibility assessment of thermal treatment for the removal of elemental Hg in porous media.

DEVELOPMENT OF A METHOD FOR MEASURING MERCURY (HG) SPECIES USING HG-DIFFUSIVE GRADIENTS IN THIN FILM (DGT) TECHNOLOGY
Paller, M., B. Looney, A. Knox, D. Jackson, N. Halverson, W. Kuhne, and M. Harmon.
Savannah River National Laboratory, 2017 LDRD: Laboratory Directed Research and Development Program, SRNL-STI-2018-00143:18-28(2018)

DGT passive samplers consist of a gel layer, which selectively binds to contaminants, and a diffusion gel, which admits molecules that are available and toxic to organisms. SRNL research in 2017 included one project to measure bioavailable metals by DGT and another to develop methods for measuring Hg by DGT. Metal concentrations measured by DGT probes were correlated with metal toxicity to an aquatic invertebrate, suggesting that DGT can serve as a surrogate for aquatic organisms, although it does not account for all factors that affect bioavailability. A novel reactive DGT probe was also developed that measures only methymercury; a chemical reaction added to the diffusion pathway of the DGT probe modifies and collects inorganic Hg, thereby preventing it from reaching the DGT collection gel. https://srnl.doe.gov/LDRD/pdf/FY17_SRNL_LDRD_Report.pdf

REMEDIATION OF MERCURY CONTAMINATED SOIL AND BIOLOGICAL MERCURY METHYLATION IN THE LANDSCAPE
Xu, Jingying, Ph.D. dissertation, Uppsala University, Sweden. 58 pp, 2018

In the first part of this study, an evaluation of the potential of soil washing for Hg remediation showed that Methanoregulaceae and hamper the growth of *Ruminococcaceae*. Results from lake sediments supported that *Geobacteraceae* have an important role in Hg(II) methylation under ferruginous geochemical conditions. https://uu.diva-portal.org/smash/get/diva2:1189465/FULLTEXT01.pdf

METHYLMERCURY UPTAKE AND DEGRADATION BY METHANOTROPHS
Lu, X., W. Gu, L. Zhao, M.F. Ul Haque, A.A. DiSpirito, J.D. Semrau, and B. Gu.
Science Advances 3(5):Paper e1700041(2017)

Methylmercury (MeHg) is a potent neurotoxin produced by certain anaerobic microorganisms in natural environments. Although numerous studies have characterized the basis of Hg methylation, no studies have examined MeHg degradation by methanotrophs, despite their ubiquitous presence in the environment. Researchers found that some methanotrophs, such as *Methylosinus trichosporium* OB3b, can take up and degrade MeHg rapidly, whereas others, such as *Methylococcus capsulatus* Bath, can take up but not degrade MeHg. Demethylation by *M. trichosporium* OB3b increased with increasing MeHg concentrations but was abolished in mutants deficient in the synthesis of methanobactin, a metal-binding compound used by some methanotrophs, such as *M. trichosporium* OB3b. Furthermore, addition of methanol (>5 mM) as a competing one-carbon substrate inhibits demethylation, suggesting that MeHg degradation by methanotrophs might involve an initial bonding of MeHg by methanobactin, followed by cleavage of the C-Hg bond in MeHg by the methanol dehydrogenase. This new demethylation pathway by methanotrophs indicates possible broader involvement of C-metabolizing aerobes in the degradation and cycling of toxic MeHg in the environment. http://advances.sciencemag.org/content/advances/3/5/e1700041.full.pdf

ROBUST MERCURY METHYLATION ACROSS DIVERSE METHANOGENIC ARCHAEA
Gilmour, C.C., A.L. Bullock, A. McBurney, M. Podar, and D.A. Elias.
mBio 9:e02403-17(2018)

Archaea, specifically methanogenic organisms, play a role in Hg methylation in nature, but their global importance to MeHg production and the subsequent risk to ecosystems are not known. Methanogenesis has been linked to Hg methylation in several natural habitats where MeHg production incurs risk to people and ecosystems, including rice paddies and permafrost. This research confirmed that most methanogens carrying the *hgcAB* gene pair are capable of Hg methylation. The investigators found that methylation rates vary inherently among *hgcAB*+ methanogens but that several species are capable of MeHg production at rates that rival those of the better-known Hg-methylating sulfate- and iron-reducing bacteria. Methanogens might need to be considered equally with sulfate and iron reducers in evaluating MeHg production in nature.
https://repository.si.edu/bitstream/handle/10088/35591/Gilmour%202018%20mBio%20Robust%20mercury%20methylation%20across%20diverse%20methanogenic%20Archaea.pdf

EVIDENCE OF MERCURY METHYLATION AND DEMETHYLATION BY THE ESTUARINE MICROBIAL COMMUNITIES OBTAINED IN STABLE HG ISOTOPE STUDIES
Figueiredo, N., M.L. Serralheiro, J. Canario, A. Duarte, H. Hintelmann, and C. Carvalho.
International Journal of Environmental Research and Public Health 15:Article 2141(2018)

Microbial communities were isolated from sediments of two highly Hg-polluted areas of the Tagus Estuary and differentiated according to their dependence on oxygen into three groups: aerobic, anaerobic, and sulfate-reducing microbial communities. Their potential to methylate Hg and demethylate methylmercury was evaluated through incubation with isotope-enriched Hg species ($^{199}HgCl$ and $CH_3{}^{201}HgCl$). The isolated microbial communities were found to be actively involved in methylation and demethylation processes. The production of $CH_3{}^{199}Hg$ was positively correlated with sulfate-reducing microbial communities, methylating up to 0.07% of the added ^{199}Hg within 48 h of incubation. A high rate of $CH_3{}^{201}Hg$ degradation was observed, and >20% of $CH_3{}^{201}Hg$ was transformed. Hg removal of inorganic forms was also observed. Results demonstrate the simultaneous occurrence of microbial methylation and demethylation processes and indicate that microorganisms are mainly responsible for methylmercury formation and accumulation in the Tagus Estuary. https://www.mdpi.com/1660-4601/15/10/2141/pdf

INCREASE IN NUTRIENTS, MERCURY, AND METHYLMERCURY AS A CONSEQUENCE OF ELEVATED SULFATE REDUCTION TO SULFIDE IN EXPERIMENTAL WETLAND MESOCOSMS
Myrbo, A., E.B. Swain, N.W. Johnson, D.R. Engstrom, J. Pastor, B. Dewey, P. Monson, et al.
Journal of Geophysical Research: Biogeosciences 122:2769-2785(2017)

In water-saturated wetland soils, which usually are anoxic, decomposition of dead plants and other organic matter is greatly retarded by the absence of oxygen. The addition of sulfate can allow bacteria that respire sulfate instead of oxygen to decompose organic matter that otherwise would not decay. This accelerated decay has multiple consequences that are concerning. The bacteria that respire sulfate "breathe out" hydrogen sulfide, analogous to the conversion or respiration of oxygen to CO_2. Sulfide is very reactive with metals, which makes it toxic at higher concentrations. In addition to the release of sulfide, sulfate-accelerated decomposition of plants releases phosphorus and nitrogen, fertilizing the waterbody. Decomposition also mobilizes Hg (which is everywhere, thanks to atmospheric transport) into the surface water. The microbes that convert sulfate to sulfide also methylate Hg, producing methylmercury (MeHg), the form of Hg that contaminates fish. This study demonstrates that adding sulfate to a wetland can not only produce toxic levels of sulfide but also increase the surface water concentrations of nitrogen, phosphorus, Hg, and MeHg.
https://agupubs.onlinelibrary.wiley.com/doi/pdf/10.1002/2017JG003788

ASSESSMENT OF REPEATED HARVESTS ON MERCURY AND ARSENIC PHYTOEXTRACTION IN A MULTI-CONTAMINATED INDUSTRIAL SOIL
Grifoni, M., F. Pedron, G. Petruzzelli, I. Rosellini, M. Barbafieri, E. Franchi, and R. Bagatin.
AIMS Environmental Science 4(2):187-205(2017)

Repeated assisted phytoextraction cycles with *Brassica juncea* were conducted at lab scale to evaluate Hg and As removal efficiency from a multi-contaminated industrial soil. The researchers also investigated the effect of 2 additives, ammonium thiosulphate and potassium dihydrogen phosphate, to increase metal bioavailability in soil with the further goal of investigating the possibility of using only one additive to remove both Hg and As from soil simultaneously. Repeated additions of mobilizing agents increased metal availability in soil, promoted plant uptake, and consequently increased contaminant removal from the studied soil. Thiosulfate addition greatly promoted plant uptake of Hg and As concentrations in the *B. juncea* aerial part, but the toxic effects of Hg reduced biomass production, and the total accumulation of both metals in the plants tended to decrease at each subsequent re-growth. *This paper is* ***Open Access*** *at* http://www.aimspress.com/article/10.3934/environsci.2017.2.187/fulltext.html

REMOVAL OF HG^{2+} AND METHYLMERCURY IN WATERS BY FUNCTIONALIZED MULTI-WALLED CARBON NANOTUBES: ADSORPTION BEHAVIOR AND THE IMPACTS OF SOME ENVIRONMENTALLY RELEVANT FACTORS
Zhang, D., Y. Yin, and J. Liu.
Chemical Speciation & Bioavailability 29(1):161-169(2017)

A study of the adsorption of Hg^{2+} and methylmercury (MeHg) to multi-walled carbon nanotubes (MWCNTs) modified, respectively, with hydroxyl, amine, and carboxyl groups evaluated the effect of factors such as initial pH, natural organic matter (NOM), Cl^-, and adsorbent dose on sorption efficiency. The amine-modified MWCNTs showed a strong adsorption capacity to Hg^{2+} and MeHg, and the removal efficiency could reach up to 92% (0.5 g/L MWCNTs, and 100 µg/L Hg^{2+} and MeHg) independent of pH. NOM had complex effects on the adsorption of Hg^{2+} and MeHg to MWCNTs. Cl^- inhibited the adsorption of Hg^{2+} and MeHg to MWCNTs. Adsorption of Hg^{2+} and MeHg was found to be inhomogeneous and homogeneous chemisorption, respectively. https://www.tandfonline.com/doi/pdf/10.1080/09542299.2017.1378596

THE USE OF CALCIUM CARBONATE-ENRICHED CLAY MINERALS AND DIAMMONIUM PHOSPHATE AS NOVEL IMMOBILIZATION AGENTS FOR MERCURY REMEDIATION: SPECTRAL INVESTIGATIONS AND FIELD APPLICATIONS
Wang, J., Y. Xing, Y. Xie, Y. Meng, J. Xia, and X. Feng.
Science of the Total Environment 646:1615-1623(2019)

Scientists evaluated the effects of calcium carbonate-enriched clay minerals (CECM), diammonium phosphate (DAP), or both in different amounts and ratios on Hg removal from solutions. Application of CECM and DAP at a ratio of 50:1 (w/w) removed over 90% of Hg from solutions containing 1.8?µM Hg^{2+}, higher than either DAP (Brassica chinensis and *Raphanus raphanistrum* in comparison to the control.

CONTAMINATED SEDIMENTS: METHODS TO ASSESS RELEASE AND TOXICITY OF ORGANIC CHEMICAL MIXTURES
Mustajarvi, Lukas, Ph.D. thesis, Stockholm University, 58 pp, 2017

This thesis encompassed both field studies and lab experiments that address two aspects of contaminated sediments: the release and the toxicity of sediment-associated hydrophobic organic compounds (HOCs). The overarching aims of the work were to develop methods for in situ assessment of the release of HOCs from sediments and to assess the toxicity of mixtures of bioavailable chemicals in sediments https://www.diva-portal.org/smash/get/diva2:1160220/FULLTEXT01.pdf

General News

THE EFFECTS OF METHYLMERCURY ON WILDLIFE: A COMPREHENSIVE REVIEW AND APPROACH FOR INTERPRETATION
Evers D.
Elsevier, Oxford. The Encyclopedia of the Anthropocene 5:181-194(2018)

A comprehensive literature review was conducted to (1) identify relevant effect thresholds for wild birds and mammals, (2) further define effects (i.e., compare traditionally used lowest-observed-adverse-effect levels [LOAEL] with recently preferred effect concentrations), (3) understand choice of tissue types and what they mean, and (4) describe the importance of taxonomic differences. This synthesis is based on 214 peer-reviewed publications (n = 138 bird studies and n = 76 mammal studies) that represent much of the literature on the effects of Hg on free-living populations and wild species experimentally dosed in captivity. Domesticated species were not included, unless they were germane for understanding relevant responses in wild species. http://www.briloon.org/uploads/Library/item/525/file/Evers%202018%20-%20Encyclopedia%20of%20the%20Anthropocene.pdf

THE MERCURY PROBLEM IN ARTISANAL AND SMALL-SCALE GOLD MINING
Esdaile, L.J. and J.M. Chalker.
Chemistry: A European Journal 24(27):6905-6916(2018)

Between 10-19 million people use mercury (Hg) to mine for gold in more than 70 countries, making pollution from Hg-dependent artisanal and small-scale gold mining (ASGM) a global issue. In practice, elemental Hg is used to extract gold from ore as an amalgam. The amalgam typically is isolated by hand and then heated—often with a torch or over a stove—to distill the Hg and isolate the gold. Hg release from tailings and vaporized Hg exceeds 1000 tonnes each year from ASGM. The health effects on the miners are dire, and communities near the mines are also affected by Hg contamination of water and soil and accumulation in fish. This paper offers a review of the problem of Hg in ASGM with a discussion on how the chemistry community can contribute solutions. https://dspace2.flinders.edu.au/xmlui/bitstream/handle/2328/38221/Esdaile_Mercury_P2018.pdf

STORMWATER BEST MANAGEMENT PRACTICES PERFORMANCE EVALUATION
Interstate Technology & Regulatory Council (ITRC), Web-based document, 2018

Post construction best management practices (BMP) lifecycle processes are detailed in this guide, in addition to contracting, cost considerations, and installation factors (e.g., construction challenges, inspection checklists, quality control, and record drawings). Long-term technology- and performance-based operational strategies include aspects such as routine and non-routine maintenance. Data and information from existing publicly available BMP performance programs have been incorporated into an online **BMP Screening Tool** at https://stormwater-1.itrcweb.org/wp-content/uploads/2018/09/itrc_sw_bmp_tool.xlsm. Given site-specific pollutant treatment requirements and installation considerations, the tool can assist the user by identifying a list of BMPs that might be appropriate for a particular site. The tool also provides summarized information on the treatment efficiency, installation requirements, and maintenance issues associated with the identified BMPs, with links to sources of more detailed information. https://stormwater-1.itrcweb.org/

EVALUATION OF INNOVATIVE METHANE DETECTION TECHNOLOGIES
Interstate Technology & Regulatory Council (ITRC), Web-based document, 2018

Methane is the primary component in natural gas. The purpose of this document is to provide an overview of existing and emerging methane detection and quantification technologies, as well as performance characteristics and parameters to consider in technology evaluation. Regulatory barriers to the use and adoption of new or innovative technologies that have the potential to reduce methane emissions are identified. The guide is intended to enable regulators, facility owners and operators, and other users to evaluate, compare, and select suitable technologies that detect and quantify methane emissions from various segments of the oil and gas supply chain for compliance with existing and forthcoming methane emission (leak) regulations, as well as to monitor inventories and enhance workforce and public safety. https://methane-1.itrcweb.org/

QUALITY CONSIDERATIONS FOR MULTIPLE ASPECTS OF MUNITIONS RESPONSE SITES
Interstate Technology & Regulatory Council (ITRC), Web-based document QCMR-1, 2018

The decision logic used throughout a munitions response (MR) project is explained to assist in developing the QA/QC activities that ensure quality data and confidence in decision-making. An overview of the MR process identifies specific quality considerations at critical decision points for MR projects. Planning for each decision point requires the assignment of specific quality metrics such that ongoing monitoring confirms project objectives are met. This document is specifically targeted toward federal, state, and local environmental regulators; MR managers, technical staff, and contractors; federal land management agencies; and tribal, environmental, and community stakeholders. Recent advances in MR technology are described, including advanced geophysical classification and corresponding developments in QA/QC procedures as well as requirements for qualifications and training. This document addresses only land-based MR and not the underwater environment. https://qcmr-1.itrcweb.org/

TECHNICAL GUIDANCE FOR MILITARY MUNITIONS RESPONSE ACTIONS
U.S. Army Corps of Engineers (USACE), Engineer Manual No. 200-1-15, 447 pp, 2018

This manual provides the USACE Project Delivery Team with the processes for executing the technical aspects of all munitions response (MR) projects, including those investigation and remedial activities conducted under CERCLA. In addition to MR project planning and reporting, this guide provides information on geospatial data and systems, geophysical investigation methodologies, munitions constituents characteristics and analytical methodologies, site characterization strategies, planning strategies for remedial or removal actions, hazard and risk assessment, and planning considerations for specific munitions constituents for remedial or removal actions.
https://www.publications.usace.army.mil/LinkClick.aspx?fileticket=mD3NRQJt4gM%3d&tabid=16439&portalid=76&mid=43544

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